



**NYSERDA**

# **Annual Investment Plan and Performance Report through June 30, 2017**

**Final Report**

## **NYSERDA's Promise to New Yorkers:**

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

### **Mission Statement:**

Advance innovative energy solutions in ways that improve New York's economy and environment.

### **Vision Statement:**

Serve as a catalyst – advancing energy innovation, technology, and investment; transforming New York's economy; and empowering people to choose clean and efficient energy as part of their everyday lives.



# **Annual Investment Plan and Performance Report through June 30, 2017**

*Final Report*

Prepared by

**New York State Energy Research and Development Authority**

Albany, NY

November 2017

# Annual CEF Metrics and Financial Report

## – November 1, 2017

### Introduction

The New York State Energy Research and Development Authority (NYSERDA) is pleased to present the first Annual Metrics and Financial Report for New York State's Clean Energy Fund (CEF) – a component of the Annual Investment Plan and Performance Report. The CEF is comprised of four portfolios: Market Development, Innovation and Research, NY Green Bank and NY-Sun. These portfolios work collectively toward meeting ambitious energy, environmental and economic goals, and are expected to contribute significantly toward the broader New York State Energy Plan goals.

To ensure comprehensive performance reporting on all four CEF portfolios, NYSERDA was directed to file an Annual CEF Metrics and Financial Report compiling the performance across all portfolios, including key financial and metrics information in relation to the minimum goals established in the Public Service Commission's (PSC) *Order Authorizing the Clean Energy Fund Framework*.<sup>1</sup> This report fulfills that requirement and provides a view of the CEF progress toward its 10-year goals through June 30, 2017.<sup>2</sup> Results achieved to date, projected level of achievement anticipated in future years and efforts revised or adjusted in response to weaker than anticipated results are described throughout. In summary, and as noted through the information provided in this report, NYSERDA is confident it will meet or exceed anticipated CEF goals over the life of the fund.

### Progress Summary

The Market Development (MD) and Innovation and Research (I&R) portfolios are currently at the 1.5-year mark of their 10-year cycle, and significant build and launch activity has taken place. Through June 2017, 40 out of 41 MD and I&R initiatives developed by NYSERDA and filed with the PSC launched in the market. In these portfolios, NYSERDA introduced 28 new initiatives

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<sup>1</sup> Cases 14-M-0094, et al., *Order Authorizing the Clean Energy Fund Framework*, issued January 21, 2016.

<sup>2</sup> Implementation of the CEF Market Development and Innovation & Research portfolios are currently at the 1.5-year mark of their 10-year authorized timeline. The NY-Sun Program began prior to the launch of the CEF and is at approximately the 3.5 year mark its 10-year authorized timeline. Similarly, pursuant to Case 13-M-0412, *Order Establishing New York Green Bank and Providing Initial Capitalization*, NY Green Bank was established in December 2013, and began commercial operations in Summer 2014.

intended to drive greater impact than traditional program approaches. In the early years of the CEF, these new initiatives will operate alongside 12 transition initiatives—a purposeful mix intended to incorporate a greater proportion of market-enabling activities without disrupting existing market momentum that is supported by existing NYSERDA and utility programs. NYSERDA will continue to develop and implement new approaches while rigorously monitoring the progress of existing market activities and complementary utility programs.

An ongoing area for improvement is better coordination of NYSERDA offerings and utility program offerings to further reduce customer confusion and efficiently serve market needs. There are successful models to build from, including the Fruitbelt REV Demo in Western NY, which is now being executed. A partnership opportunity was identified in the concept phase through NYSERDA's close collaboration with the Department of Public Service and National Grid. The objective is to drive community solar and energy efficiency, along with health and safety improvements, in a targeted neighborhood through a joint effort to drive awareness and action. This approach of early engagement on new concepts will be most effective at building partnerships. NYSERDA must allow for more collaboration in the design phase of initiatives and is committed to making additional progress on this collaboration front over the coming year.

In its CEF Order, the PSC stated its expectation that new approaches undertaken by NYSERDA would achieve significantly more impact per dollar spent than past efforts, thereby reducing the overall cost of achieving clean energy goals. While building the CEF portfolio, NYSERDA actively monitors investment and progress toward its primary return on investment metric: cost-per-ton of carbon dioxide equivalent (CO<sub>2</sub>e) emission reductions.<sup>3</sup> The CO<sub>2</sub>e cost-per-ton, along with other key drivers such as achievement of energy efficiency goals, inform the design of the CEF. To support the achievement of greater impact per dollar spent, NYSERDA's strategies fund pilots and projects intended to maximize indirect impacts, which are the market effects expected to accrue over the longer term as a result of the NYSERDA

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<sup>3</sup> For MD specifically, based on available programmatic funding (approximately \$2.6 billion, exclusive of Evaluation) and minimum goals for the 10-year CEF period (approximately 97 million lifetime metric tons CO<sub>2</sub>e, based on the most current emission factor), the portfolio must achieve CO<sub>2</sub>e reductions at or below a cost of \$27/CO<sub>2</sub>e lifetime metric ton.

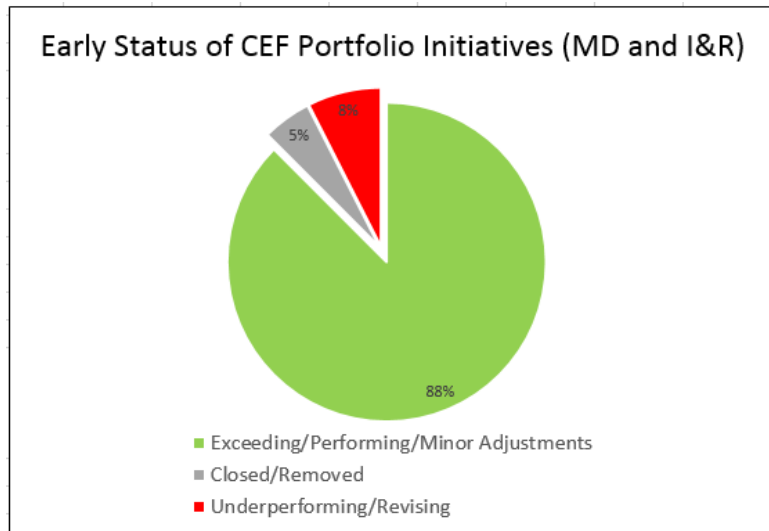
investment and follow on market activity. To help meet these goals, NYSERDA also included new ways to seek clean energy cost-reducing strategies from the market. The Soft Cost Challenge, for example, will act as a conduit to solicit commercially viable solutions from the private market, with the winning ideas ultimately being deployed in the market, enabling lower-cost expansion of energy efficiency.

The expectation of greater impact per ratepayer dollar implies experimentation of approaches—with tolerance for failure—provided it is addressed swiftly and the portfolio is on track to meet long-term outcomes. Accordingly, the MD and I&R portfolios have seen a mix of success, adjustment, and more substantial correction. NYSERDA is using a “test-measure-adjust” approach to be as responsive to market conditions in real time as possible, and redeploy resources from underperforming efforts when appropriate.

The majority (88%) of MD and I&R launched initiatives are on track and have either maintained their original plans or have moved forward with minor changes, as noted in Figure 1. As information is gained, NYSERDA has modified several of these largely-successful initiatives for optimal market alignment. For example, the Real Time Energy Management offering eligibility was broadened beyond equipment-sellers to include subscription-oriented vendors, and the Industry Partnerships initiative expanded the eligibility of industry partnership project leaders, as well as allocating funding for additional solicitations.

Also shown in Figure 1, a smaller percentage of initiatives are undergoing more substantial adjustment (8%) or have been closed/removed due to lack of performance (5%). Closed offerings generally experienced lower customer demand than expected. In the case of NYSERDA’s Commercial Implementation Assistance offering, for example, customer needs were met through utility programs. Initiatives undergoing significant adjustment including the Low- to Moderate-Income Multifamily initiative, which was redesigned and relaunched in July 2017, generally required repositioning to better meet the needs of specific market segments.

**Figure 1. Early Status of CEF Portfolio Initiatives (Market Development and Innovation and Research)**



NY-Sun represents the most mature of the four CEF portfolios, approximately 3.5 years into the 10-year cycle. NY-Sun is performing well, with more than half of the approximately \$1.2 billion in programmatic funding committed and nearly equal progress against its renewable capacity and generation goals. Most notably, with nearly 1.5 gigawatts of installed and pipeline projects presently, NY-Sun is well on the way to meeting its overall portfolio goal to install 3 gigawatts of solar capacity by 2023.

NY Green Bank, which began commercial operations in Summer 2014, hit its stride in 2016. Through June 30, 2017, overall investments reached \$409.4 million and NY Green Bank exceeded its goal to commit \$200 million in new investments each year. In addition, during the fiscal year that ended March 31, 2017, NY Green Bank achieved self-sufficiency with annual revenues exceeding annual expenses for the first time, and a year ahead of schedule.

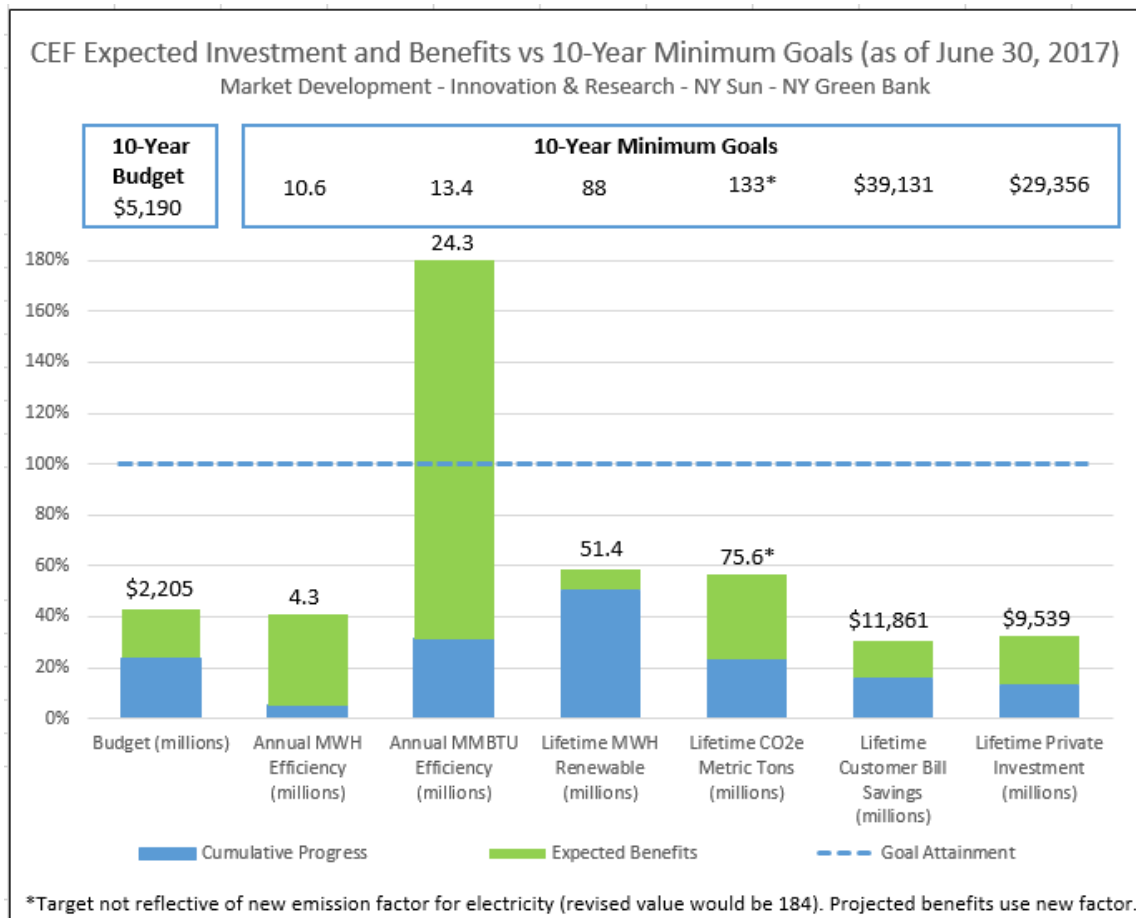
A comprehensive view of investment and benefits progress, inclusive of all four CEF portfolios, is provided in Figure 2. Progress is set in context of the total 10-year programmatic budget authorization<sup>4</sup> and the 10-year minimum goals from the PSC’s authorizing order, as shown across the top of Figure 2.

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<sup>4</sup> Less Administration and Evaluation for all portfolios.



**Figure 2. CEF Expected Investment and Benefits vs. 10-Year Minimum Projected Goals (as of June 30, 2017) (millions)**



The stacked bar labeled Budget reflects the sum of all funds expended or committed for projects that are either completed or in the pipeline (Cumulative Progress—blue portion of stacked bar) and the sum of remaining funds not yet associated with completed or pipeline projects, but tied to filed investment plans and transaction profiles (Expected Benefits—green portion of stacked bar). The remainder of the stacked bars present progress on each key metric for the CEF, including benefits from projects completed or in the pipeline (Cumulative Progress—blue portion of stacked bar),<sup>5</sup> and benefits associated with filed investment plans and transactions profiles, but not yet associated with specific projects (Expected Benefits—green portion of stacked bar).<sup>6</sup>

<sup>5</sup> As pipeline data is not available for NY Green Bank, only actuals are included.

<sup>6</sup> With the exception of the NY-Sun Program, which does not have a progressive design/build format and Expected Benefits equals Cumulative Progress.

Planning and deployment of funds is progressing at an appropriate pace given the early stage of this effort. CEF MD and I&R investment plans filed with the PSC, NY-Sun commitments, plus NY Green Bank overall investments through June 30, 2017 represent more than 40% of the total CEF 10-year budget that is programmed at this time. Approximately 1.5 years into the fund, the progressively built MD and I&R portfolios are still ramping up, but are expected to meet overall contributions to the CEF goals over the 10-year horizon. With 41 initiatives in MD and I&R, NYSERDA is focused on ensuring they are fully operational and that funds are committed and expended to achieve market benefits.

Progress towards realization of benefits is well aligned with overall goals and deployment of funds, as depicted in Figure 2. Specifically:

- Achievement of the energy efficiency MWh and MMBtu goals is on track. The energy efficiency goals are core to the MD portfolio and fulfill “no backsliding from EEPS” achievements required by the CEF Order. MMBtu expected benefits are already significantly greater than the minimum projected benefits, and which are due to the expansion into all fuels, is advancing the State Energy Plan goals, and is capturing the significant potential that exists in fuels, especially in the areas of industrial, low-income, and electric vehicles.
- Renewable energy MWh generation shows excellent progress largely due to NY-Sun, which began in 2014 and is performing strongly against its goals.
- Carbon dioxide equivalent (CO<sub>2</sub>e) emission reduction progress is excellent, and NYSERDA is well-positioned to meet the overall goal for the CEF. The CEF’s fuel-neutral approach is a large driver of success on the CO<sub>2</sub>e metric.<sup>7</sup>
- Performance of the customer (participant) bill savings<sup>8</sup> metric is somewhat low, but is not yet inclusive of estimated indirect bill savings projected to result from the new MD initiatives, which will occur later in the 10-year time frame. NYSERDA’s current expectation is that this metric will be attained over the life of the CEF.
- Lifetime private investment benefits are expected to increase in proportion to budget in later stages of the portfolio. At this stage, private investment does not represent recycling (or reinvestment) of NY Green Bank capital nor is progress reflective of indirect private investment, both of which will occur later in the 10-year CEF.

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<sup>7</sup> NYSERDA’s electricity emission reduction factor of 1,160 pounds CO<sub>2</sub>e/MWh is derived using the marginal emission-rate analysis for CO<sub>2</sub> from “Appendix: The Benefits and Costs of Net Energy Metering in New York” Figure 28, and applying a line loss factor of 7.2%. <http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterSeq=49636&MNO=15-E-0703>

<sup>8</sup> Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA programs.

The CEF Order directs NYSERDA to allocate a minimum of \$234.5 million—inclusive of Administration and Cost Recovery Fee (CRF)—to Low- to Moderate-Income initiatives over the first three years of the CEF.<sup>9</sup> This amount corresponds to programmatic allocations of \$210.6 million net of Administration and CRF. To date, NYSERDA has programmed \$207.8 million in program funds for 2016–2018, the most significant portion of which supports continuation of the standard offer incentive programs that provide direct incentives to overcome first cost and incremental cost barriers. Beyond these traditional energy efficiency programs, NYSERDA launched market development initiatives to advance the market for clean energy improvements, provide communities with resources to reduce service delivery costs, and improve awareness and education among customers and service providers.

For example, through RetrofitNY NYSERDA seeks to harness the collective market power of affordable housing organizations in the State to entice the architecture, engineering, and construction industry to collaborate on the cutting-edge design and widespread deployment of cost-effective deep retrofit solutions in multifamily buildings. The goal is to create a self-sustaining marketplace for retrofits in tenanted multifamily buildings in the State. While public subsidies will be needed to develop, build, and test the initial retrofit packages, it is anticipated that once proven, these solutions will be implemented on a large scale with operational savings sufficient to support the project.

The allocation of the balance of the required 2016–2019 funds, net Administration and Cost Recovery Fee, will be informed through stakeholder engagements and recommendations from the Clean Energy Advisory Council (CEAC) LMI Working Group. Given the needs of this sector and NYSERDA’s desire for additional opportunities to drive more impact in this sector, the ordered level of funding remains an appropriate minimum funding amount and NYSERDA suggests this level remain for the near term.

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<sup>9</sup> NYSERDA defines the low-income market segment as households with annual incomes at or below 60% of the State Median Income (SMI), and the moderate-income market segment as households with an annual income between 60% and 80% of the SMI or the Area Median Income (AMI), whichever is greater. Together these form the Low- to Moderate- Income (LMI) market segment.

## Metrics Reporting

The cumulative progress and expected benefits from all four portfolios, alongside the CEF minimum projected benefits, is shown in Table 1 and reflecting similar progress to Figure 2. NYSERDA removes overlap among its CEF portfolios in this roll up, so the sum of individual portfolio tables presented later will not match the totals in Table 1. Direct overlap between NY Green Bank and NY-Sun as well as NY Green Bank and MD has been removed. Also, in terms of total expected indirect benefits in 2025, consistent with its Budget and Benefits Chapter, NYSERDA conservatively included only 50% of the estimated total indirect benefits from market transformation to avoid overlap in these values. An asterisk in the Minimum Projected Benefits columns indicates there is no PSC-ordered goal for that metric.

**Table 1. CEF Minimum Projected Benefits 2016–2025 and Progress to Date through June 30, 2017**

		Cumulative Annual Benefits			Lifetime Benefits		
		Cumulative Progress through June 30, 2017 <sup>a</sup>	Total Expected Benefits as of June 30, 2017 <sup>b</sup>	Minimum Projected Benefits 2016–2025 <sup>c</sup>	Cumulative Progress through June 30, 2017 <sup>a</sup>	Total Expected Benefits as of June 30, 2017 <sup>b</sup>	Minimum Projected Benefits 2016–2025 <sup>c</sup>
Energy Efficiency	MWh	560,157	4,321,115	10,600,000	8,323,214	50,056,862	*
	MMBtu	4,184,818	24,336,500	13,400,000	64,762,770	354,320,003	*
	MW	49	77	*	49	77	*
Renewable Energy <sup>d</sup>	MWh	1,786,025	2,215,765	*	41,469,989	51,362,451	88,000,000
	MW	1,514	1,966	*	1,411	1,966	*
CO2e Emission Reductions (metric tons)		1,460,651	5,089,176	*	31,285,051	75,572,951	133,000,000
Customer Bill Savings <sup>e</sup> (\$ million)		\$282	\$679	*	\$6,195	\$11,861	\$39,131
Private Investment (\$ million)		\$3,896	\$9,189	*	\$3,896	\$9,540	\$29,356

- a Across the CEF portfolios, Cumulative Progress through June 30, 2017 generally represents the sum of all benefits from projects that are completed and in the pipeline (pipeline data is not available for NY Green Bank).
- b Across the CEF portfolio, Total Expected Benefits as of June 30, 2017 is inclusive of all benefits associated with filed investment plans and transactions profiles.
- c Minimum Projected Benefits are from the PSC *Order Authorizing the Clean Energy Fund Framework*, Issued and effective January 21, 2016.
- d NYSERDA makes no claim to the environmental attributes or any NYGATS certificates that may be associated with these projects.
- e The estimated retail value of the avoided energy use or of the total clean generation produced by a renewable system.

Progress of the MD portfolio is reflected in Table 2. Cumulative progress represents benefits from all projects completed or in the pipeline and, at this early stage of the CEF, does not include any of the indirect benefit expected to accrue and be measured over the longer term. Total expected benefits will be the result in 2025 from full implementation of NYSERDA's filed investment plans, including the estimated indirect benefits (in the form of energy efficiency, renewable energy

and CO2e emission reductions) from market transformation spurred by the CEF initiatives. The Investment Plan Review Supplements located in the appendices of each Investment Plan chapter include additional initiative-level detail.

**Table 2. Market Development Annual and Lifetime Cumulative Progress and Expected Benefits through June 30, 2017**

		Cumulative Annual Benefits		Lifetime Benefits	
		Cumulative Progress through June 30, 2017 <sup>a,c</sup>	Total Expected Benefits from Filed Investment Plans as of June 30, 2017 <sup>b</sup>	Cumulative Progress through June 30, 2017 <sup>a,c</sup>	Total Expected Benefits from Filed Investment Plans as of June 30, 2017 <sup>b</sup>
Energy Efficiency	MWh	559,039	4,232,000	8,323,214	48,941,772
	MMBtu	4,169,506	23,536,000	64,762,770	344,891,003
	MW	49	76	49	76
Renewable Energy <sup>d</sup>	MWh	13,595	348,453	173,427	5,173,025
	MW	5	377	5	377
CO2e Emission Reductions (metric tons)		522,915	3,856,733	7,930,777	48,583,118
Customer Bill Savings <sup>e</sup> (\$ million)		\$90	\$451	\$1,377	\$6,452
Private Investment (\$ million)		\$653	\$5,138	\$653	\$5,138

- a Cumulative Progress through June 30, 2017 represents the sum of all benefits from projects that are completed (installed) and in the pipeline (committed but not yet complete).
- b Total Expected Benefits from Filed Investment Plans as of June 30, 2017 represents the sum of direct benefits from all investment plans filed with the PSC prior to June 30, 2017. For MWh and MMBtu energy efficiency, MWh renewable energy, and CO2e emission reductions, 50% of the indirect benefits expected by 2025 are also included, based on the sum of those benefits present in investment plans filed with the PSC prior to June 30, 2017.
- c Energy Efficiency MWh and MMBtu values represent only the energy savings from CHP systems and from Electric Vehicles. However, CO2e emission reductions and customer bill savings are fully net, accounting for both the energy savings and the energy use of these measures.
- d NYSERDA makes no claim to the environmental attributes or any NYGATS certificates that may be associated with these projects.
- e The estimated retail value of the avoided energy use or of the total clean generation produced by a renewable system.

NYSERDA’s progress in the CEF Market Development portfolio can also be evaluated in the nearer term. When viewed against cumulative annual commitment-based goals through June 30, 2017, the portfolio shows good progress and alignment with these goals, as follows:<sup>10</sup>

- Cumulative Annual Energy Efficiency MWh is at 94%
- Cumulative Annual Energy Efficiency MMBtu is at 132%
- Lifetime CO2e Reductions is at 106%
- Lifetime Customer (Participant) Bill Savings is at 97%
- Lifetime Private Investment is at 77%

<sup>10</sup> NYSERDA’s CEF Quarterly Performance Report for Q2 2017 was filed in the Department of Public Service’s Document Matter Management System under case 14-M-0094 on August 14, 2017, and can also be found at: Clean Energy Fund Quarterly Performance Report (Quarter 2, 2017).

Progress of the Innovation & Research portfolio for the metrics applicable to I&R, is shown in Table 3. Cumulative progress represents the benefits from all projects completed or in the pipeline. Total expected benefits will be the result in 2025 from full implementation of all NYSERDA’s filed investment plans, and for CO2e emission reductions, include indirect benefits from market transformation spurred by the CEF initiatives. The Investment Plan Review Supplements located in the appendices of each Investment Plan chapter include additional initiative-level detail.

**Table 3. Innovation and Research Annual and Lifetime Cumulative Progress and Expected Benefits through June 30, 2017**

		Cumulative Annual Benefits		Lifetime Benefits	
		Cumulative Progress through June 30, 2017 <sup>a</sup>	Total Expected Benefits from Filed Investment Plans as of June 30, 2017 <sup>b</sup>	Cumulative Progress through June 30, 2017 <sup>a</sup>	Total Expected Benefits from Filed Investment Plans as of June 30, 2017 <sup>b</sup>
Energy Efficiency	MWh	-	N/A	-	N/A
	MMBtu	-	N/A	-	N/A
	MW	-	N/A	-	N/A
Renewable Energy	MWh	-	N/A	-	N/A
	MW	-	N/A	-	N/A
CO2e Emission Reductions (metric tons)		-	150,000	-	1,500,000
Customer Bill Savings (\$ million)		-	N/A	-	N/A
Private Investment (\$ million)		\$151	\$959	\$151	\$959

- a Cumulative Progress through June 30, 2017 represents the sum of all benefits from projects that are completed (installed) and in the pipeline (committed, but not yet complete).
- b Total Expected Benefits from Filed Investment Plans as of June 30, 2017 represents the sum of direct benefits from all investment plans filed with the PSC prior to June 30, 2017. For CO2e emission reductions, 50% of the indirect benefits expected by 2025 are also included, based on the sum of those benefits present in investment plans filed with the PSC prior to June 30, 2017.

NYSERDA’s progress in the I&R portfolio can also be evaluated in the nearer term against cumulative annual commitment-based goals through June 30, 2017. Currently, progress toward the private investment annual commitment-based goal is at 71%.

Progress of the NY-Sun portfolio is shown in Table 4. Cumulative progress represents benefits from all projects completed or in the pipeline. Unlike the other portfolios of the CEF, NY-Sun does not have a progressive build format, therefore Total Expected Benefits as of June 30, 2017 equals Cumulative Progress through June 30, 2017. That said, NY-Sun is on a path to fully meet its 3GW solar capacity goal and be a major contributor toward the CEF lifetime renewable energy generation goal of 88 million MWh.<sup>11</sup>

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<sup>11</sup> NYSERDA’s NY-Sun Quarterly Performance Report for Q2 2017 was filed in the Department of Public Service’s Document Matter Management System under Case 03-E-0188 on August 14, 2017 and can also be found at: NY-Sun Quarterly Performance Report (Quarter 2, 2017).

**Table 4. NY-Sun Annual and Lifetime Cumulative Progress and Expected Benefits through June 30, 2017**

		Cumulative Annual Benefits		Lifetime Benefits	
		Cumulative Progress through June 30, 2017 <sup>a</sup>	Total Expected Benefits as of June 30, 2017 <sup>b</sup>	Cumulative Progress through June 30, 2017 <sup>a</sup>	Total Expected Benefits as of June 30, 2017 <sup>b</sup>
Energy Efficiency	MWh	-	N/A	-	N/A
	MMBtu	-	N/A	-	N/A
	MW	-	N/A	-	N/A
Renewable Energy <sup>c</sup>	MWh	1,719,313	1,719,313	42,982,836	42,982,836
	MW	1,465	1,465	1,465	1,465
CO2 Emission Reductions (metric tons)		904,647	904,647	22,616,183	22,616,183
Customer Bill Savings <sup>d</sup> (\$ million)		\$184	\$184	\$4,609	\$4,609
Private Investment <sup>e</sup> (\$ million)		\$3,092	\$3,092	\$3,092	\$3,092

- a Cumulative Progress through June 30, 2017 represents the sum of all benefits from projects that are completed (installed) and in the pipeline (contracted but not yet completed, plus applications approved, but not yet contracted). Values vary slightly from the NY-Sun Q2 2017 report due to data lags and quality checking.
- b Unlike the other portfolios of the CEF, NY-Sun does not have a progressive build and approval format, therefore Total Expected Benefits as of June 30, 2017 equals Cumulative Progress through June 30, 2017.
- c NYSERDA makes no claim to the environmental attributes or any NYGATS certificates that may be associated with these projects.
- d The estimated retail value of the avoided energy use or of the total clean generation produced by a renewable system.
- e The sum of all PV project costs reported to NYSERDA by participating contractors, minus the total NYSERDA incentives paid on these projects.

Progress of the NY Green Bank portfolio is shown in Table 5. Cumulative Progress through June 30, 2017 represents benefits from clean energy measures actually deployed in New York State. Total Expected Benefits from Executed Transactions as of June 30, 2017 will be the result, no later than 2025, from full implementation of all NY Green Bank transactions executed by this date.<sup>12</sup>

<sup>12</sup> NYSERDA’s NY Green Bank Metrics, Reporting & Evaluation Report through June 30, 2017 was filed in the Department of Public Service’s Document Matter Management System under case 13-M-0412 on August 14, 2017 and can also be found at: NY Green Bank Metrics, Reporting & Evaluation Report (through June 30, 2017).

**Table 5. NY Green Bank Annual and Lifetime Cumulative Progress and Expected Benefits through June 30, 2017**

		Cumulative Annual Benefits		Lifetime Benefits	
		Cumulative Progress through June 30, 2017 <sup>a</sup>	Total Expected Benefits from Executed Transactions as of June 30, 2017 <sup>b,c</sup>	Cumulative Progress through June 30, 2017 <sup>d</sup>	Total Expected Benefits from Executed Transactions as of June 30, 2017 <sup>e,d</sup>
Energy Efficiency	MWh	1,118	89,408	12,316	1,122,160
	MMBtu	15,312	800,500	164,059	9,429,000
	MW	-	2	-	2
Renewable Energy <sup>e</sup>	MWh	120,303	258,130	3,009,203	5,955,000
	MW	103	220	103	220
CO2e Emission Reductions (metric tons)		68,661	235,763	1,628,732	4,320,640
Customer Bill Savings <sup>f</sup> (\$ million)		\$19	\$61	\$470	\$1,185
Total Project Costs <sup>g,h</sup> (\$ million)		N/A	N/A	N/A	\$1,185

- a Cumulative Progress is the Actual Clean Energy systems deployed in NYS, reported by NYGB's clients, as a result of NYGB's participation in financing these projects in NYS.
- b Total Expected Benefits from Executed Transactions as of June 30, 2017 represents the sum of the low end of the range for all First-Year estimated energy savings, energy generation and GHG emissions reductions (as also reported in NYGB Quarterly Metrics Reports).
- c Energy Efficiency values represent MWh savings from the use of CHP systems; natural gas required to run CHP systems is 1,700 MMBtu cumulative annual and 41,000 MMBtu lifetime. Expected emission reductions and customer bill savings are net, including both MWh that add to the benefits and additional natural gas required to run CHP systems that subtract from the benefits.
- d Cumulative Progress and Expected Benefits are the same measure as reflected in the corresponding Cumulative Annual Benefits calculations, but for each NYGB investment, the relevant annual measure is multiplied by the expected measure life and summed to total Cumulative Progress or Expected Benefits.
- e NYSERDA makes no claim to the environmental attributes or any NYGATS certificates that may be associated with these projects.
- f The estimated retail value of the avoided energy use or of the total clean generation produced by a renewable system.
- g Total Project Costs representing Expected Benefits on a Lifetime Benefits basis, reflect the low end of the range for estimated system deployment to be achieved by the end of the availability period for each transaction, aggregated across all NYGB investments.
- h The NYGB Metrics, Reporting & Evaluation Plan (see page 15) and in this table, define Total Project Costs to include fair market value ("FMV") data for a subset of NYGB's investments. FMV is an estimated market valuation of fully installed energy projects provided by NYGB's counterparties and is often required for federal income tax purposes, by institutional investors and for certain grant program purposes unconnected with NYGB. As projects progress and the cost of installed equipment and labor are known and reported to NYGB by its counterparties, NYGB will seek to adjust reported values and replace FMV in its aggregated data sets and periodic reporting with those actual costs.

## Financial Reporting

Portfolio-level financial status information for the MD, I&R and NY-Sun portfolios is provided in Table 6.



**Table 6. Market Development, Innovation & Research, NY-Sun Portfolio Level Budgets and Spending (\$ million)**

Initiative	PSC Ordered Budget Funds <sup>a</sup>	Budget Approved through June 30, 2017 <sup>b</sup>	Expended Funds through June 30, 2017 <sup>c</sup>	Open Encumbrances through June 30, 2017 <sup>d</sup>	Pre-Encumbrances through June 30, 2017 <sup>e</sup>	Committed Funds through June 30, 2017 <sup>f</sup>	% of Approved Budget Committed through June 30, 2017 <sup>g</sup>	Budget Approved Remaining Balance through June 30, 2017 <sup>h</sup>
Market Development (2016-2025)								
Program Funds	\$2,387	\$903	\$62	\$54	\$66	\$182	20%	\$721
NYS Cost Recovery Fee								
Innovation & Research (2016-2025)								
Program Funds	\$630	\$244	\$1	\$3	\$15	\$19	8%	\$225
NYS Cost Recovery Fee								
NY-SUN (2014-2023)								
Program Funds	\$1,193	\$1,193	\$213	\$412	\$1	\$626	53%	\$567
NYS Cost Recovery Fee								
<b>Total Program Funds and CRF</b>	<b>\$4,210</b>	<b>\$2,340</b>	<b>\$276</b>	<b>\$469</b>	<b>\$83</b>	<b>\$828</b>	<b>35%</b>	<b>\$1,513</b>
Administration	\$312	\$105	\$29	\$1	\$0.1	\$31	29%	\$74
Evaluation	\$133	\$34	\$1	\$3	-	\$3	10%	\$31
<b>Total</b>	<b>\$4,654</b>	<b>\$2,480</b>	<b>\$306</b>	<b>\$473</b>	<b>\$83</b>	<b>\$862</b>	<b>35%</b>	<b>\$1,618</b>

- a CEF and NY-Sun Order authorized funding.
- b Funds approved by DPS as of June 30, 2017.
- c Invoices processed for payment by NYSERDA.
- d Remaining funding obligated under a contract, purchase order or incentive award.
- e Planned funding for contracts awarded and under negotiation.
- f The sum of Expended Funds, Open Encumbrances and Pre-Encumbrances.
- g The percentage of the committed budget.
- h The difference between Budget Approved and Committed funds.

Funding and financial status of NY Green Bank is provided in Tables 7 and 8. NY Green Bank is presented separately from the other CEF portfolios in order to accurately represent NY Green Bank's unique characteristics, e.g., funds invested by NY Green Bank are ultimately returned and recycled, and revenues are generated to support self-sufficiency and re-investment. Table 8 shows NY Green Bank's Overall Investments to Date against the aggregate NY Green Bank CEF 10-year investment goal, which includes the expected recycling of funds.

**Table 7. NY Green Bank Portfolio Level Funding and Financial Status (\$ million)**

	Budgeted Funds	Deployed Funds	Committed Capital	Approved Investments	Current Portfolio <sup>a</sup>	Available Capital <sup>b</sup>
Program Costs & Revenue						
NY Green Bank	\$978.4	\$320.0	\$76.7	N/A	\$396.7	\$581.7
Cumulative Revenues	-	-	-	-	-	\$17.8
<b>SUBTOTAL</b>	<b>\$978.4</b>	<b>\$320.0</b>	<b>\$76.7</b>	<b>N/A</b>	<b>\$396.7</b>	<b>\$599.5</b>
	Budgeted Funds	Cumulative Expenses	Open Encumbrances	Pre-Encumbrances	Committed Funds	Remaining Balance <sup>c</sup>
Other Costs						
Operating Expenses (Program Adminis	\$17.0	\$18.6	\$4.3	\$0.5	\$23.4	(\$6.3)
Program Evaluation	\$4.0	\$0.04	-	-	\$0.04	\$4.0
New York State Cost Recovery Fee	\$0.6	\$0.4	\$0.0	\$0.0	\$0.4	\$0.2
<b>OTHER COSTS TOTAL</b>	<b>\$21.6</b>	<b>\$19.0</b>	<b>\$4.3</b>	<b>\$0.5</b>	<b>\$23.8</b>	<b>(\$2.1)</b>
	Budgeted Funds	Deployed Funds plus Cumulative Expenses	Committed Capital plus Open Encumbrances	Pre-Encumbrances	Current Portfolio plus Committed Funds	Available Capital plus Remaining Balance
<b>TOTAL</b>	<b>\$1,000.0</b>	<b>\$339.0</b>	<b>\$81.0</b>	<b>\$0.5</b>	<b>\$420.5</b>	<b>\$597.3</b>

a Sum of Deployed Funds and Committed Capital.

b Available Capital reflects the sum of NYGB's initial \$1.0 billion capitalization confirmed in the CEF Order, together with Cumulative Revenues, that is not currently Deployed or Committed. As NYGB investments mature and are redeployed into new projects, Available Capital gives a snapshot in time of the funds available for clean energy investment. NYGB's Overall Investments to Date against the goal for aggregate NYGB investment expected over the term of the CEF is shown in Table 8.

c Remaining Balance shows the net of expenses against Budgeted Funds consistent with the CEF Order. As NYGB is required to be self-sufficient, revenue generated is expected to fund operating expenses.

**Table 8. NY Green Bank Investments to Date (\$ million)**

CEF 10-Year Investment Goal	Overall Investments to Date	Remaining
\$1,900.0	\$409.4	\$1,490.6

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Budget Accounting and Benefits Chapter

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

## Budget Accounting and Benefits

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This Budget Accounting and Benefits chapter is intended to provide a current and comprehensive compilation of budgets and benefits for all Market Development and Innovation & Research portfolio initiatives contained within the Clean Energy Fund (CEF) Investment Plan as of November 1, 2017. These are compared to the minimum projected benefits identified in the CEF Order and presented in Table 1 for the combined four portfolios of the CEF which also includes NY-Sun and NYGB. All dollars and benefits are reflected in the year in which they are anticipated to be committed.

**Table 1. CEF Minimum Projected Benefits 2016 - 2025 (in millions)**

		Cumulative Annual	Lifetime
Energy Efficiency	MWh	10.6	*
	MMBtu	13.4	*
	MW	*	*
Renewable Energy	MWh	*	88
	MW	*	*
CO2e Emissions Reductions (tons)		*	133
Customer Bill Savings		*	\$39,131
Private Investment		*	\$29,356

*\* Denotes metric to be tracked and reported*

Table 2 summarizes the progressive budget schedule by portfolio, admin, and evaluation funding. The budget reflects the adjustment to reduce the Market Development and Innovation & Research program authorization funding by \$9,604,661 as a result of the amount of uncommitted SBC, EEPS, T&MD and RPS funds as of February 29, 2016 being less than originally projected, as reported in NYSERDA's filing dated April 29, 2016. The resulting adjustment was applied proportionately by year and in total between Market Development – Program & CRF, Innovation & Research – Program & CRF, and Administration. Table 3 details the budget schedule by all initiatives contained within this Investment Plan.

**Table 2. Market Development and Innovation & Research Portfolio Budgets<sup>1</sup>**

	Program Authorization	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	% of Program Authorization
<b>Market Development</b>													
Program Funds	\$2,386,760,624	\$133,309,741	\$228,803,381	\$284,991,411	\$225,276,394	\$149,363,555	\$73,455,086	\$20,297,878	\$12,870,037	\$9,513,380	\$4,950,384	\$1,142,831,248	49.09%
NYS Cost Recovery Fee		\$3,355,687	\$5,782,704	\$7,199,201	\$5,727,372	\$3,744,925	\$1,850,187	\$528,457	\$336,166	\$246,902	\$136,714	\$28,908,315	
<b>Innovation &amp; Research</b>													
Program Funds	\$629,833,404	\$14,800,000	\$63,325,000	\$62,575,000	\$53,850,000	\$47,100,000	\$38,050,000	\$26,500,000	\$3,300,000	\$5,775,000	\$4,125,000	\$319,400,000	52.00%
NYS Cost Recovery Fee		\$372,547	\$1,600,456	\$1,580,714	\$1,369,069	\$1,180,917	\$958,404	\$689,930	\$86,196	\$149,879	\$113,919	\$8,102,032	
Administration	\$273,601,311	\$13,557,215	\$26,847,855	\$31,926,964	\$25,805,241	\$17,912,151	\$10,213,059	\$4,430,501	\$1,535,861	\$1,442,840	\$911,393	\$134,583,080	49.19%
Evaluation	\$130,200,000	\$4,070,000	\$9,238,787	\$10,813,764	\$10,537,436	\$4,600,339	\$3,136,499	\$2,934,500	\$1,070,000	\$907,500	\$1,155,000	\$48,463,825	37.22%
<b>Total</b>	<b>\$3,420,395,339</b>	<b>\$169,465,190</b>	<b>\$335,598,183</b>	<b>\$399,087,055</b>	<b>\$322,565,512</b>	<b>\$223,901,887</b>	<b>\$127,663,235</b>	<b>\$55,381,267</b>	<b>\$19,198,260</b>	<b>\$18,035,501</b>	<b>\$11,392,409</b>	<b>\$1,682,288,500</b>	<b>49.18%</b>

<sup>1</sup>The CEF Order authorized CEF funding and noted that these costs would be funded from the funding authorized for the combined program costs and New York State Cost Recovery Fee (CRF) costs. NYSERDA has revised the presentation in this summary to report CRF separate from program costs, but still subject to the original authorization (as modified by NYSERDA’s Uncommitted Funds filing dated April 29, 2016) on a combined basis. This approach improves the transparency of reporting and also recognizes the differences in the timing of commitment/expenditures of program costs vs. CRF costs. The initial budget for CRF assumes the assessment will average 2.2% of funding over the term of the CEF.

**Table 3. Market Development and Innovation & Research Budget by Chapter and Initiative**

<b>Market Development</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Resource Acquisition Transition Chapter</b>											
<i>Commercial</i>	\$2,472,500	\$10,250,000	\$6,890,000	\$6,780,000							\$26,392,500
<i>Industrial</i>	\$12,611,000	\$19,842,391	\$19,000,057	\$18,109,484							\$69,562,932
<i>Agriculture</i>	\$1,591,700	\$1,238,300	\$770,000								\$3,600,000
<i>Multifamily Market Rate</i>	\$46,554	\$110,074	\$0								\$156,628
<i>Single Family Market Rate</i>	\$7,884,100	\$9,095,090	\$5,045,490								\$22,024,680
<i>Commercial New Construction</i>	\$10,855,584	\$13,828,415	\$6,000,000								\$30,683,999
<i>Low Rise New Construction</i>	\$2,734,000	\$4,547,000	\$6,043,000								\$13,324,000
<i>Multifamily New Construction</i>	\$3,904,000	\$4,324,000	\$5,385,000								\$13,613,000
<i>Anaerobic Digesters</i>	\$4,050,000	\$4,050,000	\$4,050,000								\$12,150,000
<i>Small Wind</i>	\$2,030,000	\$2,030,000	\$2,030,000								\$6,090,000
<i>Solar Thermal</i>	\$399,000	\$0	\$0								\$399,000
<i>Combined Heat &amp; Power</i>	\$26,050,000	\$13,050,000	\$9,450,000								\$48,550,000
<b>Resource Acquisition Transition Chapter Total</b>	<b>\$74,628,438</b>	<b>\$82,365,270</b>	<b>\$64,663,547</b>	<b>\$24,889,484</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$246,546,739</b>
<b>Market Characterization &amp; Design Chapter</b>											
	\$850,000	\$3,075,000	\$7,700,000	\$5,925,000	\$3,600,000	\$0	\$0	\$0	\$0	\$0	\$21,150,000
<b>Commercial Chapter</b>											
<i>Real Estate Tenant</i>	\$1,367,700	\$2,821,331	\$3,435,281	\$4,113,234	\$4,442,662	\$3,547,139	\$2,551,617	\$2,066,642	\$1,054,395	\$100,000	\$25,500,000
<i>Energy Management</i>	\$1,035,212	\$7,240,000	\$9,709,667	\$12,241,333	\$12,189,000	\$9,794,763	\$3,684,776	\$2,093,750	\$1,816,500	\$0	\$59,805,000
<i>REV Campus Challenge</i>	\$409,269	\$3,587,102	\$3,614,637	\$2,114,637	\$2,032,029	\$2,008,986	\$2,008,986	\$2,008,986	\$2,008,986	\$1,856,384	\$21,650,000
<i>K-12</i>	\$0	\$0	\$1,785,000	\$2,885,000	\$2,855,000	\$3,005,000	\$3,905,000	\$2,805,000	\$2,605,000	\$1,755,000	\$21,600,000
<b>Commercial Chapter Total</b>	<b>\$2,812,181</b>	<b>\$13,648,433</b>	<b>\$18,544,585</b>	<b>\$21,354,204</b>	<b>\$21,518,691</b>	<b>\$18,355,887</b>	<b>\$12,150,378</b>	<b>\$8,974,377</b>	<b>\$7,484,880</b>	<b>\$3,711,384</b>	<b>\$128,555,000</b>
<b>Industrial Chapter</b>											
<i>Continuous Energy Improvement</i>	\$0	\$7,101,000	\$4,029,000	\$2,012,000	\$1,789,000	\$1,466,000	\$1,142,000	\$0	\$0	\$0	\$17,539,000
<b>Industrial Chapter Total</b>	<b>\$0</b>	<b>\$7,101,000</b>	<b>\$4,029,000</b>	<b>\$2,012,000</b>	<b>\$1,789,000</b>	<b>\$1,466,000</b>	<b>\$1,142,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$17,539,000</b>
<b>Communities Chapter</b>											
<i>Clean Energy Communities</i>	\$12,941	\$2,929,877	\$5,024,675	\$4,556,249	\$1,694,785	\$0	\$0	\$0	\$0	\$0	\$14,218,527
<i>Community Energy Engagement</i>	\$0	\$4,409,882	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,409,882
<b>Communities Chapter Total</b>	<b>\$12,941</b>	<b>\$7,339,759</b>	<b>\$5,024,675</b>	<b>\$4,556,249</b>	<b>\$1,694,785</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$18,628,409</b>
<b>Large-Scale Renewables Chapter</b>											
<i>Offshore Wind Master Plan</i>	\$5,000,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,000,000
<i>Offshore Wind Pre-Development Activities</i>	\$10,000,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$10,000,000
<b>Large-Scale Renewables Chapter Total</b>	<b>\$15,000,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$15,000,000</b>
<b>REV Technical Assistance Chapter</b>											
<i>REV Connect</i>	\$2,500,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,500,000
<b>REV Technical Assistance Chapter Total</b>	<b>\$2,500,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2,500,000</b>
<b>Energy Storage Chapter</b>											
<i>Reducing Barriers to Distributed Deployment</i>	\$30,000	\$7,200,000	\$9,325,000	\$6,775,000	\$1,120,000	\$0	\$0	\$0	\$0	\$0	\$24,450,000
<b>Energy Storage Chapter Total</b>	<b>\$30,000</b>	<b>\$7,200,000</b>	<b>\$9,325,000</b>	<b>\$6,775,000</b>	<b>\$1,120,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$24,450,000</b>
<b>Clean Transportation Chapter</b>											
<i>Electric Vehicles</i>	\$0	\$7,150,000	\$15,250,000	\$13,850,000	\$3,250,000	\$0	\$0	\$0	\$0	\$0	\$39,500,000
<b>Clean Transportation Chapter Total</b>	<b>\$0</b>	<b>\$7,150,000</b>	<b>\$15,250,000</b>	<b>\$13,850,000</b>	<b>\$3,250,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$39,500,000</b>
<b>Agriculture Chapter</b>											
<i>2030 GLASE</i>	\$5,000,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,000,000
<i>Advancing Agricultural Energy Technologies</i>	\$0	\$0	\$20,000	\$895,000	\$940,000	\$940,000	\$920,000	\$45,000	\$0	\$0	\$3,760,000
<b>Agriculture Chapter Total</b>	<b>\$5,000,000</b>	<b>\$0</b>	<b>\$20,000</b>	<b>\$895,000</b>	<b>\$940,000</b>	<b>\$940,000</b>	<b>\$920,000</b>	<b>\$45,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$8,760,000</b>

<b>Low- to Moderate-Income Chapter</b>												
RetrofitNY	\$0	\$6,413,000	\$6,177,000	\$5,417,750	\$4,817,750	\$3,869,500	\$2,219,500	\$969,500	\$469,500	\$150,000	\$30,503,500	
REvitalize	\$0	\$600,000	\$125,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$725,000	
Low-Income Forum on Energy	\$0	\$245,000	\$75,000	\$184,000	\$162,000	\$97,000	\$122,000	\$145,000	\$195,000	\$75,000	\$1,300,000	
Healthy Homes Feasibility Study	\$215,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$215,000	
LMI Single Family	\$31,202,557	\$57,910,000	\$45,335,000	\$31,604,768	\$31,604,768	\$31,604,759					\$229,261,852	
LMI Multifamily	\$848,624	\$13,520,377	\$8,136,000	\$7,624,417	\$11,730,000	\$8,330,000					\$50,189,418	
Low Income Community Solar	\$0	\$1,445,000	\$9,900,000	\$5,940,000	\$3,960,000	\$0	\$0	\$0	\$0	\$0	\$21,245,000	
<b>Low- to Moderate-Income Chapter Total</b>	<b>\$32,266,181</b>	<b>\$80,133,377</b>	<b>\$69,748,000</b>	<b>\$50,770,935</b>	<b>\$52,274,518</b>	<b>\$43,901,259</b>	<b>\$2,341,500</b>	<b>\$1,114,500</b>	<b>\$664,500</b>	<b>\$225,000</b>	<b>\$333,439,770</b>	
<b>Workforce Development and Training Chapter</b>												
Industry Partnerships	\$210,000	\$4,325,000	\$4,100,000	\$2,710,000	\$0	\$0	\$0	\$0	\$0	\$0	\$11,345,000	
<b>Workforce Dev. and Training Chapter Total</b>	<b>\$210,000</b>	<b>\$4,325,000</b>	<b>\$4,100,000</b>	<b>\$2,710,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$11,345,000</b>	
<b>Renewable Heating &amp; Cooling Chapter</b>												
Heat Pumps and Solar Thermal	\$0	\$6,551,143	\$12,029,600	\$9,949,600	\$2,807,000	\$1,874,500	\$0	\$0	\$0	\$0	\$33,211,843	
Renewable Heat NY	\$0	\$2,326,000	\$2,888,000	\$3,233,000	\$2,878,000	\$2,162,000	\$0	\$0	\$0	\$0	\$13,487,000	
<b>Renewable Heating &amp; Cooling Chapter Total</b>	<b>\$0</b>	<b>\$8,877,143</b>	<b>\$14,917,600</b>	<b>\$13,182,600</b>	<b>\$5,685,000</b>	<b>\$4,036,500</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$46,698,843</b>	
<b>Clean Energy Products Chapter</b>												
Underutilized Product Support	\$0	\$2,100,000	\$7,950,000	\$10,690,000	\$8,156,000	\$0	\$0	\$0	\$0	\$0	\$28,896,000	
<b>Clean Energy Products Chapter Total</b>	<b>\$0</b>	<b>\$2,100,000</b>	<b>\$7,950,000</b>	<b>\$10,690,000</b>	<b>\$8,156,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$28,896,000</b>	
<b>Multi-Sector Solutions Chapter</b>												
Soft Cost Challenge	\$0	\$1,342,000	\$5,000,000	\$3,658,000	\$0	\$0	\$0	\$0	\$0	\$0	\$10,000,000	
Technical Services	\$0	\$125,000	\$2,945,000	\$2,845,440	\$4,519,000	\$3,305,440	\$3,044,000	\$2,736,160	\$1,364,000	\$1,014,000	\$21,898,040	
Clean Energy AMP Challenge	\$0	\$0	\$10,500,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$10,500,000	
Clean Energy Siting & Soft Cost Reduction	\$0	\$0	\$2,965,000	\$2,965,000	\$2,865,000	\$0	\$0	\$0	\$0	\$0	\$8,795,000	
<b>Multi-Sector Solutions Chapter Total</b>	<b>\$0</b>	<b>\$1,467,000</b>	<b>\$21,410,000</b>	<b>\$9,468,440</b>	<b>\$7,384,000</b>	<b>\$3,305,440</b>	<b>\$3,044,000</b>	<b>\$2,736,160</b>	<b>\$1,364,000</b>	<b>\$1,014,000</b>	<b>\$51,193,040</b>	
<b>Codes Chapter</b>												
Code to Zero	\$0	\$160,000	\$3,320,000	\$11,540,000	\$3,980,000	\$1,300,000	\$700,000	\$0	\$0	\$0	\$21,000,000	
<b>Codes Chapter Total</b>	<b>\$0</b>	<b>\$160,000</b>	<b>\$3,320,000</b>	<b>\$11,540,000</b>	<b>\$3,980,000</b>	<b>\$1,300,000</b>	<b>\$700,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$21,000,000</b>	
<b>On-Site Power Chapter</b>												
Fuel Cells	\$0	\$0	\$7,500,000	\$7,500,000	\$0	\$0	\$0	\$0	\$0	\$0	\$15,000,000	
<b>On-Site Power Chapter Total</b>	<b>\$0</b>	<b>\$0</b>	<b>\$7,500,000</b>	<b>\$7,500,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$15,000,000</b>	
<b>New Construction Chapter</b>												
New Construction	\$0	\$3,861,400	\$23,283,700	\$34,748,166	\$34,748,166	\$0	\$0	\$0	\$0	\$0	\$96,641,432	
<b>New Construction Chapter Total</b>	<b>\$0</b>	<b>\$3,861,400</b>	<b>\$23,283,700</b>	<b>\$34,748,166</b>	<b>\$34,748,166</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$96,641,432</b>	
<b>Residential Chapter</b>												
Engaging New Markets	\$0	\$0	\$8,205,305	\$4,409,315	\$3,223,395	\$150,000	\$0	\$0	\$0	\$0	\$15,988,015	
<b>Residential Chapter Total</b>	<b>\$0</b>	<b>\$0</b>	<b>\$8,205,305</b>	<b>\$4,409,315</b>	<b>\$3,223,395</b>	<b>\$150,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$15,988,015</b>	
<b>NYS Cost Recovery Fee</b>	<b>\$3,355,687</b>	<b>\$5,782,704</b>	<b>\$7,199,201</b>	<b>\$5,727,372</b>	<b>\$3,744,925</b>	<b>\$1,850,187</b>	<b>\$528,457</b>	<b>\$336,166</b>	<b>\$246,902</b>	<b>\$136,714</b>	<b>\$28,908,315</b>	
<b>Total Market Development</b>	<b>\$136,665,428</b>	<b>\$234,586,085</b>	<b>\$292,190,612</b>	<b>\$231,003,766</b>	<b>\$153,108,480</b>	<b>\$75,305,274</b>	<b>\$20,826,336</b>	<b>\$13,206,203</b>	<b>\$9,760,282</b>	<b>\$5,087,097</b>	<b>\$1,171,739,562</b>	

<b>Innovation &amp; Research</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Market Characterization &amp; Design Chapter</b>	\$0	\$0	\$0	\$250,000	\$0	\$0	\$0	\$0	\$0	\$0	\$250,000
<b>Grid Modernization Chapter</b>											
<i>DER Interconnection</i>	\$3,800,000	\$2,500,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,300,000
<i>High Performing Electric Grid</i>	\$5,000,000	\$18,350,000	\$20,350,000	\$16,700,000	\$16,700,000	\$16,700,000	\$16,700,000	\$0	\$0	\$0	\$110,500,000
<i>Next Generation Power Electronics</i>	\$0	\$16,700,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$16,700,000
<b>Grid Modernization Chapter Total</b>	\$8,800,000	\$37,550,000	\$20,350,000	\$16,700,000	\$16,700,000	\$16,700,000	\$16,700,000	\$0	\$0	\$0	\$133,500,000
<b>Innovation Capacity and Business Development Chapter</b>											
<i>CleanTech Startup Growth</i>	\$6,000,000	\$6,500,000	\$8,450,000	\$10,450,000	\$7,650,000	\$6,650,000	\$3,500,000	\$0	\$0	\$0	\$49,200,000
<i>Manufacturing Corps</i>	\$0	\$0	\$4,000,000	\$3,000,000	\$5,000,000	\$0	\$0	\$0	\$0	\$0	\$12,000,000
<i>Novel Business Models and Offerings</i>	\$0	\$0	\$3,150,000	\$3,500,000	\$4,550,000	\$4,900,000	\$0	\$0	\$0	\$0	\$16,100,000
<b>Innovation Capacity and Bus. Dev. Chapter Total</b>	\$6,000,000	\$6,500,000	\$15,600,000	\$16,950,000	\$17,200,000	\$11,550,000	\$3,500,000	\$0	\$0	\$0	\$77,300,000
<b>Building Innovation Chapter</b>											
<i>NextGen HVAC</i>	\$0	\$4,000,000	\$6,000,000	\$5,000,000	\$0	\$0	\$0	\$0	\$0	\$0	\$15,000,000
<b>Building Innovation Chapter Total</b>	\$0	\$4,000,000	\$6,000,000	\$5,000,000	\$0	\$0	\$0	\$0	\$0	\$0	\$15,000,000
<b>Clean Transportation Chapter</b>											
<i>Public Transportation and Electrified Rail</i>	\$0	\$0	\$4,750,000	\$4,250,000	\$3,500,000	\$3,000,000	\$3,000,000	\$0	\$0	\$0	\$18,500,000
<i>Electric Vehicles</i>	\$0	\$2,850,000	\$3,000,000	\$2,250,000	\$2,250,000	\$1,500,000	\$0	\$0	\$0	\$0	\$11,850,000
<b>Clean Transportation Chapter Total</b>	\$0	\$2,850,000	\$7,750,000	\$6,500,000	\$5,750,000	\$4,500,000	\$3,000,000	\$0	\$0	\$0	\$30,350,000
<b>Energy-Related Environmental Research Chapter</b>											
<i>Energy-Related Environmental Research</i>	\$0	\$10,600,000	\$8,400,000	\$4,850,000	\$4,150,000	\$2,000,000	\$0	\$0	\$0	\$0	\$30,000,000
<b>Energy-Related Environ. Research Chapter Total</b>	\$0	\$10,600,000	\$8,400,000	\$4,850,000	\$4,150,000	\$2,000,000	\$0	\$0	\$0	\$0	\$30,000,000
<b>Renewables Optimization Chapter</b>											
<i>Energy Storage Innovations</i>	\$0	\$1,825,000	\$4,475,000	\$3,600,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$5,775,000	\$4,125,000	\$33,000,000
<b>Renewables Optimization Chapter Total</b>	\$0	\$1,825,000	\$4,475,000	\$3,600,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$5,775,000	\$4,125,000	\$33,000,000
<b>NYS Cost Recovery Fee</b>	\$372,547.18	\$1,600,456	\$1,580,714	\$1,369,069	\$1,180,917	\$958,404	\$689,930	\$86,196	\$149,879	\$113,919	\$8,102,032
<b>Total Innovation &amp; Research</b>	\$15,172,547	\$64,925,456	\$64,155,714	\$55,219,069	\$48,280,917	\$39,008,404	\$27,189,930	\$3,386,196	\$5,924,879	\$4,238,919	\$327,502,032



Similarly, Tables 4 through 12 present the associated benefits of these investments. Benefits are rounded to three significant figures therefore totals may not sum. Table 4 includes estimated indirect savings from market effects expected to accrue over the longer term as a result of NYSERDA's investment and follow on market activity. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. Therefore, indirect savings shown in Table 4 reflect a 50% discount, as a basis for conservative estimation at this time. The indirect savings will be quantified and reported based on periodic Market Evaluation studies. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs. For Tables 7 through 10, emissions reductions, energy metrics, and bill savings are measured on a 'lifetime' basis to account for the repeating benefits that are realized year-after-year from the implementation of clean energy activity. The carbon benefits are estimated using standard factors to convert electricity, natural gas, and petroleum savings into carbon (1,160 lbs/MWh, 117 lbs/MMBtu, 162 lbs/MMBtu respectively). Estimated bill savings are based on avoided retail rates and include electric, natural gas and petroleum bill savings.

**Table 4. Market Development and Innovation & Research Portfolio Energy Efficiency Cumulative First Year Annual Benefits (MWh and MMBtu)**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total (Direct)	% of 10 yr Min. Goals (Direct)	Cumulative Annual 2025 Indirect Savings	% of 10 yr Min. Goals (Direct + Indirect)	
Market Development															
MWh	381,700	471,200	675,800	614,300	441,800	118,800	89,430	71,930	84,240	91,610	3,041,000	29%	2,201,000	49%	
MMBtu	1,158,000	4,276,000	4,030,000	3,407,000	1,606,000	856,900	1,120,000	824,700	1,149,000	1,392,000	19,820,000	148%	7,728,000	206%	
Innovation and Research															
MWh	-	-	-	-	-	-	-	-	-	-	-	0%	-	0%	
MMBtu	-	-	-	-	-	-	-	-	-	-	-	0%	-	0%	
Total MWh	381,700	471,200	675,800	614,300	441,800	118,800	89,430	71,930	84,240	91,610	3,041,000	29%	2,201,000	49%	
Total MMBtu	1,158,000	4,276,000	4,030,000	3,407,000	1,606,000	856,900	1,120,000	824,700	1,149,000	1,392,000	19,820,000	148%	7,728,000	206%	

**Table 5. Market Development and Innovation & Research Energy Efficiency Cumulative First Year Annual Benefits by Chapter and Initiative (MWh)**

<b>Market Development</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Resource Acquisition Transition Chapter</b>											
<i>Commercial</i>	7,500	37,100	33,000	32,000							109,600
<i>Industrial</i>	153,000	92,400	88,000	88,000							421,700
<i>Agriculture</i>	4,000	5,000	5,000								14,000
<i>Multifamily Market Rate</i>	-	41	-								41
<i>Single Family Market Rate</i>	1,290	1,110	1,110								3,504
<i>Commercial New Construction</i>	19,600	18,400	28,200								66,200
<i>Low Rise New Construction</i>	3,630	4,680	6,470								14,780
<i>Multifamily New Construction</i>	5,690	6,870	8,230								20,790
<i>Anaerobic Digesters</i>	-	-	-								-
<i>Small Wind</i>	-	-	-								-
<i>Solar Thermal</i>	-	-	-								-
<i>Combined Heat &amp; Power</i>	175,000	52,000	60,000								287,000
<b>Resource Acquisition Transition Chapter Total</b>	<b>369,700</b>	<b>217,600</b>	<b>230,000</b>	<b>120,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>937,600</b>
<b>Commercial Chapter</b>											
<i>Real Estate Tenant</i>	121	13,100	24,100	22,400	26,100	18,600	11,200	5,600	3,700	-	124,900
<i>Energy Management</i>	2,450	56,100	106,000	119,000	112,000	33,700	10,200	3,410	945	242	444,300
<i>REV Campus Challenge</i>	-	23,200	23,200	11,600	11,600	7,720	7,720	7,720	7,720	7,720	108,100
<i>K-12</i>	-	-	5,800	11,600	11,700	11,700	17,500	11,700	11,700	8,770	90,480
<b>Commercial Chapter Total</b>	<b>2,571</b>	<b>92,400</b>	<b>159,100</b>	<b>164,600</b>	<b>161,400</b>	<b>71,720</b>	<b>46,620</b>	<b>28,430</b>	<b>24,070</b>	<b>16,730</b>	<b>767,800</b>
<b>Industrial Chapter</b>											
<i>Continuous Energy Improvement</i>	-	67,500	20,000	23,200	20,700	17,700	12,500	-	-	-	161,600
<b>Industrial Chapter Total</b>	<b>-</b>	<b>67,500</b>	<b>20,000</b>	<b>23,200</b>	<b>20,700</b>	<b>17,700</b>	<b>12,500</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>161,600</b>
<b>Communities Chapter</b>											
<i>Clean Energy Communities</i>	-	24,600	41,900	38,000	14,100	-	-	-	-	-	118,600
<i>Community Energy Engagement</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Communities Chapter Total</b>	<b>-</b>	<b>24,600</b>	<b>41,900</b>	<b>38,000</b>	<b>14,100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>118,600</b>
<b>Large-Scale Renewables Chapter</b>											
<i>Offshore Wind Master Plan</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Offshore Wind Pre-Development Activities</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Large-Scale Renewables Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>REV Technical Assistance Chapter</b>											
<i>REV Connect</i>	-	-	-	-	-	-	-	-	-	-	-
<b>REV Technical Assistance Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Energy Storage Chapter</b>											
<i>Reducing Barriers to Distributed Deployment</i>	-	2,600	4,700	4,600	1,900	-	-	-	-	-	13,800
<b>Energy Storage Chapter Total</b>	<b>-</b>	<b>2,600</b>	<b>4,700</b>	<b>4,600</b>	<b>1,900</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>13,800</b>
<b>Clean Transportation Chapter</b>											
<i>Electric Vehicles</i>											
<b>Clean Transportation Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Agriculture Chapter</b>											
<i>2030 GLASE</i>	3,470	-	-	-	-	-	-	-	-	-	3,470
<i>Advancing Agricultural Energy Technologies</i>	-	-	-	410	410	410	410	-	-	-	1,642
<b>Agriculture Chapter Total</b>	<b>3,470</b>	<b>-</b>	<b>-</b>	<b>410</b>	<b>410</b>	<b>410</b>	<b>410</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>5,112</b>

<b>Low- to Moderate-Income Chapter</b>											
<i>RetrofitNY</i>	-	-	270	342	743	1,620	17,600	37,800	56,700	72,000	187,100
<i>REVitalize</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Low-Income Forum on Energy</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Healthy Homes Feasibility Study</i>	-	-	-	-	-	-	-	-	-	-	-
<i>LMI Single Family</i>	4,950	6,820	6,820	5,090	5,090	5,090	-	-	-	-	33,860
<i>LMI Multifamily</i>	1,000	4,140	9,380	10,400	11,400	11,400	-	-	-	-	47,720
<i>Low Income Community Solar</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Low- to Moderate-Income Chapter Total</b>	5,950	10,960	16,470	15,830	17,230	18,110	17,600	37,800	56,700	72,000	268,700
<b>Workforce Development and Training Chapter</b>											
<i>Industry Partnerships</i>	-	53,200	65,500	28,700	-	-	-	-	-	-	147,400
<b>Workforce Dev. and Training Chapter Total</b>	-	53,200	65,500	28,700	-	-	-	-	-	-	147,400
<b>Renewable Heating &amp; Cooling Chapter</b>											
<i>Heat Pumps and Solar Thermal</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Renewable Heat NY</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewable Heating &amp; Cooling Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Energy Products Chapter</b>											
<i>Underutilized Product Support</i>	-	2,300	15,800	31,500	40,200	-	-	-	-	-	89,790
<b>Clean Energy Products Chapter Total</b>	-	2,300	15,800	31,500	40,200	-	-	-	-	-	89,790
<b>Multi-Sector Solutions Chapter</b>											
<i>Soft Cost Challenge</i>	-	-	8,860	8,860	-	-	-	-	-	-	17,720
<i>Technical Services</i>	-	-	20,200	12,300	19,600	10,900	12,300	5,700	3,470	2,880	87,310
<i>Clean Energy AMP Challenge</i>	-	-	25,900	-	-	-	-	-	-	-	25,900
<i>Clean Energy Siting &amp; Soft Cost Reduction</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Multi-Sector Solutions Chapter Total</b>	-	-	54,960	21,160	19,600	10,900	12,300	5,700	3,470	2,880	130,900
<b>Codes Chapter</b>											
<i>Code to Zero</i>	-	-	-	66,300	99,400	-	-	-	-	-	165,700
<b>Codes Chapter Total</b>	-	-	-	66,300	99,400	-	-	-	-	-	165,700
<b>On-Site Power Chapter</b>											
<i>Fuel Cells</i>	-	-	33,300	33,300	-	-	-	-	-	-	66,580
<b>On-Site Power Chapter Total</b>	-	-	33,300	33,300	-	-	-	-	-	-	66,580
<b>New Construction Chapter</b>											
<i>New Construction</i>	-	-	34,000	66,200	66,200	-	-	-	-	-	166,400
<b>New Construction Chapter Total</b>	-	-	34,000	66,200	66,200	-	-	-	-	-	166,400
<b>Residential Chapter</b>											
<i>Engaging New Markets</i>	-	-	25	465	704	-	-	-	-	-	1,194
<b>Residential Chapter Total</b>	-	-	25	465	704	-	-	-	-	-	1,194
<b>Total Market Development</b>	381,700	471,200	675,800	614,300	441,800	118,800	89,430	71,930	84,240	91,610	3,041,000

<b>Innovation and Research</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Grid Modernization Chapter</b>											
<i>DER Interconnection</i>	-	-	-	-	-	-	-	-	-	-	-
<i>High Performing Electric Grid</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Next Generation Power Electronics</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Grid Modernization Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Innovation Capacity and Business Development Chapter</b>											
<i>CleanTech Startup Growth</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Manufacturing Corps</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Novel Business Models and Offerings</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Innovation Capacity and Bus. Dev. Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Building Innovation Chapter</b>											
<i>NextGen HVAC</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Building Innovation Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter</b>											
<i>Public Transportation and Electrified Rail</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Electric Vehicles</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy-Related Environmental Research Chapter</b>											
<i>Energy-Related Environmental Research</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy-Related Environ. Research Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewables Optimization Chapter</b>											
<i>Energy Storage Innovations</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewables Optimization Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Total Innovation &amp; Research</b>	-	-	-	-	-	-	-	-	-	-	-

<b>Increased First Year Annual MWh</b>											
<i>Heat Pumps and Solar Thermal</i>	-	(2,117)	(4,873)	(6,407)	(7,524)	(7,540)	-	-	-	-	(28,462)
<i>Underutilized Product Support</i>	-	(1,160)	(10,204)	(9,585)	(5,566)	-	-	-	-	-	(26,514)
<i>Electric Vehides</i>	-	(18,500)	(41,400)	(37,300)	(8,400)	-	-	-	-	-	(105,600)
<b>Total</b>	-	(21,776)	(56,477)	(53,293)	(21,490)	(7,540)	-	-	-	-	(160,576)

**Table 6. Market Development and Innovation & Research Energy Efficiency Cumulative First Year Annual Benefits by Chapter and Initiative (MMBtu)**

<b>Market Development</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Resource Acquisition Transition Chapter</b>											
<i>Commercial</i>	61,000	339,000	290,000	290,000							980,000
<i>Industrial</i>	740,000	1,890,000	480,000	480,000							3,586,000
<i>Agriculture</i>	1,000	3,000	3,000								7,000
<i>Multifamily Market Rate</i>	-	9,870	-								9,871
<i>Single Family Market Rate</i>	67,100	81,800	81,800								230,700
<i>Commercial New Construction</i>	36,200	14,000	54,900								105,100
<i>Low Rise New Construction</i>	38,300	47,200	60,300								145,800
<i>Multifamily New Construction</i>	31,000	31,200	47,400								109,600
<i>Anaerobic Digesters</i>	-	-	-								-
<i>Small Wind</i>	-	-	-								-
<i>Solar Thermal</i>	-	-	-								-
<i>Combined Heat &amp; Power</i>											
<b>Resource Acquisition Transition Chapter Total</b>	<b>974,600</b>	<b>2,416,000</b>	<b>1,017,000</b>	<b>770,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>5,174,000</b>
<b>Commercial Chapter</b>											
<i>Real Estate Tenant</i>	128	13,800	25,500	23,600	27,500	19,700	11,800	5,900	3,900	-	131,800
<i>Energy Management</i>	2,100	24,800	44,600	47,100	44,100	15,000	4,530	1,520	420	108	184,200
<i>REV Campus Challenge</i>	-	144,000	144,000	71,800	71,800	47,900	47,900	47,900	47,900	47,900	670,000
<i>K-12</i>	-	-	32,300	64,500	64,500	64,500	96,800	64,500	64,500	48,400	500,000
<b>Commercial Chapter Total</b>	<b>2,228</b>	<b>182,600</b>	<b>246,400</b>	<b>207,000</b>	<b>207,900</b>	<b>147,100</b>	<b>161,000</b>	<b>119,800</b>	<b>116,700</b>	<b>96,410</b>	<b>1,486,000</b>
<b>Industrial Chapter</b>											
<i>Continuous Energy Improvement</i>	-	581,000	214,000	236,000	160,000	137,000	571,000	-	-	-	1,899,000
<b>Industrial Chapter Total</b>	<b>-</b>	<b>581,000</b>	<b>214,000</b>	<b>236,000</b>	<b>160,000</b>	<b>137,000</b>	<b>571,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,899,000</b>
<b>Communities Chapter</b>											
<i>Clean Energy Communities</i>	-	138,000	236,000	214,000	79,500	-	-	-	-	-	667,500
<i>Community Energy Engagement</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Communities Chapter Total</b>	<b>-</b>	<b>138,000</b>	<b>236,000</b>	<b>214,000</b>	<b>79,500</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>667,500</b>
<b>Large-Scale Renewables Chapter</b>											
<i>Offshore Wind Master Plan</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Offshore Wind Pre-Development Activities</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Large-Scale Renewables Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>REV Technical Assistance Chapter</b>											
<i>REV Connect</i>	-	-	-	-	-	-	-	-	-	-	-
<b>REV Technical Assistance Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Energy Storage Chapter</b>											
<i>Reducing Barriers to Distributed Deployment</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy Storage Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Clean Transportation Chapter</b>											
<i>Electric Vehicles</i>	-	250,000	560,000	505,000	114,000	-	-	-	-	-	1,430,000
<b>Clean Transportation Chapter Total</b>	<b>-</b>	<b>250,000</b>	<b>560,000</b>	<b>505,000</b>	<b>114,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,430,000</b>
<b>Agriculture Chapter</b>											
<i>2030 GLASE</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Advancing Agricultural Energy Technologies</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Agriculture Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

<b>Low- to Moderate-Income Chapter</b>											
<i>RetrofitNY</i>	-	-	4,840	6,130	13,300	29,100	315,000	678,000	1,020,000	1,290,000	3,356,000
<i>REVitalize</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Low-Income Forum on Energy</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Healthy Homes Feasibility Study</i>	-	-	-	-	-	-	-	-	-	-	-
<i>LMI Single Family</i>	168,000	203,000	203,000	146,000	146,000	146,000	-	-	-	-	1,012,000
<i>LMI Multifamily</i>	13,600	56,500	128,000	142,000	155,000	155,000	-	-	-	-	650,100
<i>Low Income Community Solar</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Low- to Moderate-Income Chapter Total</b>	<b>181,600</b>	<b>259,500</b>	<b>335,800</b>	<b>294,100</b>	<b>314,300</b>	<b>330,100</b>	<b>315,000</b>	<b>678,000</b>	<b>1,020,000</b>	<b>1,290,000</b>	<b>5,018,000</b>
<b>Workforce Development and Training Chapter</b>											
<i>Industry Partnerships</i>	-	352,000	434,000	190,000	-	-	-	-	-	-	975,800
<b>Workforce Dev. and Training Chapter Total</b>	<b>-</b>	<b>352,000</b>	<b>434,000</b>	<b>190,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>975,800</b>
<b>Renewable Heating &amp; Cooling Chapter</b>											
<i>Heat Pumps and Solar Thermal</i>	-	76,200	190,000	207,000	191,000	178,000	-	-	-	-	841,600
<i>Renewable Heat NY</i>	-	3,460	4,130	4,400	3,870	1,780	-	-	-	-	17,640
<b>Renewable Heating &amp; Cooling Chapter Total</b>	<b>-</b>	<b>79,660</b>	<b>194,100</b>	<b>211,400</b>	<b>194,900</b>	<b>179,800</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>859,200</b>
<b>Clean Energy Products Chapter</b>											
<i>Underutilized Product Support</i>	-	17,400	154,000	144,000	83,800	-	-	-	-	-	399,000
<b>Clean Energy Products Chapter Total</b>	<b>-</b>	<b>17,400</b>	<b>154,000</b>	<b>144,000</b>	<b>83,800</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>399,000</b>
<b>Multi-Sector Solutions Chapter</b>											
<i>Soft Cost Challenge</i>	-	-	295,000	295,000	-	-	-	-	-	-	590,600
<i>Technical Services</i>	-	-	114,000	54,900	121,000	62,900	73,200	26,900	12,500	5,930	471,300
<i>Clean Energy AMP Challenge</i>	-	-	152,000	-	-	-	-	-	-	-	152,000
<i>Clean Energy Siting &amp; Soft Cost Reduction</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Multi-Sector Solutions Chapter Total</b>	<b>-</b>	<b>-</b>	<b>561,000</b>	<b>349,900</b>	<b>121,000</b>	<b>62,900</b>	<b>73,200</b>	<b>26,900</b>	<b>12,500</b>	<b>5,930</b>	<b>1,214,000</b>
<b>Codes Chapter</b>											
<i>Code to Zero</i>	-	-	-	52,900	79,300	-	-	-	-	-	132,200
<b>Codes Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>52,900</b>	<b>79,300</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>132,200</b>
<b>On-Site Power Chapter</b>											
<i>Fuel Cells</i>	-	-	-	-	-	-	-	-	-	-	-
<b>On-Site Power Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>New Construction Chapter</b>											
<i>New Construction</i>	-	-	75,900	198,000	198,000	-	-	-	-	-	472,100
<b>New Construction Chapter Total</b>	<b>-</b>	<b>-</b>	<b>75,900</b>	<b>198,000</b>	<b>198,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>472,100</b>
<b>Residential Chapter</b>											
<i>Engaging New Markets</i>	-	-	1,880	34,900	52,800	-	-	-	-	-	89,580
<b>Residential Chapter Total</b>	<b>-</b>	<b>-</b>	<b>1,880</b>	<b>34,900</b>	<b>52,800</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>89,580</b>
<b>Total Market Development</b>	<b>1,158,000</b>	<b>4,276,000</b>	<b>4,030,000</b>	<b>3,407,000</b>	<b>1,606,000</b>	<b>856,900</b>	<b>1,120,000</b>	<b>824,700</b>	<b>1,149,000</b>	<b>1,392,000</b>	<b>19,820,000</b>

<b>Innovation and Research</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Grid Modernization Chapter</b>											
<i>DER Interconnection</i>	-	-	-	-	-	-	-	-	-	-	-
<i>High Performing Electric Grid</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Next Generation Power Electronics</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Grid Modernization Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Innovation Capacity and Business Development Chapter</b>											
<i>CleanTech Startup Growth</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Manufacturing Corps</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Novel Business Models and Offerings</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Innovation Capacity and Bus. Dev. Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Building Innovation Chapter</b>											
<i>NextGen HVAC</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Building Innovation Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter</b>											
<i>Public Transportation and Electrified Rail</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Electric Vehicles</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy-Related Environmental Research Chapter</b>											
<i>Energy-Related Environmental Research</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy-Related Environ. Research Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewables Optimization Chapter</b>											
<i>Energy Storage Innovations</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewables Optimization Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Total Innovation &amp; Research</b>	-	-	-	-	-	-	-	-	-	-	-

<b>Increased MMBTU</b>											
CHP	(987,000)	(302,000)	(334,000)								(1,623,000)
Fuel Cells	-	-	(259,000)	(259,000)	-	-	-	-	-	-	(518,700)
<b>Total</b>	<b>(987,000)</b>	<b>(302,000)</b>	<b>(593,000)</b>	<b>(259,000)</b>	-	-	-	-	-	-	<b>(2,141,700)</b>

**Table 7. Market Development and Innovation & Research Portfolio Lifetime Benefits**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	% of 10 yr Min. Goals
<b>Market Development</b>												
Renewable Energy (MWh)	104,900	630,200	970,300	625,500	245,500	15,000	15,000	15,000	15,000	11,850	2,648,000	3%
CO2e Reductions (metric tons)	3,449,000	8,373,000	8,120,000	7,646,000	5,274,000	1,427,000	1,539,000	1,542,000	2,079,000	2,479,000	41,920,000	32%
Customer Bill Savings (\$ million)	\$ 815.2	\$ 1,268.0	\$ 1,728.0	\$ 1,643.0	\$ 1,198.0	\$ 289.3	\$ 293.4	\$ 304.5	\$ 407.2	\$ 483.1	\$ 8,427.0	22%
Private Investment (\$ million)	\$ 462.4	\$ 770.6	\$ 1,148.0	\$ 1,189.0	\$ 694.1	\$ 211.1	\$ 204.6	\$ 244.6	\$ 483.7	\$ 695.80	\$ 6,105.0	21%
<b>Innovation and Research</b>												
Renewable Energy (MWh)	-	-	-	-	-	-	-	-	-	-	-	0%
CO2e Reductions (metric tons)	-	-	-	-	-	-	-	-	-	-	-	0%
Customer Bill Savings (\$ million)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	0%
Private Investment (\$ million)	\$ 70.35	\$ 200.00	\$ 290.90	\$ 257.30	\$ 218.50	\$ 184.30	\$ 100.00	\$ 16.50	\$ 28.90	\$ 20.60	\$ 1,387.00	5%
<b>Total Renewable Energy (MWh)</b>	<b>104,900</b>	<b>630,200</b>	<b>970,300</b>	<b>625,500</b>	<b>245,500</b>	<b>15,000</b>	<b>15,000</b>	<b>15,000</b>	<b>15,000</b>	<b>11,850</b>	<b>2,648,000</b>	<b>3%</b>
<b>Total CO2e Reductions (metric tons)</b>	<b>3,449,000</b>	<b>8,373,000</b>	<b>8,120,000</b>	<b>7,646,000</b>	<b>5,274,000</b>	<b>1,427,000</b>	<b>1,539,000</b>	<b>1,542,000</b>	<b>2,079,000</b>	<b>2,479,000</b>	<b>41,920,000</b>	<b>32%</b>
<b>Total Customer Bill Savings (\$ million)</b>	<b>\$ 815.20</b>	<b>\$ 1,268.00</b>	<b>\$ 1,728.00</b>	<b>\$ 1,643.00</b>	<b>\$ 1,198.00</b>	<b>\$ 289.30</b>	<b>\$ 293.40</b>	<b>\$ 304.50</b>	<b>\$ 407.20</b>	<b>\$ 483.10</b>	<b>\$ 8,427.00</b>	<b>22%</b>
<b>Total Private Investment (\$ million)</b>	<b>\$ 532.75</b>	<b>\$ 970.60</b>	<b>\$ 1,438.90</b>	<b>\$ 1,446.30</b>	<b>\$ 912.60</b>	<b>\$ 395.40</b>	<b>\$ 304.60</b>	<b>\$ 261.10</b>	<b>\$ 512.60</b>	<b>\$ 716.40</b>	<b>\$ 7,492.00</b>	<b>26%</b>



**Table 8. Market Development and Innovation & Research Renewable Energy Lifetime Benefits by Chapter/Initiative (MWh)**

Market Development	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
<b>Resource Acquisition Transition Chapter</b>											
Commercial	-	-	-	-							-
Industrial	-	-	-								-
Agriculture	-	-	-								-
Multifamily Market Rate	-	-	-								-
Single Family Market Rate	-	-	-								-
Commercial New Construction	-	-	-								-
Low Rise New Construction	-	-	-								-
Multifamily New Construction	-	-	-								-
Anaerobic Digesters	74,400	150,000	150,000								374,400
Small Wind	18,000	32,000	32,000								82,000
Solar Thermal	12,500	-	-								12,500
Combined Heat & Power	-	-	-								-
<b>Resource Acquisition Transition Chapter Total</b>	<b>104,900</b>	<b>182,000</b>	<b>182,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>468,900</b>
<b>Commercial Chapter</b>											
Real Estate Tenant	-	-	-	-	-	-	-	-	-	-	-
Energy Management	-	-	-	-	-	-	-	-	-	-	-
REV Campus Challenge	-	22,000	22,000	16,500	16,500	11,000	11,000	11,000	11,000	11,000	132,100
K-12	-	-	-	-	-	-	-	-	-	-	-
<b>Commercial Chapter Total</b>	<b>-</b>	<b>22,000</b>	<b>22,000</b>	<b>16,500</b>	<b>16,500</b>	<b>11,000</b>	<b>11,000</b>	<b>11,000</b>	<b>11,000</b>	<b>11,000</b>	<b>132,100</b>
<b>Industrial Chapter</b>											
Continuous Energy Improvement	-	-	-	-	-	-	-	-	-	-	-
<b>Industrial Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Communities Chapter</b>											
Clean Energy Communities	-	391,000	668,000	605,000	225,000	-	-	-	-	-	1,889,000
Community Energy Engagement	-	-	-	-	-	-	-	-	-	-	-
<b>Communities Chapter Total</b>	<b>-</b>	<b>391,000</b>	<b>668,000</b>	<b>605,000</b>	<b>225,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,889,000</b>
<b>Large-Scale Renewables Chapter</b>											
Offshore Wind Master Plan	-	-	-	-	-	-	-	-	-	-	-
Offshore Wind Pre-Development Activities	-	-	-	-	-	-	-	-	-	-	-
<b>Large-Scale Renewables Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>REV Technical Assistance Chapter</b>											
REV Connect	-	-	-	-	-	-	-	-	-	-	-
<b>REV Technical Assistance Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Energy Storage Chapter</b>											
Reducing Barriers to Distributed Deployment	-	-	-	-	-	-	-	-	-	-	-
<b>Energy Storage Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Clean Transportation Chapter</b>											
Electric Vehicles	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Agriculture Chapter</b>											
2030 GLASE	-	-	-	-	-	-	-	-	-	-	-
Advancing Agricultural Energy Technologies	-	-	-	-	-	-	-	-	-	-	-
<b>Agriculture Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

<b>Low- to Moderate-Income Chapter</b>											
<i>RetrofitNY</i>	-	-	-	-	-	-	-	-	-	-	-
<i>REVitalize</i>	-	35,200	24,700	-	-	-	-	-	-	-	59,880
<i>Low-Income Forum on Energy</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Healthy Homes Feasibility Study</i>	-	-	-	-	-	-	-	-	-	-	-
<i>LMI Single Family</i>	-	-	-	-	-	-	-	-	-	-	-
<i>LMI Multifamily</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Low Income Community Solar</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Low- to Moderate-Income Chapter Total</b>	-	35,200	24,700	-	-	-	-	-	-	-	59,880
<b>Workforce Development and Training Chapter</b>											
<i>Industry Partnerships</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Workforce Dev. and Training Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewable Heating &amp; Cooling Chapter</b>											
<i>Heat Pumps and Solar Thermal</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Renewable Heat NY</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewable Heating &amp; Cooling Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Energy Products Chapter</b>											
<i>Underutilized Product Support</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Energy Products Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Multi-Sector Solutions Chapter</b>											
<i>Soft Cost Challenge</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Technical Services</i>	-	-	3,150	4,000	4,000	4,000	4,000	4,000	4,000	850	27,970
<i>Clean Energy AMP Challenge</i>	-	-	70,400	-	-	-	-	-	-	-	70,400
<i>Clean Energy Siting &amp; Soft Cost Reduction</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Multi-Sector Solutions Chapter Total</b>	-	-	73,550	4,000	4,000	4,000	4,000	4,000	4,000	850	98,370
<b>Codes Chapter</b>											
<i>Code to Zero</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Codes Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>On-Site Power Chapter</b>											
<i>Fuel Cells</i>	-	-	-	-	-	-	-	-	-	-	-
<b>On-Site Power Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>New Construction Chapter</b>											
<i>New Construction</i>	-	-	-	-	-	-	-	-	-	-	-
<b>New Construction Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Residential Chapter</b>											
<i>Engaging New Markets</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Residential Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Total Market Development</b>	104,900	630,200	970,300	625,500	245,500	15,000	15,000	15,000	15,000	11,850	2,648,000

<b>Innovation and Research</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Grid Modernization Chapter</b>											
<i>DER Interconnection</i>	-	-	-	-	-	-	-	-	-	-	-
<i>High Performing Electric Grid</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Next Generation Power Electronics</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Grid Modernization Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Innovation Capacity and Business Development Chapter</b>											
<i>CleanTech Startup Growth</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Manufacturing Corps</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Novel Business Models and Offerings</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Innovation Capacity and Bus. Dev. Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Building Innovation Chapter</b>											
<i>NextGen HVAC</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Building Innovation Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter</b>											
<i>Public Transportation and Electrified Rail</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Electric Vehicles</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy-Related Environmental Research Chapter</b>											
<i>Energy-Related Environmental Research</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy-Related Environ. Research Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewables Optimization Chapter</b>											
<i>Energy Storage Innovations</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewables Optimization Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Total Innovation &amp; Research</b>	-	-	-	-	-	-	-	-	-	-	-

**Table 9. Market Development and Innovation & Research Lifetime Benefits by Chapter/Initiative (tons CO2e Reductions)**

Market Development	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
<b>Resource Acquisition Transition Chapter</b>											
Commercial	123,000	647,000	565,000	556,000							1,891,000
Industrial	1,790,000	3,880,000	1,080,000	1,080,000							7,821,000
Agriculture	30,000	45,000	45,000								120,000
Multifamily Market Rate	-	8,970	-								8,967
Single Family Market Rate	111,000	130,000	130,000								371,900
Commercial New Construction	245,000	208,000	355,000								808,000
Low Rise New Construction	78,800	99,200	132,000								310,000
Multifamily New Construction	92,700	105,000	137,000								334,700
Anaerobic Digesters	39,200	80,000	80,000								199,200
Small Wind	10,000	17,000	17,000								44,000
Solar Thermal	6,550	-	-								6,550
Combined Heat & Power	596,000	170,000	207,000								973,000
<b>Resource Acquisition Transition Chapter Total</b>	<b>3,122,000</b>	<b>5,390,000</b>	<b>2,748,000</b>	<b>1,636,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>12,890,000</b>
<b>Commercial Chapter</b>											
Real Estate Tenant	564	61,000	112,000	104,000	122,000	86,600	52,100	26,100	17,200	-	581,600
Energy Management	11,200	246,000	467,000	520,000	490,000	148,000	44,800	15,000	4,160	1,060	1,948,000
REV Campus Challenge	-	309,000	309,000	157,000	157,000	105,000	105,000	105,000	105,000	105,000	1,455,000
K-12	-	-	73,400	147,000	147,000	148,000	221,000	148,000	148,000	111,000	1,143,000
<b>Commercial Chapter Total</b>	<b>11,760</b>	<b>616,000</b>	<b>961,400</b>	<b>928,000</b>	<b>916,000</b>	<b>487,600</b>	<b>422,900</b>	<b>294,100</b>	<b>274,400</b>	<b>217,100</b>	<b>5,128,000</b>
<b>Industrial Chapter</b>											
Continuous Energy Improvement	-	773,000	315,000	330,000	199,000	171,000	389,000	-	-	-	2,177,000
<b>Industrial Chapter Total</b>	<b>-</b>	<b>773,000</b>	<b>315,000</b>	<b>330,000</b>	<b>199,000</b>	<b>171,000</b>	<b>389,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2,177,000</b>
<b>Communities Chapter</b>											
Clean Energy Communities	-	518,000	884,000	802,000	298,000	-	-	-	-	-	2,502,000
Community Energy Engagement	-	-	-	-	-	-	-	-	-	-	-
<b>Communities Chapter Total</b>	<b>-</b>	<b>518,000</b>	<b>884,000</b>	<b>802,000</b>	<b>298,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2,502,000</b>
<b>Large-Scale Renewables Chapter</b>											
Offshore Wind Master Plan	-	-	-	-	-	-	-	-	-	-	-
Offshore Wind Pre-Development Activities	-	-	-	-	-	-	-	-	-	-	-
<b>Large-Scale Renewables Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>REV Technical Assistance Chapter</b>											
REV Connect	-	-	-	-	-	-	-	-	-	-	-
<b>REV Technical Assistance Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Energy Storage Chapter</b>											
Reducing Barriers to Distributed Deployment	-	13,700	24,700	24,200	10,000	-	-	-	-	-	72,600
<b>Energy Storage Chapter Total</b>	<b>-</b>	<b>13,700</b>	<b>24,700</b>	<b>24,200</b>	<b>10,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>72,600</b>
<b>Clean Transportation Chapter</b>											
Electric Vehicles	-	134,000	301,000	271,000	61,000	-	-	-	-	-	767,300
<b>Clean Transportation Chapter Total</b>	<b>-</b>	<b>134,000</b>	<b>301,000</b>	<b>271,000</b>	<b>61,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>767,300</b>
<b>Agriculture Chapter</b>											
2030 GLASE	18,300	-	-	-	-	-	-	-	-	-	18,300
Advancing Agricultural Energy Technologies	-	-	-	3,240	3,240	3,240	3,240	-	-	-	12,960
<b>Agriculture Chapter Total</b>	<b>18,300</b>	<b>-</b>	<b>-</b>	<b>3,240</b>	<b>3,240</b>	<b>3,240</b>	<b>3,240</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>31,260</b>

<b>Low- to Moderate-Income Chapter</b>											
<i>RetrofitNY</i>	-	-	8,370	10,600	23,000	50,300	545,000	1,170,000	1,760,000	2,230,000	5,804,000
<i>REVitalize</i>	-	18,500	13,000	-	-	-	-	-	-	-	31,500
<i>Low-Income Forum on Energy</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Healthy Homes Feasibility Study</i>	-	-	-	-	-	-	-	-	-	-	-
<i>LMI Single Family</i>	277,000	338,000	338,000	164,000	164,000	164,000	-	-	-	-	1,445,000
<i>LMI Multifamily</i>	19,800	82,100	186,000	206,000	226,000	226,000	-	-	-	-	945,900
<i>Low Income Community Solar</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Low- to Moderate-Income Chapter Total</b>	296,800	438,600	545,400	380,600	413,000	440,300	545,000	1,170,000	1,760,000	2,230,000	8,226,000
<b>Workforce Development and Training Chapter</b>											
<i>Industry Partnerships</i>	-	374,000	460,000	201,000	-	-	-	-	-	-	1,034,000
<b>Workforce Dev. and Training Chapter Total</b>	-	374,000	460,000	201,000	-	-	-	-	-	-	1,034,000
<b>Renewable Heating &amp; Cooling Chapter</b>											
<i>Heat Pumps and Solar Thermal</i>	-	84,800	217,000	221,000	183,000	164,000	-	-	-	-	870,300
<i>Renewable Heat NY</i>	-	5,090	6,070	6,460	5,690	2,620	-	-	-	-	25,920
<b>Renewable Heating &amp; Cooling Chapter Total</b>	-	89,890	223,100	227,500	188,700	166,600	-	-	-	-	896,200
<b>Clean Energy Products Chapter</b>											
<i>Underutilized Product Support</i>	-	25,800	197,000	298,000	323,000	-	-	-	-	-	844,600
<b>Clean Energy Products Chapter Total</b>	-	25,800	197,000	298,000	323,000	-	-	-	-	-	844,600
<b>Multi-Sector Solutions Chapter</b>											
<i>Soft Cost Challenge</i>	-	-	233,000	233,000	-	-	-	-	-	-	465,700
<i>Technical Services</i>	-	-	287,000	162,000	288,000	158,000	179,000	77,800	44,600	31,700	1,229,000
<i>Clean Energy AMP Challenge</i>	-	-	370,000	-	-	-	-	-	-	-	370,000
<i>Clean Energy Siting &amp; Soft Cost Reduction</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Multi-Sector Solutions Chapter Total</b>	-	-	890,000	395,000	288,000	158,000	179,000	77,800	44,600	31,700	2,065,000
<b>Codes Chapter</b>											
<i>Code to Zero</i>	-	-	-	949,000	1,420,000	-	-	-	-	-	2,371,000
<b>Codes Chapter Total</b>	-	-	-	949,000	1,420,000	-	-	-	-	-	2,371,000
<b>On-Site Power Chapter</b>											
<i>Fuel Cells</i>	-	-	75,000	75,000	-	-	-	-	-	-	150,000
<b>On-Site Power Chapter Total</b>	-	-	75,000	75,000	-	-	-	-	-	-	150,000
<b>New Construction Chapter</b>											
<i>New Construction</i>	-	-	492,000	1,070,000	1,070,000	-	-	-	-	-	2,622,000
<b>New Construction Chapter Total</b>	-	-	492,000	1,070,000	1,070,000	-	-	-	-	-	2,622,000
<b>Residential Chapter</b>											
<i>Engaging New Markets</i>	-	-	2,970	55,300	83,700	-	-	-	-	-	142,000
<b>Residential Chapter Total</b>	-	-	2,970	55,300	83,700	-	-	-	-	-	142,000
<b>Total Market Development</b>	3,449,000	8,373,000	8,120,000	7,646,000	5,274,000	1,427,000	1,539,000	1,542,000	2,079,000	2,479,000	41,920,000

<b>Innovation and Research</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Grid Modernization Chapter</b>											
<i>DER Interconnection</i>	-	-	-	-	-	-	-	-	-	-	-
<i>High Performing Electric Grid</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Next Generation Power Electronics</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Grid Modernization Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Innovation Capacity and Business Development Chapter</b>											
<i>CleanTech Startup Growth</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Manufacturing Corps</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Novel Business Models and Offerings</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Innovation Capacity and Bus. Dev. Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Building Innovation Chapter</b>											
<i>NextGen HVAC</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Building Innovation Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter</b>											
<i>Public Transportation and Electrified Rail</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Electric Vehicles</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Clean Transportation Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy-Related Environmental Research Chapter</b>											
<i>Energy-Related Environmental Research</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Energy-Related Environ. Research Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewables Optimization Chapter</b>											
<i>Energy Storage Innovations</i>	-	-	-	-	-	-	-	-	-	-	-
<b>Renewables Optimization Chapter Total</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Total Innovation &amp; Research</b>	-	-	-	-	-	-	-	-	-	-	-

**Table 10. Market Development and Innovation & Research Lifetime Benefits by Chapter/Initiative (Customer Bill Savings in \$ million)**

Market Development	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
<b>Resource Acquisition Transition Chapter</b>											
Commercial	\$ 26.80	\$ 139.00	\$ 122.00	\$ 119.00							\$ 406.80
Industrial	\$ 303.00	\$ 308.00	\$ 175.00	\$ 175.00							\$ 961.80
Agriculture	\$ 8.85	\$ 11.30	\$ 11.30								\$ 31.35
Multifamily Market Rate	\$ -	\$ 1.63	\$ -								\$ 1.63
Single Family Market Rate	\$ 28.40	\$ 33.60	\$ 33.60								\$ 95.71
Commercial New Construction	\$ 56.20	\$ 51.10	\$ 81.00								\$ 188.30
Low Rise New Construction	\$ 18.80	\$ 23.70	\$ 32.00								\$ 74.50
Multifamily New Construction	\$ 18.50	\$ 21.70	\$ 27.10								\$ 67.30
Anaerobic Digesters	\$ 9.99	\$ 20.00	\$ 20.00								\$ 49.99
Small Wind	\$ 3.20	\$ 5.60	\$ 5.60								\$ 14.40
Solar Thermal	\$ 1.66	\$ -	\$ -								\$ 1.66
Combined Heat & Power	\$ 267.00	\$ 78.70	\$ 92.00								\$ 437.70
<b>Resource Acquisition Transition Chapter Total</b>	<b>\$ 742.40</b>	<b>\$ 694.30</b>	<b>\$ 599.60</b>	<b>\$ 294.00</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 2,331.00</b>
<b>Commercial Chapter</b>											
Real Estate Tenant	\$ 0.13	\$ 14.50	\$ 26.70	\$ 24.90	\$ 29.00	\$ 20.70	\$ 12.40	\$ 6.22	\$ 4.11	\$ -	\$ 138.70
Energy Management	\$ 2.70	\$ 60.80	\$ 115.00	\$ 129.00	\$ 122.00	\$ 36.50	\$ 11.00	\$ 3.70	\$ 1.02	\$ 0.26	\$ 480.90
REV Campus Challenge	\$ -	\$ 58.10	\$ 58.10	\$ 29.00	\$ 29.00	\$ 19.40	\$ 19.40	\$ 19.40	\$ 19.40	\$ 19.40	\$ 271.10
K-12	\$ -	\$ -	\$ 16.10	\$ 32.20	\$ 32.30	\$ 32.40	\$ 48.50	\$ 32.40	\$ 32.40	\$ 24.30	\$ 250.40
<b>Commercial Chapter Total</b>	<b>\$ 2.83</b>	<b>\$ 133.40</b>	<b>\$ 215.90</b>	<b>\$ 215.10</b>	<b>\$ 212.30</b>	<b>\$ 109.00</b>	<b>\$ 91.30</b>	<b>\$ 61.72</b>	<b>\$ 56.93</b>	<b>\$ 43.96</b>	<b>\$ 1,141.00</b>
<b>Industrial Chapter</b>											
Continuous Energy Improvement	\$ -	\$ 120.00	\$ 48.80	\$ 51.20	\$ 31.10	\$ 26.60	\$ 59.30	\$ -	\$ -	\$ -	\$ 337.00
<b>Industrial Chapter Total</b>	<b>\$ -</b>	<b>\$ 120.00</b>	<b>\$ 48.80</b>	<b>\$ 51.20</b>	<b>\$ 31.10</b>	<b>\$ 26.60</b>	<b>\$ 59.30</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 337.00</b>
<b>Communities Chapter</b>											
Clean Energy Communities	\$ -	\$ 120.00	\$ 205.00	\$ 186.00	\$ 69.30	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 580.30
Community Energy Engagement	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Communities Chapter Total</b>	<b>\$ -</b>	<b>\$ 120.00</b>	<b>\$ 205.00</b>	<b>\$ 186.00</b>	<b>\$ 69.30</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 580.30</b>
<b>Large-Scale Renewables Chapter</b>											
Offshore Wind Master Plan	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Offshore Wind Pre-Development Activities	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Large-Scale Renewables Chapter Total</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>REV Technical Assistance Chapter</b>											
REV Connect	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>REV Technical Assistance Chapter Total</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Energy Storage Chapter</b>											
Reducing Barriers to Distributed Deployment	\$ -	\$ 3.46	\$ 6.25	\$ 6.12	\$ 2.53	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 18.35
<b>Energy Storage Chapter Total</b>	<b>\$ -</b>	<b>\$ 3.46</b>	<b>\$ 6.25</b>	<b>\$ 6.12</b>	<b>\$ 2.53</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 18.35</b>
<b>Clean Transportation Chapter</b>											
Electric Vehicles	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Clean Transportation Chapter Total</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Agriculture Chapter</b>											
2030 GLASE	\$ 2.92	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2.92
Advancing Agricultural Energy Technologies	\$ -	\$ -	\$ -	\$ 0.90	\$ 0.90	\$ 0.90	\$ 0.90	\$ -	\$ -	\$ -	\$ 3.58
<b>Agriculture Chapter Total</b>	<b>\$ 2.92</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 0.90</b>	<b>\$ 0.90</b>	<b>\$ 0.90</b>	<b>\$ 0.90</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 6.50</b>

<b>Low- to Moderate-Income Chapter</b>											
<i>RetrofitNY</i>	\$ -	\$ -	\$ 1.62	\$ 2.05	\$ 4.45	\$ 9.73	\$ 106.00	\$ 227.00	\$ 341.00	\$ 432.00	\$ 1,123.00
<i>REVitalize</i>	\$ -	\$ 5.56	\$ 3.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 9.46
<i>Low-Income Forum on Energy</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>Healthy Homes Feasibility Study</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>LMI Single Family</i>	\$ 62.90	\$ 77.50	\$ 77.50	\$ 38.70	\$ 38.70	\$ 38.70	\$ -	\$ -	\$ -	\$ -	\$ 334.00
<i>LMI Multifamily</i>	\$ 4.10	\$ 17.10	\$ 38.80	\$ 43.00	\$ 47.00	\$ 47.00	\$ -	\$ -	\$ -	\$ -	\$ 197.00
<i>Low Income Community Solar</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Low- to Moderate-Income Chapter Total</b>	\$ 67.00	\$ 100.20	\$ 121.80	\$ 83.75	\$ 90.15	\$ 95.43	\$ 106.00	\$ 227.00	\$ 341.00	\$ 432.00	\$ 1,663.00
<b>Workforce Development and Training Chapter</b>											
<i>Industry Partnerships</i>	\$ -	\$ 72.20	\$ 88.80	\$ 38.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 199.90
<b>Workforce Dev. and Training Chapter Total</b>	\$ -	\$ 72.20	\$ 88.80	\$ 38.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 199.90
<b>Renewable Heating &amp; Cooling Chapter</b>											
<i>Heat Pumps and Solar Thermal</i>	\$ -	\$ 14.30	\$ 37.00	\$ 36.50	\$ 28.30	\$ 24.80	\$ -	\$ -	\$ -	\$ -	\$ 140.80
<i>Renewable Heat NY</i>	\$ -	\$ 1.77	\$ 2.11	\$ 2.25	\$ 1.98	\$ 0.91	\$ -	\$ -	\$ -	\$ -	\$ 9.03
<b>Renewable Heating &amp; Cooling Chapter Total</b>	\$ -	\$ 16.07	\$ 39.11	\$ 38.75	\$ 30.28	\$ 25.71	\$ -	\$ -	\$ -	\$ -	\$ 149.80
<b>Clean Energy Products Chapter</b>											
<i>Underutilized Product Support</i>	\$ -	\$ 7.93	\$ 62.10	\$ 87.10	\$ 88.50	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 245.50
<b>Clean Energy Products Chapter Total</b>	\$ -	\$ 7.93	\$ 62.10	\$ 87.10	\$ 88.50	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 245.50
<b>Multi-Sector Solutions Chapter</b>											
<i>Soft Cost Challenge</i>	\$ -	\$ -	\$ 55.60	\$ 55.60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 111.10
<i>Technical Services</i>	\$ -	\$ -	\$ 58.20	\$ 33.70	\$ 57.50	\$ 31.70	\$ 35.90	\$ 15.80	\$ 9.23	\$ 7.17	\$ 249.20
<i>Clean Energy AMP Challenge</i>	\$ -	\$ -	\$ 51.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 51.90
<i>Clean Energy Siting &amp; Soft Cost Reduction</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Multi-Sector Solutions Chapter Total</b>	\$ -	\$ -	\$ 165.70	\$ 89.30	\$ 57.50	\$ 31.70	\$ 35.90	\$ 15.80	\$ 9.23	\$ 7.17	\$ 412.20
<b>Codes Chapter</b>											
<i>Code to Zero</i>	\$ -	\$ -	\$ -	\$ 234.00	\$ 351.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 584.30
<b>Codes Chapter Total</b>	\$ -	\$ -	\$ -	\$ 234.00	\$ 351.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 584.30
<b>On-Site Power Chapter</b>											
<i>Fuel Cells</i>	\$ -	\$ -	\$ 59.90	\$ 59.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 119.80
<b>On-Site Power Chapter Total</b>	\$ -	\$ -	\$ 59.90	\$ 59.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 119.80
<b>New Construction Chapter</b>											
<i>New Construction</i>	\$ -	\$ -	\$ 114.00	\$ 244.00	\$ 244.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 603.00
<b>New Construction Chapter Total</b>	\$ -	\$ -	\$ 114.00	\$ 244.00	\$ 244.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 603.00
<b>Residential Chapter</b>											
<i>Engaging New Markets</i>	\$ -	\$ -	\$ 0.73	\$ 13.60	\$ 20.60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 34.99
<b>Residential Chapter Total</b>	\$ -	\$ -	\$ 0.73	\$ 13.60	\$ 20.60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 34.99
<b>Total Market Development</b>	\$ 815.20	\$ 1,268.00	\$ 1,728.00	\$ 1,643.00	\$ 1,198.00	\$ 289.30	\$ 293.40	\$ 304.50	\$ 407.20	\$ 483.10	\$ 8,427.00



<b>Innovation and Research</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Grid Modernization Chapter</b>											
<i>DER Interconnection</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>High Performing Electric Grid</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>Next Generation Power Electronics</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Grid Modernization Chapter Total</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Innovation Capacity and Business Development Chapter</b>											
<i>CleanTech Startup Growth</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>Manufacturing Corps</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>Novel Business Models and Offerings</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Innovation Capacity and Bus. Dev. Chapter Total</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Building Innovation Chapter</b>											
<i>NextGen HVAC</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Building Innovation Chapter Total</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Clean Transportation Chapter</b>											
<i>Public Transportation and Electrified Rail</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>Electric Vehicles</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Clean Transportation Chapter Total</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Energy-Related Environmental Research Chapter</b>											
<i>Energy-Related Environmental Research</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Energy-Related Environ. Research Chapter Total</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Renewables Optimization Chapter</b>											
<i>Energy Storage Innovations</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Renewables Optimization Chapter Total</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Total Innovation &amp; Research</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

**Table 11. Market Development and Innovation & Research Lifetime Benefits by Chapter/Initiative (Private Investment in \$ million)**

Market Development	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
<b>Resource Acquisition Transition Chapter</b>											
Commercial	\$ 7.20	\$ 36.40	\$ 24.40	\$ 24.00							\$ 92.00
Industrial	\$ 157.00	\$ 176.00	\$ 213.00	\$ 215.00							\$ 761.10
Agriculture	\$ 3.49	\$ 4.56	\$ 4.19								\$ 12.24
Multifamily Market Rate	\$ -	\$ 0.42	\$ -								\$ 0.42
Single Family Market Rate	\$ 19.30	\$ 29.00	\$ 29.00								\$ 77.23
Commercial New Construction	\$ 17.10	\$ 20.40	\$ 4.57								\$ 42.07
Low Rise New Construction	\$ 10.30	\$ 14.50	\$ 18.70								\$ 43.50
Multifamily New Construction	\$ 25.10	\$ 26.40	\$ 31.70								\$ 83.20
Anaerobic Digesters	\$ 19.00	\$ 40.00	\$ 40.00								\$ 99.00
Small Wind	\$ 1.60	\$ 2.80	\$ 2.80								\$ 7.20
Solar Thermal	\$ 0.82	\$ -	\$ -								\$ 0.82
Combined Heat & Power	\$ 176.00	\$ 26.00	\$ 28.00								\$ 230.00
<b>Resource Acquisition Transition Chapter Total</b>	<b>\$ 436.90</b>	<b>\$ 376.50</b>	<b>\$ 396.40</b>	<b>\$ 239.00</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,449.00</b>
<b>Commercial Chapter</b>											
Real Estate Tenant	\$ 0.01	\$ 1.27	\$ 2.35	\$ 2.18	\$ 2.54	\$ 1.81	\$ 1.09	\$ 0.54	\$ 0.36	\$ -	\$ 12.15
Energy Management	\$ 3.34	\$ 19.30	\$ 33.90	\$ 44.20	\$ 51.30	\$ 78.70	\$ 92.00	\$ 9.58	\$ 11.20	\$ 14.40	\$ 357.80
REV Campus Challenge	\$ -	\$ 13.30	\$ 13.40	\$ 7.43	\$ 7.10	\$ 5.98	\$ 5.98	\$ 5.98	\$ 5.98	\$ 5.98	\$ 71.20
K-12	\$ -	\$ -	\$ 7.14	\$ 11.50	\$ 11.40	\$ 12.00	\$ 15.60	\$ 11.20	\$ 10.40	\$ 7.02	\$ 86.40
<b>Commercial Chapter Total</b>	<b>\$ 3.35</b>	<b>\$ 33.87</b>	<b>\$ 56.79</b>	<b>\$ 65.31</b>	<b>\$ 72.34</b>	<b>\$ 98.49</b>	<b>\$ 114.70</b>	<b>\$ 27.30</b>	<b>\$ 27.94</b>	<b>\$ 27.40</b>	<b>\$ 527.60</b>
<b>Industrial Chapter</b>											
Continuous Energy Improvement	\$ -	\$ 104.00	\$ 20.40	\$ 15.90	\$ 0.90	\$ 0.87	\$ 0.74	\$ -	\$ -	\$ -	\$ 142.80
<b>Industrial Chapter Total</b>	<b>\$ -</b>	<b>\$ 104.00</b>	<b>\$ 20.40</b>	<b>\$ 15.90</b>	<b>\$ 0.90</b>	<b>\$ 0.87</b>	<b>\$ 0.74</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 142.80</b>
<b>Communities Chapter</b>											
Clean Energy Communities	\$ -	\$ 16.70	\$ 28.50	\$ 25.90	\$ 9.63	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 80.73
Community Energy Engagement	\$ -	\$ 1.73	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1.73
<b>Communities Chapter Total</b>	<b>\$ -</b>	<b>\$ 18.43</b>	<b>\$ 28.50</b>	<b>\$ 25.90</b>	<b>\$ 9.63</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 82.46</b>
<b>Large-Scale Renewables Chapter</b>											
Offshore Wind Master Plan	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Offshore Wind Pre-Development Activities	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Large-Scale Renewables Chapter Total</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>REV Technical Assistance Chapter</b>											
REV Connect	\$ -	\$ 0.25	\$ 0.25	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0.50
<b>REV Technical Assistance Chapter Total</b>	<b>\$ -</b>	<b>\$ 0.25</b>	<b>\$ 0.25</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 0.50</b>
<b>Energy Storage Chapter</b>											
Reducing Barriers to Distributed Deployment	\$ -	\$ 8.50	\$ 11.60	\$ 9.50	\$ 0.40	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 30.00
<b>Energy Storage Chapter Total</b>	<b>\$ -</b>	<b>\$ 8.50</b>	<b>\$ 11.60</b>	<b>\$ 9.50</b>	<b>\$ 0.40</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 30.00</b>
<b>Clean Transportation Chapter</b>											
Electric Vehicles	\$ -	\$ 180.00	\$ 403.00	\$ 363.00	\$ 81.70	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,027.00
<b>Clean Transportation Chapter Total</b>	<b>\$ -</b>	<b>\$ 180.00</b>	<b>\$ 403.00</b>	<b>\$ 363.00</b>	<b>\$ 81.70</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,027.00</b>
<b>Agriculture Chapter</b>											
2030 GLASE	\$ 9.46	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 9.46
Advancing Agricultural Energy Technologies	\$ -	\$ -	\$ -	\$ 0.19	\$ 0.19	\$ 0.19	\$ 0.19	\$ -	\$ -	\$ -	\$ 0.75
<b>Agriculture Chapter Total</b>	<b>\$ 9.46</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 0.19</b>	<b>\$ 0.19</b>	<b>\$ 0.19</b>	<b>\$ 0.19</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 10.21</b>

<b>Low- to Moderate-Income Chapter</b>											
<i>RetrofitNY</i>	\$ -	\$ -	\$ -	\$ 0.61	\$ 2.55	\$ 6.23	\$ 77.00	\$ 210.00	\$ 450.00	\$ 664.00	\$ 1,411.00
<i>REVitalize</i>	\$ -	\$ 3.75	\$ 2.13	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5.88
<i>Low-Income Forum on Energy</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>Healthy Homes Feasibility Study</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>LMI Single Family</i>	\$ 9.51	\$ 9.42	\$ 10.20	\$ 6.55	\$ 6.55	\$ 6.55	\$ -	\$ -	\$ -	\$ -	\$ 48.78
<i>LMI Multifamily</i>	\$ 3.14	\$ 19.40	\$ 35.90	\$ 36.70	\$ 40.20	\$ 40.20	\$ -	\$ -	\$ -	\$ -	\$ 175.50
<i>Low Income Community Solar</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Low- to Moderate-Income Chapter Total</b>	\$ 12.65	\$ 32.57	\$ 48.23	\$ 43.86	\$ 49.30	\$ 52.98	\$ 77.00	\$ 210.00	\$ 450.00	\$ 664.00	\$ 1,641.00
<b>Workforce Development and Training Chapter</b>											
<i>Industry Partnerships</i>	\$ -	\$ 3.59	\$ 4.42	\$ 1.93	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 9.95
<b>Workforce Dev. and Training Chapter Total</b>	\$ -	\$ 3.59	\$ 4.42	\$ 1.93	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 9.95
<b>Renewable Heating &amp; Cooling Chapter</b>											
<i>Heat Pumps and Solar Thermal</i>	\$ -	\$ 4.56	\$ 15.70	\$ 27.80	\$ 30.20	\$ 44.70	\$ -	\$ -	\$ -	\$ -	\$ 122.90
<i>Renewable Heat NY</i>	\$ -	\$ 2.55	\$ 3.26	\$ 3.57	\$ 3.37	\$ 2.61	\$ -	\$ -	\$ -	\$ -	\$ 15.36
<b>Renewable Heating &amp; Cooling Chapter Total</b>	\$ -	\$ 7.11	\$ 18.96	\$ 31.37	\$ 33.57	\$ 47.31	\$ -	\$ -	\$ -	\$ -	\$ 138.30
<b>Clean Energy Products Chapter</b>											
<i>Underutilized Product Support</i>	\$ -	\$ 5.78	\$ 45.60	\$ 58.00	\$ 52.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 161.30
<b>Clean Energy Products Chapter Total</b>	\$ -	\$ 5.78	\$ 45.60	\$ 58.00	\$ 52.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 161.30
<b>Multi-Sector Solutions Chapter</b>											
<i>Soft Cost Challenge</i>	\$ -	\$ -	\$ 3.66	\$ 3.66	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 7.32
<i>Technical Services</i>	\$ -	\$ -	\$ 19.30	\$ 13.40	\$ 17.60	\$ 11.30	\$ 12.00	\$ 7.30	\$ 5.77	\$ 4.37	\$ 91.12
<i>Clean Energy AMP Challenge</i>	\$ -	\$ -	\$ 54.50	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 54.50
<i>Clean Energy Siting &amp; Soft Cost Reduction</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Multi-Sector Solutions Chapter Total</b>	\$ -	\$ -	\$ 77.46	\$ 17.06	\$ 17.60	\$ 11.30	\$ 12.00	\$ 7.30	\$ 5.77	\$ 4.37	\$ 152.90
<b>Codes Chapter</b>											
<i>Code to Zero</i>	\$ -	\$ -	\$ -	\$ 220.00	\$ 293.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 513.50
<b>Codes Chapter Total</b>	\$ -	\$ -	\$ -	\$ 220.00	\$ 293.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 513.50
<b>On-Site Power Chapter</b>											
<i>Fuel Cells</i>	\$ -	\$ -	\$ 20.50	\$ 20.50	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 41.00
<b>On-Site Power Chapter Total</b>	\$ -	\$ -	\$ 20.50	\$ 20.50	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 41.00
<b>New Construction Chapter</b>											
<i>New Construction</i>	\$ -	\$ -	\$ 15.60	\$ 66.90	\$ 66.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 149.30
<b>New Construction Chapter Total</b>	\$ -	\$ -	\$ 15.60	\$ 66.90	\$ 66.90	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 149.30
<b>Residential Chapter</b>											
<i>Engaging New Markets</i>	\$ -	\$ -	\$ 0.76	\$ 10.80	\$ 16.60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 28.17
<b>Residential Chapter Total</b>	\$ -	\$ -	\$ 0.76	\$ 10.80	\$ 16.60	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 28.17
<b>Total Market Development</b>	\$ 462.40	\$ 770.60	\$ 1,148.00	\$ 1,189.00	\$ 694.10	\$ 211.10	\$ 204.60	\$ 244.60	\$ 483.70	\$ 695.80	\$ 6,105.00

<b>Innovation and Research</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Grid Modernization Chapter</b>											
<i>DER Interconnection</i>	\$ 3.35	\$ 2.48	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5.83
<i>High Performing Electric Grid</i>	\$ 13.00	\$ 53.00	\$ 59.00	\$ 52.00	\$ 44.00	\$ 44.00	\$ 44.00	\$ -	\$ -	\$ -	\$ 309.00
<i>Next Generation Power Electronics</i>	\$ -	\$ 47.00	\$ 33.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 80.00
<b>Grid Modernization Chapter Total</b>	\$ 16.35	\$ 102.50	\$ 92.00	\$ 52.00	\$ 44.00	\$ 44.00	\$ 44.00	\$ -	\$ -	\$ -	\$ 394.80
<b>Innovation Capacity and Business Development Chapter</b>											
<i>CleanTech Startup Growth</i>	\$ 54.00	\$ 58.50	\$ 76.00	\$ 94.00	\$ 68.90	\$ 60.00	\$ 31.50	\$ -	\$ -	\$ -	\$ 442.90
<i>Manufacturing Corps</i>	\$ -	\$ -	\$ 20.00	\$ 15.00	\$ 25.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 60.00
<i>Novel Business Models and Offerings</i>	\$ -	\$ -	\$ 32.90	\$ 36.60	\$ 47.60	\$ 51.30	\$ -	\$ -	\$ -	\$ -	\$ 168.40
<b>Innovation Capacity and Bus. Dev. Chapter Total</b>	\$ 54.00	\$ 58.50	\$ 128.90	\$ 145.60	\$ 141.50	\$ 111.30	\$ 31.50	\$ -	\$ -	\$ -	\$ 671.30
<b>Building Innovation Chapter</b>											
<i>NextGen HVAC</i>	\$ -	\$ 20.00	\$ 30.00	\$ 25.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 75.00
<b>Building Innovation Chapter Total</b>	\$ -	\$ 20.00	\$ 30.00	\$ 25.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 75.00
<b>Clean Transportation Chapter</b>											
<i>Public Transportation and Electrified Rail</i>	\$ -	\$ -	\$ 8.00	\$ 9.00	\$ 9.00	\$ 8.00	\$ 8.00	\$ -	\$ -	\$ -	\$ 42.00
<i>Electric Vehicles</i>	\$ -	\$ 7.20	\$ 7.50	\$ 6.50	\$ 6.50	\$ 4.00	\$ -	\$ -	\$ -	\$ -	\$ 31.70
<b>Clean Transportation Chapter Total</b>	\$ -	\$ 7.20	\$ 15.50	\$ 15.50	\$ 15.50	\$ 12.00	\$ 8.00	\$ -	\$ -	\$ -	\$ 73.70
<b>Energy-Related Environmental Research Chapter</b>											
<i>Energy-Related Environmental Research</i>	\$ -	\$ 2.65	\$ 2.10	\$ 1.21	\$ 1.04	\$ 0.50	\$ -	\$ -	\$ -	\$ -	\$ 7.50
<b>Energy-Related Environ. Research Chapter Total</b>	\$ -	\$ 2.65	\$ 2.10	\$ 1.21	\$ 1.04	\$ 0.50	\$ -	\$ -	\$ -	\$ -	\$ 7.50
<b>Renewables Optimization Chapter</b>											
<i>Energy Storage Innovations</i>	\$ -	\$ 9.10	\$ 22.40	\$ 18.00	\$ 16.50	\$ 16.50	\$ 16.50	\$ 16.50	\$ 28.90	\$ 20.60	\$ 165.00
<b>Renewables Optimization Chapter Total</b>	\$ -	\$ 9.10	\$ 22.40	\$ 18.00	\$ 16.50	\$ 16.50	\$ 16.50	\$ 16.50	\$ 28.90	\$ 20.60	\$ 165.00
<b>Total Innovation &amp; Research</b>	\$ 70.35	\$ 200.00	\$ 290.90	\$ 257.30	\$ 218.50	\$ 184.30	\$ 100.00	\$ 16.50	\$ 28.90	\$ 20.60	\$ 1,387.00

**Table 12. Market Development and Innovation & Research Participants**

Market Development	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
<b>Resource Acquisition Transition Chapter</b>											
Commercial	53	120	100	67							340
Industrial	78	76	72	72							298
Agriculture	218	285	262								765
Multifamily Market Rate	-	186	-								186
Single Family Market Rate	2,484	3,408	3,408								9,300
Commercial New Construction	45	55	47								147
Low Rise New Construction	2,015	2,803	3,437								8,255
Multifamily New Construction	2,846	3,500	4,200								10,546
Anaerobic Digesters	2	4	4								10
Small Wind	29	50	50								129
Solar Thermal	62	-	-								62
Combined Heat & Power	45	35	30								110
<b>Resource Acquisition Transition Chapter Total</b>	<b>7,877</b>	<b>10,520</b>	<b>11,610</b>	<b>139</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>30,150</b>
<b>Commercial Chapter</b>											
Real Estate Tenant	1	141	186	151	168	188	178	168	168	-	1,349
Energy Management	17	72	231	391	391	110	90	80	80	-	1,462
REV Campus Challenge	63	20	20	17	10	5	5	5	3	2	150
K-12	-	-	200	360	360	360	560	360	360	240	2,800
<b>Commercial Chapter Total</b>	<b>81</b>	<b>233</b>	<b>637</b>	<b>919</b>	<b>929</b>	<b>663</b>	<b>833</b>	<b>613</b>	<b>611</b>	<b>242</b>	<b>5,761</b>
<b>Industrial Chapter</b>											
Continuous Energy Improvement	-	35	44	23	23	19	15	-	-	-	159
<b>Industrial Chapter Total</b>	<b>-</b>	<b>35</b>	<b>44</b>	<b>23</b>	<b>23</b>	<b>19</b>	<b>15</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>159</b>
<b>Communities Chapter</b>											
Clean Energy Communities	-	40	80	51	-	-	-	-	-	-	171
Community Energy Engagement	-	3,355	-	-	-	-	-	-	-	-	3,355
<b>Communities Chapter Total</b>	<b>-</b>	<b>3,395</b>	<b>80</b>	<b>51</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3,526</b>
<b>Large-Scale Renewables Chapter</b>											
Offshore Wind Master Plan	-	-	-	-	-	-	-	-	-	-	-
Offshore Wind Pre-Development Activities	-	-	-	-	-	-	-	-	-	-	-
<b>Large-Scale Renewables Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>REV Technical Assistance Chapter</b>											
REV Connect	-	-	-	-	-	-	-	-	-	-	-
<b>REV Technical Assistance Chapter Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Energy Storage Chapter</b>											
Reducing Barriers to Distributed Deployment	-	45	60	40	20	-	-	-	-	-	165
<b>Energy Storage Chapter Total</b>	<b>-</b>	<b>45</b>	<b>60</b>	<b>40</b>	<b>20</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>165</b>
<b>Clean Transportation Chapter</b>											
Electric Vehicles	-	5,125	11,250	10,500	2,375	-	-	-	-	-	29,250
<b>Clean Transportation Chapter Total</b>	<b>-</b>	<b>5,125</b>	<b>11,250</b>	<b>10,500</b>	<b>2,375</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>29,250</b>
<b>Agriculture Chapter</b>											
2030 GLASE	-	5	10	5	5	-	-	-	-	-	25
Advancing Agricultural Energy Technologies	-	-	-	5	5	5	5	-	-	-	20
<b>Agriculture Chapter Total</b>	<b>-</b>	<b>5</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>45</b>

<b>Low- to Moderate-Income Chapter</b>											
<i>RetrofitNY</i>	-	170	170	200	500	1,000	10,000	20,000	30,000	37,960	100,000
<i>REVitalize</i>	-	5	-	-	-	-	-	-	-	-	5
<i>Low-Income Forum on Energy</i>	187	763	778	794	810	826	842	859	876	894	7,629
<i>Healthy Homes Feasibility Study</i>	-	-	-	-	-	-	-	-	-	-	-
<i>LMI Single Family</i>	9,520	13,210	13,211	9,755	9,755	9,755	-	-	-	-	65,206
<i>LMI Multifamily</i>	835	3,251	7,708	8,682	9,494	9,494	-	-	-	-	39,464
<i>Low Income Community Solar</i>	-	-	3,000	4,000	3,000	-	-	-	-	-	10,000
<b>Low- to Moderate-Income Chapter Total</b>	10,540	17,400	24,870	23,430	23,560	21,080	10,840	20,860	30,880	38,850	222,300
<b>Workforce Development and Training Chapter</b>											
<i>Industry Partnerships</i>	-	15	18	9	-	-	-	-	-	-	42
<b>Workforce Dev. and Training Chapter Total</b>	-	15	18	9	-	-	-	-	-	-	42
<b>Renewable Heating &amp; Cooling Chapter</b>											
<i>Heat Pumps and Solar Thermal</i>	-	155	892	828	804	809	-	-	-	-	3,487
<i>Renewable Heat NY</i>	-	370	426	435	344	54	-	-	-	-	1,629
<b>Renewable Heating &amp; Cooling Chapter Total</b>	-	525	1,318	1,263	1,148	863	-	-	-	-	5,116
<b>Clean Energy Products Chapter</b>											
<i>Underutilized Product Support</i>	-	550	4,790	4,900	3,380	-	-	-	-	-	13,620
<b>Clean Energy Products Chapter Total</b>	-	550	4,790	4,900	3,380	-	-	-	-	-	13,620
<b>Multi-Sector Solutions Chapter</b>											
<i>Soft Cost Challenge</i>	-	10	10	-	-	-	-	-	-	-	20
<i>Technical Services</i>	-	-	15	170	240	230	230	230	190	140	1,445
<i>Clean Energy AMP Challenge</i>	-	-	2	-	-	-	-	-	-	-	2
<i>Clean Energy Siting &amp; Soft Cost Reduction</i>	-	-	60	60	40	-	-	-	-	-	160
<b>Multi-Sector Solutions Chapter Total</b>	-	10	87	230	280	230	230	230	190	140	1,627
<b>Codes Chapter</b>											
<i>Code to Zero</i>	-	250	1,500	1,503	1,503	1,500	1,500	-	-	-	7,756
<b>Codes Chapter Total</b>	-	250	1,500	1,503	1,503	1,500	1,500	-	-	-	7,756
<b>On-Site Power Chapter</b>											
<i>Fuel Cells</i>	-	-	14	13	-	-	-	-	-	-	27
<b>On-Site Power Chapter Total</b>	-	-	14	13	-	-	-	-	-	-	27
<b>New Construction Chapter</b>											
<i>New Construction</i>	-	-	1,474	8,509	8,509	-	-	-	-	-	18,492
<b>New Construction Chapter Total</b>	-	-	1,474	8,509	8,509	-	-	-	-	-	18,490
<b>Residential Chapter</b>											
<i>Engaging New Markets</i>	-	-	518	4,320	6,764	-	-	-	-	-	11,602
<b>Residential Chapter Total</b>	-	-	518	4,320	6,764	-	-	-	-	-	11,600
<b>Total Market Development</b>	18,500	38,110	58,280	55,860	48,500	24,360	13,420	21,700	31,680	39,230	349,600

<b>Innovation and Research</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Grid Modernization Chapter</b>											
<i>DER Interconnection</i>	3	5	5	-	-	-	-	-	-	-	13
<i>High Performing Electric Grid</i>	6	9	9	7	11	11	11	-	-	-	64
<i>Next Generation Power Electronics</i>	-	4	4	4	-	-	-	-	-	-	12
<b>Grid Modernization Chapter Total</b>	<b>9</b>	<b>18</b>	<b>18</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>89</b>
<b>Innovation Capacity and Business Development Chapter</b>											
<i>CleanTech Startup Growth</i>	32	92	586	739	865	921	1,072	-	-	-	4,307
<i>Manufacturing Corps</i>	-	-	100	150	200	-	-	-	-	-	450
<i>Novel Business Models and Offerings</i>	-	-	9	6	9	9	-	-	-	-	33
<b>Innovation Capacity and Bus. Dev. Chapter Total</b>	<b>32</b>	<b>92</b>	<b>695</b>	<b>895</b>	<b>1,074</b>	<b>930</b>	<b>1,072</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>4,790</b>
<b>Building Innovation Chapter</b>											
<i>NextGen HVAC</i>	-	5	8	7	5	-	-	-	-	-	25
<b>Building Innovation Chapter Total</b>	<b>-</b>	<b>5</b>	<b>8</b>	<b>7</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>25</b>
<b>Clean Transportation Chapter</b>											
<i>Public Transportation and Electrified Rail</i>	-	-	9	8	6	5	5	-	-	-	33
<i>Electric Vehicles</i>	-	8	8	7	6	4	-	-	-	-	33
<b>Clean Transportation Chapter Total</b>	<b>-</b>	<b>8</b>	<b>17</b>	<b>15</b>	<b>12</b>	<b>9</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>66</b>
<b>Energy-Related Environmental Research Chapter</b>											
<i>Energy-Related Environmental Research</i>	-	35	28	16	14	7	-	-	-	-	100
<b>Energy-Related Environ. Research Chapter Total</b>	<b>-</b>	<b>35</b>	<b>28</b>	<b>16</b>	<b>14</b>	<b>7</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>100</b>
<b>Renewables Optimization Chapter</b>											
<i>Energy Storage Innovations</i>	-	8	18	14	13	13	13	13	13	13	118
<b>Renewables Optimization Chapter Total</b>	<b>-</b>	<b>8</b>	<b>18</b>	<b>14</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>118</b>
<b>Total Innovation &amp; Research</b>	<b>41</b>	<b>166</b>	<b>784</b>	<b>958</b>	<b>1,129</b>	<b>970</b>	<b>1,101</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>5,188</b>

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Resource Acquisition Transition Chapter

**Submitted by the New York State Energy Research and Development  
Authority**

Revised July 17, 2017



Clean Energy Fund Investment Plan: Resource Acquisition Transition Chapter		
Revision Date	Description of Changes	Revision on Page(s)
February 22, 2016	Original Issue	Original Issue
December 30, 2016	<p><u>Industrial</u>: Revised table 2.2.7 to correct errors in Customer Bill Savings</p> <p><u>Anaerobic Digester</u>: Revised table 2.11.7 to correct errors in Customer Bill Savings</p> <p><u>Solar Thermal</u>: Revised table 2.14.7 to correct errors in Customer Bill Savings</p>	Multiple
June 23, 2017	<p><u>Table 1 (TRC for Energy Efficiency Programs)</u> has been revised to show updated benefit cost ratios, reflecting budget and benefit changes described below.</p> <p><u>Commercial</u>: The Commercial Implementation Assistance Program has been closed, effective April 2017. The Flexible Technical Assistance Program has been extended through 2019, with funding added for the additional year. Text and tables 2.1.6, 2.1.7, and 2.1.8 have been updated to reflect these revisions, 2016 actual values, and a shift in timing of the overall budget and benefits.</p> <p><u>Industrial</u>: Program has been extended through 2019, with funding added for the additional year. Total participant values have been adjusted downward based on applications received since the program launched. Text and tables 2.2.6, 2.2.7, and 2.2.8 have been revised to reflect this revision, 2016 actual values, and a shift in timing of the overall budget and benefits.</p> <p><u>Agriculture</u>: Total MMBTU savings have been reduced due to the incorporation of additional data from the Agriculture Energy Audit program into benefit modeling. The program has also been extended through 2018, with no change to the overall funding level. Text and tables 2.3.6, 2.3.7, and 2.3.8 have been revised to reflect these revisions, 2016 actual values, and a shift in timing of the overall budget and benefits.</p> <p><u>Multifamily Market Rate</u>: This program is being closed as of July 2017. The text and Tables.4.6, 2.4.7, and 2.4.8 have been revised to reflect 2017 actual values and program activity.</p> <p><u>Single Family Market Rate</u>: The initiative has been extended through 2018, and the budget has been increased to provide additional to support improved data analysis, performance management, technical assistance, and marketing and outreach. Text and tables 2.5.6, 2.5.7, and 2.5.8 have been revised to reflect these revisions, 2016 actual values, and a shift in timing of the overall budget and benefits.</p> <p><u>LMI Single Family</u>: This initiative has been moved to the LMI chapter.</p> <p><u>LMI Multifamily</u>: This initiative has been moved to the LMI chapter.</p>	Multiple

	<p><u>Commercial New Construction:</u> Program has been extended through 2018 with funding added for the additional year. Changes have been made to encourage deep energy savings and zero net energy projects, removal of the participation threshold to offer technical support to smaller conventional projects, and providing support for projects following an Integrated Project Delivery protocol. Text and tables 2.8.6, 2.8.7, and 2.8.8 have been revised to reflect these revisions, 2016 actual values, and a shift in timing of the overall budget and benefits.</p> <p><u>Low-Rise Residential New Construction:</u> Program has been extended through 2018 with funding added for the additional year. Incentives for cooperative advertising, first plan review, and first rating incentives will no longer be offered. The revised 2017 and additional 2018 savings are now calculated based on a baseline of NYS Energy Conservation Construction Code (ECCC) of NYS adopted in October 2016 (which was not released when the original metrics were calculated) as the baseline reference. Text and tables 2.9.6, 2.9.7, and 2.9.8 have been revised to reflect these revisions, 2016 actual values, and a shift in timing of the overall budget and benefits.</p> <p><u>Multifamily New Construction:</u> Program has been extended through 2018 with funding added for the additional year. Revised program to adjust per project incentive caps and the per dwelling unit incentives to align with the Low-rise Residential New Construction Program. The revised 2017 and additional 2018 savings are now calculated based on a baseline of NYS Energy Conservation Construction Code (ECCC) of NYS adopted in October 2016 (which was not released when the original metrics were calculated) as the baseline reference. Text and tables 2.10.6, 2.10.7, and 2.10.8 have been revised to reflect these revisions, 2016 actual values, and a shift in timing of the overall budget and benefits.</p> <p><u>Anaerobic Digesters:</u> Program has been revised to shift away from standard offer incentives to a competitive selection process. Text and table 2.11.7 have been updated to reflect this revision.</p> <p><u>Fuel Cells:</u> Program never launched and has been removed from the chapter in this revision.</p> <p><u>Small Wind:</u> Total projected benefits have been reduced to reflect a smaller project size than was estimated in the original calculation of benefits. Text and table 2.13.7 have been revised to reflect this revision and 2016 actual values.</p> <p><u>Solar Thermal:</u> Tables 2.14.6 and 2.14.7 have been revised to reflect 2016 actual values.</p>	
July 17, 2017	<p><u>Multifamily Market Rate:</u> This program will be closed thirty days after approval of this revised chapter. The text and Tables 2.4.6, 2.4.7, and 2.4.8 have been revised to reflect 2017 actual values and program activity, as well as the necessary budget to cover the thirty-day notice period.</p>	Multiple

	<u>CHP:</u> Table 2.15.7 has been updated to correct the 2016 private investment value.	
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# 1 Introduction

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Pursuant to the Order Authorizing the Clean Energy Fund Framework issued by the New York State Public Service Commission (the “Commission”) on January 21, 2016 (the “CEF Order”), the New York State Energy Research and Development Authority (NYSERDA) files this Clean Energy Fund (CEF) Investment Plan.<sup>1</sup>

The CEF is the next evolution of state clean energy programs and is part of a strategy to build a cleaner, more resilient, and affordable energy infrastructure for New York State. The CEF is a key pillar of Governor Andrew M. Cuomo’s Reforming the Energy Vision (REV) strategy, which refocuses NYSERDA’s strategic priorities in the energy marketplace through the deployment of new and redesigned programs and initiatives. While the REV Regulatory Proceeding, a complementary REV pillar, redirects the market by creating rules that facilitate and reward investment in a cleaner, more resilient and affordable energy system, the CEF will engage with the many market actors so they are best able to provide the clean, resilient and bill-reducing technologies that consumers will be able to choose through a REV-enabled marketplace. These two key pillars, alongside the third - New York Power Authority’s (NYPA’s) ‘lead by example’ approach to clean energy expansion- will work together to transition to the new clean energy marketplace that REV seeks to enable.

The CEF will serve as an integral component in advancing clean energy goals, as stated in the 2015 New York State Energy Plan<sup>2</sup> (the “2015 State Energy Plan”):

- Achieving 40% greenhouse gas (GHG) emissions reductions by 2030 in the energy sector;
- Meeting 50% of electricity demand by 2030 with renewable energy; and
- Realizing 600 TBtu of energy efficiency by 2030.

The CEF initiatives will enable NYSERDA to work with consumers and market participants to contribute to these statewide goals by managing the CEF to advance four primary outcomes:

- Reduce GHG emissions
- Reduce customer energy bills
- Increase statewide deployment of energy efficiency and renewable energy
- Mobilize private investment in clean energy technologies and solutions

The CEF’s success will be apparent in the appearance of: (1) a more dynamic “supply side” of clean energy service providers, including energy service companies, financing institutions, product suppliers, and contractors/installers who develop new models (or improve existing models) for delivering and financing energy services and solutions to consumers, and (2) a better informed “demand side” customer base that seeks innovative energy services and effective energy solutions,

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<sup>1</sup> Case 14-M-0094 – Proceeding on Motion of the Commission to Consider a Clean Energy Fund. *Order Authorizing the Clean Energy Fund Framework*, issued January 21, 2016.

<sup>2</sup> See <http://energyplan.ny.gov/>.

which collectively catalyze flourishing clean energy markets leading to clean energy investments at greater scale and impact.

This Investment Plan covers only the Market Development and Innovation & Research portfolios of the CEF; NY-Sun and New York Green Bank (NYGB) activities will continue to be described within their individual operating plan and business plan, respectively.<sup>3</sup>

The Market Development portfolio will focus on facilitating the market for on-site, behind-the-meter clean energy solutions including energy efficiency, distributed generation, renewable thermal, and energy storage. The Market Development portfolio will also include activities to facilitate Large-Scale Renewables (LSRs), in addition to any role(s) or activities NYSERDA may assume under successor programs to the RPS Main Tier program, which has historically provided direct individual project support.

A core premise of the Market Development portfolio is the recognition that, in the absence of a fully functioning market, initiatives are needed to spur solutions and innovations that accelerate the transition to market mechanisms. NYSERDA's new approach recognizes that different clean energy solutions face different barriers. For some clean energy technologies, high hard costs (e.g., manufacturing and equipment costs) lead to poor economics that dampen demand. For other clean energy technologies, high soft costs (e.g., customer acquisition, permitting, and financing costs) stand in the way of greater scale. Many other solutions are cost competitive today, yet remain under-deployed. This implies that the main barrier to increased penetration of clean energy may not be wholly financial, and indicates that direct grants and incentives may not always be the most effective means to spur adoption when solely aimed at overcoming financial barriers. Non-monetary barriers can include, but are not limited to:

- Burdensome permitting and local approval processes;
- Limited and uneven consumer awareness;
- Lack of trust in technology performance by customers and financial institutions;
- Inertia, capacity and implementation constraints; and
- Limited access to financing.

These barriers are unresolved, receive insufficient focus from other market actors, increase soft costs, impeded self-sustaining markets, and are high-potential opportunities to accelerate adoption if resolved.

The Market Development portfolio will address the diverse barriers to clean energy deployment. Bridge incentives, including those identified in the Resource Acquisition Transition Chapter, will be deployed alongside new techniques that spur self-sustaining clean energy markets and seek to mobilize capital to create the greatest opportunity for market penetration of energy efficiency and

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<sup>3</sup> See CEF Order at page 26.

distributed generation. Fundamentally, Market Development initiatives will employ the following strategies to reduce soft costs and other non-monetary barriers:

- **Provide information, data, and education** for customers and service providers to raise awareness and demand, reduce customer acquisition costs, train clean energy workforces, and improve customer confidence.
- **Offer technical assistance**, and provide **standardized and simple, robust tools** for clean energy partners, including service providers, contractors, and energy-decision makers such as code officials and local government leaders to lower soft costs and address implementation constraints.
- **Provide quality assurance** for proposed clean energy solutions and deliver performance validation, monitoring, and verification of new clean energy technologies to improve customer confidence.
- **Pilot, demonstrate, and replicate** new technologies and business models to advance innovative, scalable, and cost-effective solutions.
- **Enable aggregation** of different customer types (e.g. residences, municipalities, businesses, real estate portfolios) to reduce costs through economies of scale and leverage peer pressure to break through inertia.

The Innovation and Research portfolio focuses on Technology and Business Innovation with a goal of accelerating and catalyzing the most valuable innovations that will create low-GHG solutions, system and customer benefits, and a vibrant clean energy industry in New York. The Innovation and Research portfolio will also support energy-related environmental research that provides objective information on the environmental impacts of energy technologies, helping to inform policy making and identify strategies to mitigate environmental impacts.

In delivering the Technology and Business Innovation programs, NYSERDA will be strategic, focused and capital efficient, addressing pressing needs and opportunities in New York. Investments will complement the REV regulatory proceeding by advancing new clean energy solutions for a distributed energy system. The programs will address key points where commercialization can stall and the private sector is less likely to fill gaps, paying careful attention to the path to the market for new innovations.

## Structure of this Investment Plan

This Investment Plan employs a chapter approach in which the portfolio is progressively built over the initial year of the CEF. Individual chapters are appended/updated and filed with the Commission as NYSERDA is prepared to initiate the activities within them.

The Budgets Accounting and Benefits Chapter provides an up to date compilation of budgets and benefits for all initiatives contained within the Investment Plan. A Resource Acquisition Transition chapter details program offerings pertaining to continued operation and transitioning of programs from legacy portfolios. A Market Characterization and Design chapter will outline market research and characterization activities that will be necessary for NYSERDA to engage in to adequately

understand target markets and tailor offerings to them. A Low-to-Moderate Income (LMI) chapter will outline offerings and activities developed specifically for LMI customers. An Energy-Related Environmental Research chapter will identify research activities to provide objective information on the environmental impacts of energy technologies. Multiple individual Market Transformation Intervention chapters within the Market Development and Innovation & Research portfolios will describe new initiatives that NYSERDA will offer to target particular segments of the market. An Innovation Chapter will outline strategies to advance technology and business innovation in strategic priority areas.

## 2 Resource Acquisition Transition

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This Resource Acquisition Transition chapter provides a description of program offerings within the CEF pertaining to continued operation and transitioning of programs from legacy portfolios. Sections 2.1 through 2.10 include transition programs from the Energy Efficiency Portfolio Standard (EEPS), sections 2.11 through 2.14 include transition programs from the Renewable Portfolio Standard (RPS) Customer-Sited Tier (CST), and section 2.15 includes the transition of the CHP program from the Technology & Market Development (T&MD) portfolio.

In accordance with the CEF Order, a program level benefit cost analysis (BCA) using the Total Resource Cost (TRC) approach was performed for each energy efficiency program for informational purposes and is summarized in Table 1 and presented within. An analysis of those energy efficiency programs in aggregate resulted in a portfolio level TRC of 1.9, which meets the Commission’s requirement of a portfolio level TRC greater than 1.0.

**Table 1. TRC for Energy Efficiency Programs<sup>4</sup>**

	<b>2016 - 2019</b>
<b>Commercial</b>	
Benefits (million 2015\$)	\$187.71
Costs (million 2015\$)	\$78.30
Benefit Cost Ratio	2.4
<b>Industrial</b>	
Benefits (million 2015\$)	\$608.85
Costs (million 2015\$)	\$172.65
Benefit Cost Ratio	3.5
<b>Agriculture</b>	
Benefits (million 2015\$)	\$9.70
Costs (million 2015\$)	\$9.34
Benefit Cost Ratio	1.0
<b>Multifamily Market Rate</b>	
Benefits (million 2015\$)	\$1.30
Costs (million 2015\$)	\$0.41
Benefit Cost Ratio	3.2
<b>Single Family Market Rate</b>	
Benefits (million 2015\$)	\$44.81
Costs (million 2015\$)	\$56.83
Benefit Cost Ratio	0.8
<b>Commercial New Construction</b>	
Benefits (million 2015\$)	\$82.46
Costs (million 2015\$)	\$107.85
Benefit Cost Ratio	0.8

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<sup>4</sup> Costs defined as all costs associated with the energy efficiency program, including program specific costs, Administration, Cost Recovery Fee (CRF), and evaluation, measurement, and verification, as well as customer costs.



<b>Low Rise New Construction</b>	
Benefits (million 2015\$)	\$30.13
Costs (million 2015\$)	\$39.08
Benefit Cost Ratio	0.8
<b>Multifamily New Construction</b>	
Benefits (million 2015\$)	\$44.58
Costs (million 2015\$)	\$47.18
Benefit Cost Ratio	0.9
<b>Total Energy Efficiency Portfolio</b>	
Total Benefits (million 2015\$)	\$1,009.55
Total Costs (million 2015\$)	\$511.63
Portfolio Benefit Cost Ratio	2.0

## 2.1 Commercial

The Flexible Technical Assistance Program (FlexTech) component of the Resource Acquisition Transition has been extended through 2019. This extension is a result of market feedback uncovering a continued need for reliable, objective technical assessments of clean energy options for facilities. In addition, local utilities have discontinued or reduced their study assistance programs and are coordinating with NYSERDA to direct the marketplace to this Program.

The Commercial Implementation Assistance component of the Resource Acquisition Transition plan did not meet its 2016 projected targets. The Commercial Implementation Assistance Program was intended to provide the marketplace with a transition from NYSERDA's previous Existing Facilities Program to local utility incentive programs funding only items that the local utility programs could not. As evidenced by the lack of participation in this Program and increased participation in local utility programs, vendors and customers had already made this transition. Program revisions made in Fall 2016 also did not result in increased participation. As a result, the Program closed at the end of April 2017. The budgets and benefits in sections 2.1.6 and 2.1.7 have been updated to reflect actual program performance.

### 2.1.1 Program Description

The Commercial Facilities Programs aimed to provide a statewide commercial offering for existing buildings that increased market uptake of high-impact, comprehensive projects, and emerging clean energy technologies and systems in the commercial sector through support for credible and objective technical assistance and installation of projects aiming to achieve deep energy savings.

Flexible Technical Assistance (FlexTech) will offer cost-sharing of eligible technical assistance study costs. This program is expected to run through the end of 2019 or until all funds are committed. The cost share is typically 50% with a per project cap specified in the program offering. This program is a continuation of the current FlexTech Program with modifications on project caps and eligibility updates enacted in Q3 2015.

Commercial Implementation Assistance offered cost-sharing up to 50% or \$150,000 per project for all commercial/institutional customers who applied for utility incentives for eligible energy efficiency measures and needed additional financial support to implement more comprehensive savings projects than their utility supports. This program ran through April 2017. This effort replaced the previous Existing Facilities Program at NYSERDA.

#### ***Program Delivery***

Applicants include both eligible customers and service providers on behalf of eligible customers. Service providers have historically represented the majority of applicants and this is expected to continue. Applicants will submit required documentation to be reviewed by NYSERDA to determine eligibility of the project. Each project will receive a purchase order prior to execution of work. Cost-sharing will be administered by NYSERDA after proof of project completion.

This commercial offering will be open-enrollment. Funding will be provided on a first-come first-served basis.

### ***Personnel and Roles***

- **NYSERDA staff:** Program management, project eligibility review, general project management, and project payments.
- **Third party technical reviewers:** Technical documentation review, any measurement and verification (M&V) needed for projects.

#### 2.1.2 Target Market & Customer/Project Eligibility Rules

### ***Target Market***

The target market for the FlexTech Program includes all commercial/ institutional customers who need additional information to:

- Explore an advanced technology or system
- Create a long-term energy plan for their facility, and/or
- Develop diverse and/or deep energy savings projects

The target market for the Commercial Implementation Assistance Program included all commercial/institutional customers who applied for available utility incentives for eligible energy efficiency measures and were pursuing diverse and/or deeper energy savings projects with additional project elements not eligible to be funded through the utility program that achieve incremental energy savings.

### ***Eligibility***

Eligible participants include New York State commercial facilities which include but are not limited to: office buildings, retail, colleges and universities, health care facilities, state and local governments, not-for-profit and private institutions, and public and private K-12 schools who are New York State electricity distribution customer of a participating utility company who pay into the System Benefits Charge (SBC). Fuel switching is not eligible. On-site and renewable generation are not eligible for installation incentives through this offering. Inquiries and applications regarding these types of projects will be referred to other programs as appropriate.

The following eligibility requirements applied to the Commercial Implementation Assistance Program:

- Projects that were eligible for funding through their electric or gas distribution utility program were required to consult the utility program prior to application to this Program. NYSERDA worked in close coordination with the respective utility to review the project details and avoid overlap.
- Project elements listed on previous NYSERDA Pre-Qualified Measure Worksheets were not eligible even if a utility didn't offer a rebate. These worksheets represented proven

technologies that are highly cost effective without an incentive (e.g., Energy STAR LED exit sign, T5 and high performance T8 systems, motors meeting or exceeding the NEMA premium nominal efficiencies, high efficiency chillers). These worksheets were available to potential applicants via the NYSERDA website and upon request.

- Projects needed a simple payback period that was  $\geq 4$  years AND  $\leq 14$  years (greater than four years, AND less than fourteen years, *excluding* NYSERDA incentives). Please see the equation below for reference:

$$SPB = \frac{PC}{ACS}$$

**SPB** = Simple Payback  
**PC** = Project Cost  
**ACS** = Annual Cost Savings

- New facilities, those that have undergone substantial renovations, or change of use, had to be occupied for more than one year to be eligible for this Program. Major renovation projects were eligible under the NYSERDA Commercial New Construction Program.

### 2.1.3 Incentives/Services Offered

The existing FlexTech Program will be extended past its current end date of February 29, 2016 to December 31, 2019. The Program will offer cost-sharing, typically at 50% per technical assistance study or project. The program will run through the end of 2019 or until all funds are committed, whichever comes first. The previous Program provided cost-sharing up to 50% or \$500,000 per technical assistance study or project, whichever was lower. This revised program reduced the cost-share cap to \$250,000 in 2016. This cost-share cap may be altered based on funding availability and market feedback and will be communicated through the program offering.

The Commercial Implementation Assistance Program launched in March 2016. The Program offered cost-sharing, up to 50% or \$150,000 per project for all commercial/institutional customers who applied for utility incentives for eligible energy efficiency measures and needed additional financial support to implement more comprehensive savings projects than their utility supports. The program ran through April 2017. The retired Existing Facilities Program incentives are shown in Table 2. Program revisions made in 2015 previously retired pre-qualified, fluorescent lighting, and gas efficiency measure incentives and required a minimum of two energy conservation measures, with no single measure allowed to be responsible for more than 75% of energy savings. These changes removed highly cost-effective eligible measures.

Table 2. Incentives for the Retired Existing Facilities Program

<b>Performance-Based Electric Efficiency Incentives</b>		
<b>Tier</b>	<b>Description</b>	<b>Incentive Rate</b>
1	The electric efficiency improvements cause annual kWh reductions less than or equal to 30% of current annual usage at the Facility.	\$0.10/kWh
2	The electric efficiency improvements cause annual kWh reductions greater than 30% but less than or equal to 50% of current annual usage at the Facility.	\$0.12/kWh
3	The electric efficiency improvements cause annual kWh reductions greater than 50% of current annual usage at the Facility.	\$0.15/kWh

Applicants may not obtain financial support for the same energy efficiency measure through other NYSERDA programs or from programs offered by their local utility. No single entity (e.g. service provider, building owner, etc.) can receive or apply for more than 5% of total available incentives. With the requested budget herein, this would represent a \$1,000,000 cap in the FlexTech offer and a \$550,000 cap in the Commercial Implementation Assistance Program. The entirety of the customer’s portion of the cost-share must be a cash contribution. In-kind contributions of any type are not allowed as matching funds.

#### 2.1.4 Performance Management

Overall, NYSERDA will regularly review program participation and project performance to determine whether changes in incentives, caps or eligible projects are needed to improve efficacy of program implementation.

For the FlexTech Program, NYSERDA Project Managers review all proposed scopes of work prior to approval to ensure eligibility. NYSERDA contracted Technical Reviewers review completed reports to ensure completion of scope of work and quality of recommendations.

For the Commercial Implementation Assistance Program, NYSERDA Project Managers and NYSERDA contracted Technical Reviewers reviewed application materials prior to approval to ensure eligibility, overlap avoidance and quality of each proposed project. The NYSERDA contracted Technical Reviewer reviewed estimated energy savings and confirmed project installation. Across the program, a sample of participants with large potential energy savings were subject to NYSERDA inspection, data collection, and M&V. The size of the sample was determined based on type of project proposals received.

Metrics associated with energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting. For FlexTech, metrics have been initially estimated and estimated impacts will be reported based on a historical NYSERDA FlexTech adoption rate of 65%.

For the FlexTech Program, independent evaluation efforts will focus on determining the actual adoption rate of recommended measures and the associated energy savings and other benefits. The actual adoption rate will be used to adjust reported values. Methods will include surveys and may

also include site visits of a sample of program participants. Evaluation surveys will also inquire whether adoption was supported by utility incentive programs.

For the Commercial Implementation Assistance Program, an independent evaluation effort will review data from program site inspections, data collection and M&V to verify energy benefits as needed. Additional impact evaluation work, such as verification site visits, metering and monitoring, will only occur as needed to verify energy and other benefits.

To draw a sample and conduct an analysis that is representative and robust, evaluation measurement and verification (EM&V) has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

### 2.1.5 Relationship to Utility Programs

The FlexTech Program provides technical assistance services across the state to eligible entities and works alongside utility technical assistance programs. Participants can apply to utility implementation programs for installation funds.

The Commercial Implementation Assistance Program worked alongside proposed utility programs/rebates to support: (1) project elements that are not eligible for utility incentives but that offer incremental energy/GHG emission reduction savings; and (2) deeper energy savings additive to what utilities are supporting.

Projects that are eligible for funding through their electric distribution utility program should apply to the utility program prior to application to this Program. NYSERDA will work in close collaboration with the respective utility to review the project eligibility to offer the most effective incentive package. Upon applying to the Program, the Applicant will authorize the NYSERDA and its designated representatives to access any utility program application pertaining to the facility and engage in conversations with the utility for the purpose of discussing and confirming project eligibility. Eligible projects will vary depending on the specific project element's potential energy savings and costs and the customer's utility territory program offerings. NYSERDA incentives will not be provided for project elements that utility incentives support.

### 2.1.6 Budgets & Expenditures<sup>5,6</sup>

Budget		2016	2017	2018	2019	Total
FlexTech	Incentives & Services	\$1,800,000	\$6,100,000	\$6,100,000	\$6,000,000	\$20,000,000
	Program Implementation	\$640,000	\$790,000	\$790,000	\$780,000	\$3,000,000
	Sub-Total	\$2,440,000	\$6,890,000	\$6,890,000	\$6,780,000	\$23,000,000
Commercial Implementation Assistance	Incentives & Services	-	\$3,000,000	-	-	\$3,000,000
	Program Implementation	\$32,500	\$360,000	-	-	\$392,500
	Sub-Total	\$32,500	\$3,360,000	-	-	\$3,392,500
Total		\$2,472,500	\$10,250,000	\$6,890,000	\$6,780,000	\$26,392,500

Expenditures	2016	2017	2018	2019	2020	2021	2022
Total	1%	10%	20%	22%	27%	15%	5%

### 2.1.7 Performance Metrics<sup>7</sup>

Primary Metrics <sup>8</sup>		2016	2017	2018	2019	TOTAL
Energy Efficiency	MWh Annual	7,500	37,100	33,000	32,000	109,600
	MWh Lifetime	124,000	612,000	545,000	528,000	1,809,000
	MMBtu Annual	61,000	339,000	290,000	290,000	979,500
	MMBtu Lifetime	1,000,000	5,590,000	4,790,000	4,790,000	16,170,000
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		7,460	39,000	34,000	33,700	114,200
CO2e Emission Reduction (metric tons) Lifetime		123,000	647,000	565,000	556,000	1,891,000

<sup>5</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>6</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>7</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life for electric and 18-year measure life for heating.

<sup>8</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

Customer Bill Savings Annual (\$ million)	\$1.62	\$8.41	\$7.37	\$7.23	\$24.63
Customer Bill Savings Lifetime (\$ million)	\$26.80	\$139.00	\$122.00	\$119.00	\$406.80
Private Investment (\$ million)	\$7.20	\$36.40	\$24.40	\$24.00	\$92.00

Additional Performance Tracking Metrics		2016	2017	2018	2019	Total
Participants	Technical Assistance	53	100	100	67	320
	Implementation Assistance	-	20	-	-	20
	Total	53	120	100	67	340

### 2.1.8 Benefit Cost Analysis

The BCA summarized in the table below represents a total resource cost test, consistent with the benefit cost analysis framework described in the January 21, 2016 Order.<sup>9</sup> The benefit estimate includes avoided energy (electricity, natural gas, and oil), generation capacity, distribution capacity, and social cost of carbon.<sup>10</sup> Costs are defined as all costs associated with the energy efficiency program, including program specific costs, Administration, Cost Recovery Fee (CRF), and evaluation, measurement, and verification, as well as customer costs. The analysis calculated the following benefit cost ratios:

	2016 - 2018
<b>Commercial</b>	
Benefits (million 2015\$)	\$187.71
Costs (million 2015\$)	\$78.30
Benefit Cost Ratio	2.4

Consistent with the CEF, NYSERDA intends to offer this commercial transition program in a fuel neutral manner, offering cost-sharing to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State's clean energy goals. Offering the

<sup>9</sup>Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision. Order Establishing the Benefit Cost Analysis Framework. Issued and Effective January 21, 2016.

<sup>10</sup>The social cost of carbon is an estimate of the monetized damages to global society associated with an incremental increase in carbon emissions in a given year. It is intended to include changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change, etc.



program on a fuel neutral basis will allow us to achieve a ton of carbon savings at a cost of \$230, compared to a cost of \$420 in an electric only scenario.<sup>11</sup>

## 2.2 Industrial

The Industrial Resource Acquisition Transition Program did not meet its 2016 projected targets. Market uptake for the new industrial clean energy initiatives is progressing, but at a slower pace than anticipated, signaling the need to extend this strategy. The initiative has been revised to add an additional year of incentive funding (2019) and the total number of participants has been reduced to consider the number of applications and project sizes the program has seen so far. This will allow for continuity and minimal disruption to the sector stakeholders and market actors while delivering outreach and education on new clean energy offerings, continuing coordination with utilities, and launching additional industrial initiatives. The values in sections 2.2.6 and 2.2.7 have been updated to reflect 2016 actuals, as well as updating the timing for the overall budget and performance metrics.

### 2.2.1 Program Description

The Industrial Transition program offering provides technical and financial support to assist industrial and data center facilities with process improvement projects to help link energy and their core mission.

Industrial and Process Efficiency (IPE) Program offers performance-based incentives to manufacturers and data centers implementing cost effective process efficiency improvements IPE's goal is to help manufacturers and data centers increase product output and improve data processing as efficiently as possible.

FlexTech for manufacturers and data centers offers cost-sharing of eligible technical assistance study costs that evaluate the energy savings associated with potential process improvements.

This is a continuation of the current IPE and FlexTech Programs through the end of 2019, or until all funds are committed. Additional initiatives to support the Industrial and Data Center sectors will be available in 2019 and beyond.

#### ***Program Delivery***

Applicants will submit required documentation to be reviewed by NYSERDA to determine eligibility of the project. Each project will receive a purchase order upon approval. Installation is completed by firms/ vendors that the customer retains on their own. Technical Review is conducted by NYSERDA

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<sup>11</sup>To determine the cost-effectiveness, it was assumed all program incentives would achieve MWh savings in an electric-only scenario. In a fuel-neutral scenario some program funds achieve MMBtu savings and some achieve MWh. The cost to achieve the MWh savings remains the same as there is adequate demand for electric only projects.

contracted Technical Reviewers. Cost-sharing or incentives will be administered by NYSERDA after proof of project completion and collection of final deliverables.

The Industrial Transition offerings will be open-enrollment. Applications will be accepted on a first-come, first-served basis dependent on funding availability.

### ***Personnel and Roles***

- **NYSERDA staff:** Program management, key account management, project eligibility review, general project management, and project payments
- **Third party technical reviewers:** Technical documentation analysis and review, and measurement and verification (M&V) as needed for projects
- **Outreach contractors:** Program outreach, lead development, application assistance, key account management

#### 2.2.2 Target Market & Customer/Project Eligibility Rules

##### ***Target Market***

The IPE and FlexTech Programs are available to the manufacturing sector in New York State and targets key industries such as: chemicals and pharmaceuticals; primary metals, non-metallic minerals; pulp and paper; automotive; computers and electronics; food processing; and forest products. It includes manufacturing facilities, or support operations such as warehousing and distribution sites. Mining and extraction, as well as water and wastewater, are also included. Data centers are eligible under the IPE and FlexTech Programs, and are found in nearly every sector.<sup>12</sup>

The IPE Program offering focuses on projects that improve manufacturing process productivity and data center efficiency by offering capital incentives and technical assistance while recognizing the importance of sustaining reliability and maximizing uptime.

The FlexTech Program supports manufacturing and data center facilities that need additional information to:

- Explore an advanced technology or process
- Create a long-term energy plan for their facility, and/or
- Develop diverse and/or deep energy savings projects
- Address energy as a component of process efficiency improvements for companies engaged in continuous improvement activities such as Lean, 6-Sigma, or Total Quality Management (TQM)

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<sup>12</sup> Data centers include standalone facilities for data storage and processing, as well as on-site data center equipment, which can be found across a number of types industrial and commercial facilities.

## ***Eligibility***

Eligible participants include:

- All New York State manufacturing, industrial, and data center facilities who are New York State electricity distribution customers of a participating utility company who pay into the SBC.
- Both existing and new facilities are eligible to participate.
- Industrial projects may receive incentives for process improvement projects (metric links the process to energy consumption), including expansion projects.
- Data center projects may receive incentives for process and process-related projects.
- All non-process implementation projects are referred to the appropriate utility.

### 2.2.3 Incentives/Services Offered

These IPE and FlexTech Programs were launched in March 2016 and will run through end of 2019 or until all funds are committed, whichever comes first. Details regarding incentive rates and program caps can be found on the NYSERDA website.<sup>13</sup>

### 2.2.4 Performance Management

For the IPE portion of the program, NYSERDA will assign a technical reviewer to assist in the NYSERDA process and calculate the energy savings for each project. A pre-installation inspection is conducted to understand the project and document the base case. Energy savings calculations are completed based upon data supplied by the customer. For process efficiency projects, production data is also collected. An M&V plan is developed by the technical reviewer, customer, and NYSERDA project manager.

Upon approval of all final deliverables, NYSERDA issues the full incentive payment for projects not requiring M&V to the Applicant, and partial incentive payment for projects requiring M&V. At NYSERDA's discretion, M&V may be required or waived for any project.

For the FlexTech portion of the program, NYSERDA Project Managers review all proposed scopes of work prior to approval to ensure eligibility. NYSERDA contracted Technical Reviewers review completed reports to ensure completion of scope of work and quality of recommendations.

Overall, NYSERDA will regularly review program participation and project performance to determine whether changes in incentives, caps or eligible projects are needed to improve efficacy of program implementation.

Metrics associated with energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting. For the FlexTech portion of the program, metrics have been developed and estimated

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<sup>13</sup> PON 2456 Industrial and Process Efficiency Program. <https://www.nysesda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities/PON-2456-Industrial-and-Process-Efficiency>

impacts will be reported based on a historical NYSERDA FlexTech adoption rate of 65%. An independent evaluation effort will review data from program site inspections and program M&V to verify energy benefits. Additional impact evaluation work, such as verification site visits, metering and monitoring, will only occur as needed to verify energy and other benefits. NYSERDA will also continue to conduct targeted pre-installation evaluation M&V for a small sample of projects, as has been done in the past for the EEPS IPE Program, to support accurate baseline and other estimates.

For the FlexTech portion of the program, independent evaluation efforts will focus on determining the actual adoption rate of recommended measures and the associated energy savings and other benefits. The actual adoption rate will be used to adjust reported values. Methods will include surveys and potentially site visits of a sample of program participants. Evaluation surveys will also inquire whether adoption was supported by utility incentive programs.

To draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

#### 2.2.5 Relationship to Utility Programs

Utility Energy Efficiency Transition Implementation Plans (ETIPs) for Commercial/Industrial sector include prescriptive and custom paths for electric and gas efficiency improvements. Typical utility programs focus on building system improvements such as lighting, heating, ventilation, and air conditioning (HVAC), variable frequency drives (VFDs), and have shied away from process efficiency improvements and data center efficiency projects. NYSERDA will coordinate with utilities as they develop and evolve their ETIPs for the industrial and data center marketplace.

Energy projects involving basic building system improvements such as lighting, HVAC, building controls are referred to existing utility offerings for their support. Established collaboration with the utilities ensures proper transition for the customer. As utility offerings evolve referrals will continue to be made to utilities as appropriate.

The FlexTech Program provides technical assistance services to eligible entities and works alongside utility technical assistance programs. Participants can apply to utility implementation programs for installation funds.

## 2.2.6 Budgets & Expenditures<sup>14,15</sup>

<b>Budget</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
FlexTech	Incentives & Services	\$500,000	\$500,000	\$500,000	\$500,000	\$2,000,000
	Program Implementation	\$43,750	\$43,750	\$43,750	\$43,750	\$175,000
	Sub-Total	\$543,750	\$543,750	\$543,750	\$543,750	\$2,175,000
IPE	Incentives & Services	\$10,452,000	\$15,069,727	\$15,954,040	\$15,954,040	\$57,429,807
	Program Implementation	\$1,615,250	\$4,228,914	\$2,502,267	\$1,611,694	\$9,958,125
	Sub-Total	\$12,067,250	\$19,298,641	\$18,456,307	\$17,565,734	\$67,387,933
<b>Total</b>		<b>\$12,611,000</b>	<b>\$19,842,391</b>	<b>\$19,000,057</b>	<b>\$18,109,484</b>	<b>\$69,562,933</b>

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
Total	2%	20%	24%	24%	15%	10%	5%

## 2.2.7 Performance Metrics<sup>16</sup>

<b>Primary Metrics</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	153,000	92,400	88,000	88,000	421,700
	MWh Lifetime	2,299,000	1,390,000	1,320,000	1,320,000	6,325,000
	MMBtu Annual	740,000	1,890,000	480,000	480,000	3,586,000
	MMBtu Lifetime	11,100,000	28,300,000	7,200,000	7,200,000	53,790,000
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-

<sup>14</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>15</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>16</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life.

	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		119,000	259,000	71,800	71,800	521,400
CO2e Emission Reduction (metric tons) Lifetime		1,790,000	3,880,000	1,080,000	1,080,000	7,821,000
Customer Bill Savings Annual(\$ million)		\$20.2	\$20.6	\$11.7	\$11.7	\$64.12
Customer Bill Savings Lifetime (\$ million)		\$303	\$308	\$175	\$175	\$961.8
Private Investment (\$ million)		\$157	\$176	\$213	\$215	\$761.1

<b>Additional Performance Tracking Metrics</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
IPE	58	56	52	52	218
FlexTech	20	20	20	20	80
Total	78	76	72	72	298

## 2.2.8 Benefit Cost Analysis

The BCA summarized in the table below represents a total resource cost test, consistent with the benefit cost analysis framework described in the January 21, 2016 Order.<sup>17</sup> The benefit estimate includes avoided energy (electricity, natural gas, and oil), generation capacity, distribution capacity, and social cost of carbon.<sup>18</sup> Costs are defined as all costs associated with the energy efficiency program, including program specific costs, Administration, CRF, and evaluation, measurement, and verification, as well as customer costs. The analysis calculated the following benefit cost ratios:

	<b>2016 - 2018</b>
<b>Industrial</b>	
Benefits (million 2015\$)	\$608.85
Costs (million 2015\$)	\$172.65
Benefit Cost Ratio	3.5

<sup>17</sup>Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision. Order Establishing the Benefit Cost Analysis Framework. Issued and Effective January 21, 2016.

<sup>18</sup>The social cost of carbon is an estimate of the monetized damages to global society associated with an incremental increase in carbon emissions in a given year. It is intended to include changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change, etc.

Consistent with the CEF, NYSERDA intends to offer the Industrial Transition program in a fuel neutral manner, offering incentives to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State's clean energy goals. Offering the program on a fuel neutral basis will allow us to achieve a ton of carbon savings at a cost of \$133/ton, compared to a cost of \$314/ton in an electric only scenario.<sup>19</sup>

## 2.3 Agriculture

The Agriculture Resource Acquisition Transition Program did not meet its 2016 projected targets. The program has been extended to 2018 due to a longer program ramp up in the market and to inform future Clean Energy Fund agriculture best practices. The values in sections 2.3.6 and 2.3.7 have been updated to reflect 2016 actuals, as well as updating the timing for the overall budget, performance metrics, and reducing the total estimated MMBTU savings due to the incorporation of additional data from the Agriculture Energy Audit Program into the modeling.

### 2.3.1 Program Description

The Agriculture Energy Audit Program provides farms and on-farm producers with no-cost energy audits containing information on specific energy efficiency measures, including estimated energy savings, implementation costs and payback, enabling the farms to make well-informed investment and implementation decisions. In addition, the audits include information on implementation incentives available for recommended measures through utility or federal programs.

The Agriculture Energy Audit Program provides no-cost energy audits to eligible farms and on-farm producers based upon the level of complexity desired by the applicant. The energy audits are segmented by three levels:

- Level 1 – Walk thru energy audit
- Level 2 – Detailed energy audit
- Level 3 – System Specific energy audit

This program is expected to operate through the end of 2018 or until all funds are committed, whichever comes first.

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<sup>19</sup>To determine the cost-effectiveness, it was assumed all program incentives would achieve MWh savings in an electric-only scenario. In a fuel-neutral scenario some program funds achieve MMBtu savings and some achieve MWh. It is assumed that the cost would be the same for an electric-only program as a fuel-neutral program.

This program modifies the Agriculture Energy Efficiency Program (AEEP) which closed in January 2014. AEEP consisted of providing outreach and customer enrollment, no-cost energy audits and hard cost incentives to off-set the cost for implementing energy efficiency measures. NYSERDA will continue to provide outreach and customer enrollment and no-cost energy audits but will eliminate hard cost incentives and refer farms to utility and federal programs for possible implementation assistance.

### ***Program Delivery***

Applicants submit required documentation to be reviewed by NYSERDA to determine eligibility. Each applicant is assigned a FlexTech Consultant to perform the audit. NYSERDA pays the cost of the audit directly to the FlexTech Consultant.

This agriculture offering is open-enrollment. Funding is provided on a first-come first-serve basis.

### ***Personnel and roles***

- **NYSERDA staff:** Application acceptance, eligibility review, FlexTech Consultant assignments and payments, general program management, management of implementation contractor
- **Implementation Contractor:** Outreach, education and marketing; direct program implementation including: program enrollment assistance, customer support and participant tracking; technical review and quality assurance of audits; audit follow-up and assistance to farms accessing utility, federal or other implementation programs.

## 2.3.2 Target Market & Customer/Project Eligibility Rules

### ***Target Market***

The target market for this offering is dairy farms. Milk processing is energy intensive and responsible for the majority of energy consumption, primarily electricity, on dairy farms. Greenhouses follow due to the energy consumed by lighting and heating the growing space.

### ***Eligibility***

Eligible participants include all farms and on-farm producers, including but not limited to dairies, orchards, greenhouses, vegetables, vineyards, grain dryers, and poultry/egg, that are New York State electricity distribution customers of a participating utility company who pay into the SBC.

## 2.3.3 Incentives/Services Offered

The Agriculture Energy Audit Program launched in March 2016 as a revised component of FlexTech. The Program provides no-cost energy audits to eligible farms and on-farm producers based upon the level of complexity desired by the applicant. The energy audits are segmented by three levels.

- **Level 1:** The FlexTech Consultant visits the farm to conduct a walk thru audit and provide a limited evaluation of energy conservation measures and energy efficiency recommendations. A simple payback and cost estimate range is provided for measures. The deliverable is a



summary letter of feasible energy efficiency measures. This level has a funding cap of \$1,500 and energy audit dollars are to be paid directly to the FlexTech Consultant completing the farm energy audits.

- **Level 2:** The FlexTech Consultant visits the farm and provide a detailed energy audit with calculated evaluations of appropriate energy conservation measures including simple payback. The deliverable is an energy audit report. This level has a funding cap of \$2,500 and energy audit dollars are to be paid directly to the FlexTech Consultant completing the farm energy audits.
- **Level 3:** The FlexTech Consultant conducts an energy audit focused on specific systems or measures with a more detailed analysis of such measures, including renewable energy production. The deliverable is a system specific energy analysis report. This level has a funding cap of \$6,000 and energy audit dollars are to be paid directly to the FlexTech Consultant completing the farm energy audits. The previously offered AEEP provided hard cost incentives up to 75% of eligible project costs, capped at \$250,000 for farms to implement electric and natural gas energy efficiency measures.

#### 2.3.4 Performance Management

NYSERDA regularly reviews program participation to determine whether changes are needed to improve efficacy of program implementation.

Metrics associated with recommended energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting. Metrics have been initially estimated and estimated impacts will be reported based on a historical NYSERDA FlexTech and AEEP adoption rates. Independent evaluation efforts will focus on determining the actual adoption rate of recommended measures and the associated energy savings and other benefits. The actual adoption rate will be used to adjust reported values. Evaluation methods will include surveys and potentially site visits of a sample of program participants, depending on the level of adoption found in surveys. Evaluation surveys will also inquire whether adoption was supported by federal or utility incentive programs.

To draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

#### 2.3.5 Relationship to Utility Programs

Farm energy audits will reference utility incentive programs for installation funds on recommended energy efficiency measures.

### 2.3.6 Budgets & Expenditures<sup>20,21</sup>

<b>Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Incentives & Services	\$592,200	\$837,800	\$770,000	\$2,200,000
Program Implementation	\$999,500	\$400,500	-	\$1,400,000
<b>Total</b>	<b>\$1,591,700</b>	<b>\$1,238,300</b>	<b>\$770,000</b>	<b>\$3,600,000</b>

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
Total	16%	36%	35%	13%

### 2.3.7 Performance Metrics<sup>22</sup>

<b>Primary Metrics<sup>23</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	4,000	5,000	5,000	14,000
	MWh Lifetime	60,000	75,000	75,000	210,000
	MMBtu Annual	1,000	3,000	3,000	7,000
	MMBtu Lifetime	15,000	45,000	45,000	105,000
	MW	-	-	-	0
Renewable Energy	MWh Annual	-	-	-	0
	MWh Lifetime	-	-	-	0
	MW	-	-	-	0
CO2e Emission Reduction (metric tons) Annual		2,000	3,000	3,000	8,000
CO2e Emission Reduction (metric tons) Lifetime		30,000	45,000	45,000	120,000
Customer Bill Savings Annual (\$ million)		\$0.59	\$0.75	\$0.75	\$2.09
Customer Bill Savings Lifetime (\$ million)		\$8.85	\$11.3	\$11.3	\$31.35
Private Investment (\$ million)		\$3.49	\$ 4.56	\$ 4.19	\$12.24

<sup>20</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>21</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>22</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life.

<sup>23</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<b>Additional Performance Tracking Metrics</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Participants <sup>24</sup>	218	285	262	765

### 2.3.8 Benefit Cost Analysis

The BCA summarized in the table below represents a total resource cost test, consistent with the benefit cost analysis framework described in the January 21, 2016 Order.<sup>25</sup> The benefit estimate includes avoided energy (electricity, natural gas, and oil), generation capacity, distribution capacity, and social cost of carbon.<sup>26</sup> Costs are defined as all costs associated with the energy efficiency program, including program specific costs, Administration, CRF, and evaluation, measurement, and verification, as well as customer costs. The analysis calculated the following benefit cost ratios:

	<b>2016 - 2018</b>
<b>Agriculture</b>	
Benefits (million 2015\$)	\$9.70
Costs (million 2015\$)	\$9.34
Benefit Cost Ratio	1.0

Consistent with the CEF, NYSERDA intends to offer the Agriculture Energy Audit Program in a fuel neutral manner, offering technical assistance to encourage more efficient use of all fuel types. Offering the program on a fuel neutral basis will allow us to achieve a ton of carbon savings at a cost of \$450 compared to a cost of \$490 in an electric only scenario<sup>27</sup>.

## 2.4 Multifamily Market Rate

The Multifamily Performance Program (MPP) – Market Rate did not meet its 2016 projected targets. Due to a lack of market uptake, the program will be closed in August 2017 after a thirty-day notice period.

### 2.4.1 Program Description

The Multifamily Performance Program (MPP) – Market Rate (MR) continued under the CEF as Version 7.0. MPP to provide support to market rate building owners and the service providers who

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<sup>24</sup> Participants are the number of applicants (audits provided).

<sup>25</sup> Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision. Order Establishing the Benefit Cost Analysis Framework. Issued and Effective January 21, 2016.

<sup>26</sup> The social cost of carbon is an estimate of the monetized damages to global society associated with an incremental increase in carbon emissions in a given year. It is intended to include changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change, etc.

<sup>27</sup> Program is only audits, therefore the assumption is that the cost would be the same for an electric only program as the fuel neutral program.

serve them. This version of MPP included two (2) components designed to accomplish the following objectives:

A Targeted Option to support single measure installations with no minimum energy reduction target. This Option provided building owners a set of minimum performance criteria for a variety of building improvements that could be used to choose more efficient equipment than they may have been considering. The Targeted Option was expected to:

- Introduce building owners that have not traditionally pursued energy efficiency and may not be ready to engage in comprehensive improvements to NYSERDA and the benefits of energy efficient equipment.
- Connect NYSERDA to the contractors and businesses that typically work with these types of building owners to perform these system and equipment upgrades, i.e. HVAC installers, electricians, plumbers, etc.
- Support enhanced customer service by working with these building owners and contractors to explore additional opportunities in their buildings by considering other, deeper improvements.
- Work with the utilities to include program incentives for measures they do not currently support.

The Targeted Option did not provide incentives on any measure supported by a utility program and worked closely with all utilities to understand which measures they do encourage and why they might not assist others. The purpose of this Option was to determine what type of demand might exist for measures utilities do not currently support and work to collect the information they need to incorporate those measures into their programs.

A High Performance Offering to support deep energy retrofit projects by offering significant incentives capped at 50% of the project cost was also intended to be offered, but never launched. Owners would have worked with NYSERDA-approved energy consultants to help assess their building and develop a proposal that meets the requirements of the Program. This Option was expected to:

- Create new opportunities for cutting edge building owners and energy professionals to demonstrate deep energy retrofit possibilities in existing multifamily buildings.
- Gain experience with deep energy projects that can be used to encourage greater adoption of successful strategies and efforts.
- Collect data to highlight successful deep energy projects to convince building owners, regulatory agencies, and financial institutions about the benefits and performance of deep energy projects.

This program was a continuation of the Multifamily Performance Program with modifications to project eligibility requirements and the incentive schedule. Market rate projects would no longer be required to meet a minimum energy target.

### ***Program Delivery***

The Targeted Option was delivered through building owners, contractors, and energy consultants. Participants were educated on the Option's minimum performance requirements and any building owner or their designated representative may submit applications requesting incentives for work done. The High-Performance Offering was intended to be delivered through a network of Multifamily Building Solution Providers. This network would have built upon the previous Multifamily Performance Partner Network included energy firms, consultants, engineering firms, and others vetted and pre-approved by NYSERDA. These firms would have been selected through an open, ongoing application process and building owners would have been required to use a network Provider to submit a proposal to the High-Performance Offering.

The Targeted Option was open-enrollment. Funding was provided on a first-come first-served basis. The High-Performance Offering was intended to be offered through an annual competitive solicitation requesting proposals for deep energy retrofit projects.

### ***Personnel and Roles***

- **NYSERDA staff:** Program management, project eligibility review, general project management, and project payments.
- **Multifamily Building Solutions Providers (previously MPP Partners):** Customer recruitment, building assessment and project development, Program paperwork and documentation submittals, and installation oversight.
- **Implementation contractor:** Project management and oversight, document review/desk audit, Solutions Provider support, and program document development and maintenance.
- **Quality Assurance/Technical Assistance contractor:** Support industry standards development, conduct field verification for designated percentage of projects, savings analysis, prepare technical guidance on new systems and equipment for Solutions Providers, analysis of the effectiveness of Program rules and processes, and provision of building baselining services (development of weather-normalized building energy consumption based on utility data to be used by Solutions Providers in project development).
- **Marketing contractor:** Development of branded promotional materials, outreach events, communications strategies, and technical transfer efforts, e.g. case studies, press releases, etc.

#### 2.4.2 Target Market & Customer/Project Eligibility Rules

### ***Target Market***

The target market included owners and management companies of market rate properties defined as those that do not meet the definition of affordable housing. The two program components were designed to support multiple sub-segments of the multifamily market, i.e. building owners interested in only single measure replacements and those building owners who wanted to push the envelope of possible existing building energy retrofits.

### ***Eligibility***

Eligible participants included owners and management companies of properties that do not meet the definition of low-to-moderate income and that were New York State electricity distribution customers of a participating utility company who pay into the SBC.

Specific to the Targeted Option, measures that are not supported by the local utility program were eligible for incentives under this Option. Applications could be initiated by any entity approved by the building owner, including, but not limited to, the building owner, a management company, a Multifamily Building Solution Provider or an installation contractor.

For the High-Performance Offering, projects were intended to be selected through a competitive solicitation based on a variety of criteria including, but not limited to, the cost-effectiveness of the project, the depth of the projected energy savings, and its potential impact on the knowledge gained regarding deep energy, existing building retrofits. If any of the measures included in a project proposal received incentives under another program (either NYSERDA or utility), the value of that incentive would have been deducted from the MPP High Performance Offering incentive.

### **2.4.3 Incentives/Services Offered**

NYSERDA launched MPP V7.0 in the second quarter of 2016 with the Targeted Option. The solicitation for the High-Performance Offering is projected was never launched.

For the Targeted Option, incentives were provided to support installation of high-efficiency equipment. There were no requirements to meet a specific energy reduction target if the new equipment met the Program's efficiency standards. The initial incentives were \$3/MMBtu and \$0.03/kWh, capped at \$100/unit per building.

For the High-Performance Offering, incentives were to be provided to cost-share improvements needed to achieve deep energy savings in existing multifamily buildings. Projects would have been selected competitively through an annual solicitation and eligible to receive a payment of \$2,500/unit capped at 50% of the project cost.

If a project received an incentive from another program (NYSERDA or utility), the value of that incentive was subtracted from the MPP incentive.

#### 2.4.4 Performance Management

Overall, NYSERDA regularly reviewed program participation and project performance to determine whether changes in incentives or eligible projects were needed to improve efficacy of program implementation.

Application packets for the Targeted Option were reviewed for completeness and accuracy. During the installation phase, these projects were inspected periodically to ensure that work was progressing appropriately.

Projects using the Targeted Option were sample inspected to ensure that the application submittals are sufficient representations of the projects. Additionally, Data Release Authorization Forms, which authorize NYSERDA to collect utility consumption data on the project, were submitted with the application packet for these projects (limited to forms for the owner accounts) and, would have been submitted with proposals for the High-Performance projects (including forms for all owner accounts as well as forms from a 10% sample of apartments). These forms will be used to assess building performance post-installation on an annual basis to gauge building performance before and after participation in the Program.

Metrics associated with energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting. An independent evaluation effort will verify energy benefits using methods such as engineering review and analysis, pre/post billing analysis, modeling and on-site metering and monitoring, as needed. Independent impact evaluation will first utilize program data from technical reviews and other sources to offset primary data collection or additional analysis where possible.

To draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

#### 2.4.5 Relationship to Utility Programs

To prevent direct conflict between MPP’s incentives associated with the Targeted Option and the utility’s incentives, MPP did not provide an incentive on any measure supported by a utility program. NYSERDA and the utilities collaborated to cross-promote their programs with the purpose of directing customers towards the appropriate resource for the work they intend to do. NYSERDA worked with the utilities to encourage support of additional measures in their programs if demand for such measures was demonstrated through MPP.

#### 2.4.6 Budgets & Expenditures<sup>28,29</sup>

<b>Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Incentives & Services	\$-	\$31,354	-	\$31,354
Program Implementation	\$46,554	\$78,720	-	\$125,274
Total	\$46,554	\$110,074	-	\$156,628

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Total	30%	70%	0%	0%	0%

#### 2.4.7 Performance Metrics<sup>30</sup>

<b>Primary Metrics<sup>31</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	-	41	-	41
	MWh Lifetime	-	617	-	617
	MMBtu Annual	-	9,870	-	9,870
	MMBtu Lifetime	-	148,000	-	148,000
	MW	-	-	-	-
	MWh Annual	-	-	-	-

<sup>28</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>29</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA’s behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>30</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life.

<sup>31</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA’s programs.



Renewable Energy	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	598	-	598
CO2e Emission Reduction (metric tons) Lifetime		-	8,970	-	8,970
Customer Bill Savings Annual (\$ million)		-	\$0.11	-	\$0.11
Customer Bill Savings Lifetime (\$ million)		-	\$1.63	-	\$1.63
Private Investment (\$ million)		-	\$0.42	-	\$0.42

<b>Additional Performance Tracking Metrics</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Participants	-	186	-	186

#### 2.4.8 Benefit Cost Analysis

The BCA summarized in the table below represents a total resource cost test, consistent with the benefit cost analysis framework described in the January 21, 2016 Order.<sup>32</sup> The benefit estimate includes avoided energy (electricity, natural gas, and oil), generation capacity, distribution capacity, and social cost of carbon.<sup>33</sup> Costs are defined as all costs associated with the energy efficiency program, including program specific costs, Administration, CRF, and evaluation, measurement, and verification, as well as customer costs. The analysis calculated the following benefit cost ratios:

	<b>2016 - 2018</b>
<b>Single Family Market Rate</b>	
Benefits (million 2015\$)	\$1.30
Costs (million 2015\$)	\$0.41
Benefit Cost Ratio	3.2

Consistent with the CEF, NYSERDA offered the Multifamily Performance Program – Market Rate program in a fuel neutral manner, offering incentives to encourage more efficient use of all fuel types. This helped develop the market at the scale needed to achieve New York State’s clean energy

<sup>32</sup>Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision. Order Establishing the Benefit Cost Analysis Framework. Issued and Effective January 21, 2016.

<sup>33</sup>The social cost of carbon is an estimate of the monetized damages to global society associated with an incremental increase in carbon emissions in a given year. It is intended to include changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change, etc.

goals. Offering the program on a fuel neutral basis allowed us to achieve a ton of carbon savings at a cost of \$262, compared to a cost of \$848 in an electric only scenario.<sup>34</sup>

## 2.5 Single Family Market Rate

The Single Family Residential Program did not meet its 2016 projected targets due to lower than anticipated program participation. NYSERDA has added funding to support improved data analysis and performance management, technical assistance resources, as well as consumer education, events, and marketing activities to improve existing program activities, while beginning the process of transitioning to a market-based approach for this sector. NYSERDA has also extended the program through 2018 to support the market in the transition out of the program and while other CEF initiatives aimed to increase customer demand and reduce barriers to contractors are being developed. Accordingly, the values in sections 2.5.6 and 2.5.7 have been updated to reflect 2016 actual commitments and improved projections of the timing for the overall budget and benefit values to reflect the actual rate of program uptake.

### ***Program Description***

NYSERDA's Single Family Residential Program is designed to reduce the energy use in the State's existing one-to-four family and low-rise multifamily residential buildings and to capture heating fuel and electricity-related savings. NYSERDA is a sponsor of the national Home Performance with ENERGY STAR® Program, which helps homeowners improve the energy efficiency and comfort of their homes by using a whole house diagnostic approach to identify and address needed building shell, heating and cooling system, lighting, and appliance improvements. NYSERDA will offer incentives under this Program through December 31, 2018. Incentives will be reduced over time as NYSERDA focuses on market transformation initiatives.

The Single Family Residential Program deployed under the CEF will replace the existing Home Performance with ENERGY STAR (HPwES) Program implemented under EEPS and the Regional Greenhouse Gas Initiative (RGGI).

### ***Program Delivery***

The Program uses a network of home performance contractors to complete home energy audits, which includes diagnostic testing and an inventory of the home's current conditions. The audit allows the contractors to recommend improvements that are comprehensive, and that maximize the energy savings in each home. The contractor and customer will review the recommendations and come to agreement on the final project scope based on the priorities and needs of the customer. Participating contractors are trained and certified to complete the audits and energy efficiency upgrades.

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<sup>34</sup>The electric only scenario assumes that only the Targeted Option would be offered as comprehensive projects would not be feasible without fuel savings. In order to attract sufficient applicants without a fuel incentive, the electric only incentive would need to be increased to \$0.15/kWh.

This residential offering will be open-enrollment for customers and home performance contractors. Funding for incentives will be provided on a first-come, first-served basis and will be reduced over time as market transformation activities become NYSERDA's focus in this sector. Third party implementers and technical support services will be procured through a competitive solicitation, and will be cost-shared with the low-income components of the program.

### ***Personnel and Roles***

- **NYSERDA staff:** Program management, general project management, and project payments.
- **Independent Home Performance Contractors:** Customer recruitment, energy audits, installation, program paperwork and documentation submissions, installation oversight.
- **Implementation contractors:** Customer eligibility review and application processing, review of project submissions for technical and eligibility review, incentive processing
- **Software support:** Maintains program management database for project processing (automated to the extent possible) and program tracking
- **Technical support:** Technical support for contractors (desk audit and limited field support)
- **Standards & Quality Assurance:** Support industry standards development, conduct field verification of completed projects
- **Marketing contractor:** Development of branded promotional materials, communications strategies, and technical transfer efforts, e.g. case studies, press releases, etc.

#### 2.5.1 Target Market & Customer/Project Eligibility Rules

### ***Target Market***

The target market includes owners of one-to four-family and low-rise residential buildings in service territories of electric utilities contributing to the CEF. The secondary target market is home performance contractors.

### ***Eligibility***

Projects must include measures approved by NYSERDA and deemed to be cost effective or have important health, safety, or comfort benefits. Projects must be installed by a participating home performance contractor designated as a Gold Star Contractor by the Building Performance Institute, and must follow all applicable codes, standards and laws. Participants must be New York State electricity distribution customers of a participating utility company who pay into the SBC.

#### 2.5.2 Incentives/Services Offered

During the initial 6-month period through August 2016, the program incentive offerings included the incentives offered under the legacy incentive programs, including:

- Free/Reduced-cost audits.<sup>35</sup>
- Consumer incentive of 10% of the cost of the approved energy efficiency measures
- Contractor incentive of 5% of the cost of the approved energy efficiency measures
- Contractor incentive of 2% of the cost of approved energy efficiency measures that are referred to another participating contractor of a different trade
- Contractor incentives for targeted electric reduction measures.
- Midstream contractor incentives including – Cooperative advertising, equipment incentives, Building Performance Institute (BPI) certification and accreditation reimbursement
- One-time Contractor incentive for implementing HPXML compliant software, enabling further process streamlining and more effective data management

NYSERDA implemented the first set of programmatic changes on September 1, 2016. These changes included:

- Streamlined project approval processes
- Retirement of the following incentives:
  - Consumer incentive of 10% of the cost of the approved energy efficiency measures (consumers may be eligible for utility incentives)
  - Contractor incentive of 2% of the cost of approved energy efficiency measures that are referred to another participating contractor of a different trade
  - Contractor incentives for targeted electric reduction measures
  - Midstream contractor incentives including – Cooperative advertising and equipment incentives
- An increase of the project-based contractor incentive from 5% to 10% of project cost. This change gives contractors flexibility in their business models. This can enable the contractor to use these funds as needed to increase their business, such as offering discounts to customers or undertaking marketing and outreach activities. NYSERDA anticipates this flexibility will increase the conversion rate from audits to completed retrofit work.

The remaining incentives will be evaluated over the course of the first three years of the CEF and adjusted/reduced as appropriate in response to streamlining of program processes and to NYSERDA’s market transformation efforts.

The Program is also supported by the Green Jobs – Green New York Residential Financing Program.

### 2.5.3 Performance Management

Overall, NYSERDA will regularly review program participation, customer motivation factors and project performance to determine whether changes in incentives, eligible projects, or program processes are needed to improve efficacy of program implementation. In addition to program metric and performance tracking, stakeholder input will be solicited and discussed on a periodic basis.

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<sup>35</sup> Funding for free/reduced-cost home energy audit for the moderate income sector will be funded through CEF once RGGI funds are exhausted.

It is anticipated that quality assurance will be provided to 10% of completed market rate projects on average across the program. A rational sampling approach allows contractors with high quality scores and who prove to have well defined and effective internal quality assurance and quality control practices to benefit from lower inspection rates. The Program average inspection rate will not be reduced to less than 5%.

Metrics associated with energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting. Independent evaluation efforts will focus on determining the adoption rate of recommended measures for those customers who receive an audit but do not go through the incentive program and the associated energy savings and other benefits. Methods will include surveys and potentially site visits of a sample of program participants. Evaluation surveys will also inquire whether adoption was supported by utility incentive programs.

For projects receiving direct incentives, an independent evaluation effort will verify energy benefits using methods such as pre/post billing analysis and site visits as needed. Billing analysis typically includes a census of customers whose utility usage data meets the requirements of the analysis method (e.g., adequate number of actual meter reads during the pre and post periods). Where methods other than billing analysis are used, a sampling approach is expected to be employed.

To draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

#### 2.5.4 Relationship to Utility Programs

The Single Family Residential Program will seek to coordinate projects with utility rebates and programs when they are available. The NY Home Performance Portal offers a flexible project tracking and management tool that is available to participating contractors, customers, constituency based organizations (CBOs), implementation contractors and financing providers. We will explore coordinating utility rebates through the Portal to complement NYSERDA's program and financing options. This coordination will ensure no consumer incentives will be paid for by both NYSERDA and utility programs. In addition, some utilities are enabling, or expect in the future to enable, home performance contractors to offer their services through the utility residential marketplaces.

### 2.5.5 Budgets & Expenditures<sup>36,37</sup>

<b>Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Incentives & Services	\$6,189,835	\$4,845,490	\$4,845,490	\$15,880,815
Program Implementation	\$1,694,265	\$4,349,600	\$200,000	\$6,143,865
<b>Total</b>	<b>\$7,884,100</b>	<b>\$9,095,090</b>	<b>\$5,045,490</b>	<b>\$22,024,680</b>

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
Total	36%	32%	32%

### 2.5.6 Performance Metrics<sup>38</sup>

<b>Primary Metrics<sup>39</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	1,290	1,110	1,110	3,504
	MWh Lifetime	19,300	16,600	16,600	52,550
	MMBtu Annual	67,100	81,800	81,800	230,700
	MMBtu Lifetime	1,680,000	2,040,000	2,040,000	5,766,000
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		4,743	5,540	5,540	15,820
CO2e Emission Reduction (metric tons) Lifetime		111,000	130,000	130,000	371,900
Customer Bill Savings Annual (\$ million)		\$1.21	\$1.43	\$1.43	\$4.07
Customer Bill Savings Lifetime (\$ million)		\$28.40	\$33.60	\$33.60	\$95.71
Private Investment (\$ million)		\$19.30	\$29.00	\$29.00	\$77.20

<b>Additional Performance Tracking Metrics</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
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<sup>36</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>37</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>38</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life for electric and 25-year measure life for heating.

<sup>39</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

Participants <sup>40</sup>	2,484	3,408	3,408	9,300
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## 2.5.7 Benefit Cost Analysis

The BCA summarized in the table below represents a total resource cost test, consistent with the benefit cost analysis framework described in the January 21, 2016 Order.<sup>41</sup> The benefit estimate includes avoided energy (electricity, natural gas, and oil), generation capacity, distribution capacity, and social cost of carbon.<sup>42</sup> Costs are defined as all costs associated with the energy efficiency program, including program specific costs, Administration, CRF, and evaluation, measurement, and verification, as well as customer costs. The analysis calculated the following benefit cost ratios:

	2016 - 2018
<b>Single Family Market Rate</b>	
Benefits (million 2015\$)	\$44.81
Costs (million 2015\$)	\$56.83
Benefit Cost Ratio	0.8

Consistent with the CEF, NYSERDA intends to offer the Single Family Residential program in a fuel neutral manner, offering incentives to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State’s clean energy goals. Offering the program on a fuel neutral basis will allow NYSERDA to achieve a ton of carbon savings at a cost of \$1,392, compared to a cost of \$3,131 in an electric only scenario.<sup>43</sup>

## 2.6 LMI Single Family

This section has been moved to the LMI chapter.

## 2.7 LMI Multifamily

This section has been moved to the LMI chapter.

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<sup>40</sup> Completed energy efficiency projects.

<sup>41</sup>Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision. Order Establishing the Benefit Cost Analysis Framework. Issued and Effective January 21, 2016.

<sup>42</sup>The social cost of carbon is an estimate of the monetized damages to global society associated with an incremental increase in carbon emissions in a given year. It is intended to include changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change, etc.

<sup>43</sup> The residential market rate segment offers limited demand for a program designed to only achieve electric savings without rich consumer incentives. Historic program data was used to calculate the energy savings that could be achieved in the market for a program focused on lighting improvements, select cost-effective appliance replacements, and shell work on homes with central air conditioning.

## 2.8 Commercial New Construction

The Commercial New Construction Program tracked closely to its 2016 projected targets and exceeded projected commitments in annual MMBtu and annual greenhouse gas reductions. While applications were somewhat lower than anticipated, the average square footage per application was approximately 50% higher than initial estimates. The Program is expected to maintain course during 2017. Applicants have shown interest and are participating in the deep energy savings/zero net energy early technical support which was offered for the first time in Commercial New Construction; however, prospective applicants of smaller projects have also expressed interest in participating. Due to the continued interest and feedback from market participants, NYSERDA is extending the program through 2018. The Program extension is being crafted to further encourage deep energy savings and zero net energy projects, and the participation threshold is being removed to offer technical support to smaller conventional projects. In response to lessons learned during 2016, including the importance of including all stakeholders during programming and design phases of deep savings and zero net energy projects; and in response to reduced funding availability, the 2018 Program extension will provide support for projects following an Integrated Project Delivery (also known as Integrated Design) protocol. Funding for the Integrated Project Delivery opportunity will be partially funded through removal of incentives for green building certification. The values presented in the tables below have been updated to reflect 2016 commitments as well as revised projections for 2017 and additional funds and related metrics for 2018.

### 2.8.1 Program Description

The 2016-2018 Commercial New Construction Program will provide an offering for new buildings, and for substantial renovations to existing buildings, that increases market uptake of high-impact, comprehensive projects, and emerging clean energy technologies and systems through support for credible and objective technical assistance and installation of projects designed to achieve deep energy savings. The program will:

- Increase awareness of and demand for design and construction of highly efficient buildings.
- Strengthen the capacity of the design and construction community to deliver highly efficient buildings.
- Extend the existing Commercial New Construction Program through 2018 or until all funds are committed, whichever comes first.

#### ***Program Delivery***

The program is offered as an open enrollment solicitation where NYSERDA provides program development, maintenance and applicant support. Technical support is provided through Energy Modeling Partners, who engage with the applicant and the applicant's design team to provide energy guidance and analysis. Financial support is also provided to help cover the project design, construction, and commissioning costs.



In response to market feedback the program revisions are focused on expanding support for deep energy savings and zero net energy projects, and restoring technical support for smaller custom measure projects.

## 2.8.2 Target Market & Customer/Project Eligibility Rules

### ***Target Market***

The target market includes owners, tenants, developers, and design teams for non-residential new building and substantial renovation projects, which include, but are not limited to, office buildings, retail, colleges and universities, health care facilities, state and local governments, not-for-profit and private institutions, and public and private K-12 schools.

### ***Eligibility***

To be eligible for program participation an applicant must be, or be capable of and intend to be, a New York State electricity distribution customer of a participating utility company who pays into the SBC.

Projects must be for new construction or substantial renovation. To be eligible for enhanced support applicants must be willing to pursue and incorporate deep energy savings or zero net energy goals into their project programming.

Project design targets must be at least 10% better than State Energy Code requirements for basic technical support, and at least 40% better than code for enhanced technical support and financial support. The targets may be updated based on market feedback and conditions during the program.

## 2.8.3 Incentives/Services Offered

### ***Technical Support***

A NYSERDA approved Energy Modeling Partner works with the applicant's design team to identify opportunities and equipment choices to improve the energy efficiency of their new building or substantial renovation project.

The technical support is based on a negotiated scope of work with the applicant. For basic technical support services NYSERDA cost shares 50-50 with the applicant. NYSERDA's contribution for basic services is capped based on project complexity and potential energy savings opportunities.

Applicants who are pursuing deep energy savings or zero net energy projects typically require additional early technical support to guide the early project programming, design concept and operational decisions that are critical to the success of the project. To encourage these projects NYSERDA will currently require no technical support cost share from an applicant and the NYSERDA contribution will currently be capped at a higher level. The technical support terms and opportunities may be updated based on market feedback and conditions during the program.

### ***Integrated Project Delivery Support***

Larger, deep savings projects and zero net energy projects benefit from close involvement of the owner's team, the design team, construction professionals and other project stakeholders

throughout the project design. To encourage this holistic approach, referred to as Integrated Project Delivery, NYSERDA offers financial support.

### ***Capital Financial Support***

For deep energy savings and zero net energy projects NYSERDA offers financial support to offset a portion of the applicant's incremental (additional) costs for high performance equipment and systems and building commissioning services.

Capital financial support is currently based on the projected energy performance of the building above an energy analysis baseline (currently ASHRAE 90.1-2013 Appendix G with addenda) as identified through energy modeling provided through the Technical Support. Incentives are based on the predicted reduction in greenhouse gas emissions. The capital financial support terms and opportunities may be updated based on market feedback and conditions during the program.

Commissioning is recognized as an important service to ensure a building is performing as intended. A study of building commissioning by Lawrence Berkeley National Laboratory found that commissioned new buildings achieved energy savings approximately 13% higher than equivalent un-commissioned projects.<sup>44</sup> Currently, NYSERDA will provide additional financial support to offset a portion of the applicant's cost for commissioning services.

On-site and/or renewable generation are currently not eligible for capital financial support through this offering, and applicants are not restricted by participation in this offering from receiving incentives from NY-Sun or other renewable offerings. Generally, customers cannot receive incentives from two programs for the same measure.

#### **2.8.4 Performance Management**

Overall, NYSERDA will regularly review program participation and project performance to determine whether changes in incentives, caps or eligible projects are needed to improve efficacy of program implementation. NYSERDA will provide guidance and technical review of assistance provided through the energy modeling partners. NYSERDA will provide quality assurance of equipment and systems installation as described in the technical support report and NYSERDA offer letter.

Metrics associated with energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting. An independent evaluation effort will review data from projects to verify energy benefits. NYSERDA will update program services and offerings to be responsive to the results of these program performance reviews. Additional impact evaluation work, including potentially engineering analysis, site visits and building modeling, will occur as needed to further verify energy and other benefits. Validating baseline assumptions and as-built conditions will be important aspects of ensuring rigorous and defensible energy savings for new construction.

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<sup>44</sup> Building Commissioning – A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions, Evan Mills, Ph.D., Lawrence Berkeley National Laboratory, July 21, 2009

To draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

### 2.8.5 Relationship to Utility Programs

To the extent utility companies' support activities in commercial new construction, particularly new buildings and substantial renovations, NYSERDA will collaborate to identify synergistic approaches that move the construction market towards higher performance, minimize market disruption, and avoid market confusion.

### 2.8.6 Budgets & Expenditures<sup>45,46,47</sup>

<b>Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Incentives & Services	\$10,313,336	\$13,538,572	\$5,415,100	\$29,267,032
Program Implementation	\$542,224	\$289,843	\$584,900	\$1,416,967
<b>Total</b>	<b>\$10,855,584</b>	<b>\$13,828,415</b>	<b>\$6,000,000</b>	<b>\$30,683,999</b>

<b>Expenditures<sup>48</sup></b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
<b>Total</b>	1%	18%	25%	30%	23%	3%

### 2.8.7 Performance Metrics<sup>49</sup>

<b>Primary Metrics<sup>50</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	19,613	18,387	28,183	66,183

<sup>45</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>46</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>47</sup> Program incentives for 2016 are based on committed applications (paid, encumbered and pre-encumbered) as of 12/31/2016 and do not include future cancellations.

<sup>48</sup>Expenditures are estimated based on the typical design and construction schedules for commercial sector projects, and on the timing of NYSERDA application within that process. While it is anticipated the vast majority of projects will be completed within the time frame shown, the expenditure projections do not indicate a 5-year project completion requirement.

<sup>49</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life.

<sup>50</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

	MWh Lifetime	392,260	367,740	563,660	1,323,660
	MMBtu Annual	36,193	14,036	54,927	105,156
	MMBtu Lifetime	723,860	280,720	1,098,540	2,103,120
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		12,238	10,418	17,741	40,397
CO2e Emission Reduction (metric tons) Lifetime		244,760	208,360	354,820	807,940
Customer Bill Savings Annual (\$ million)		\$2.81	\$2.55	\$4.05	\$9.41
Customer Bill Savings Lifetime (\$ million)		\$56.2	\$51.1	\$81.0	\$188.3
Private Investment (\$ million)		\$17.1	\$20.4	\$4.57	\$42.11

<b>Additional Performance Tracking Metrics</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Participants	45	55	47	147

## 2.8.8 Benefit Cost Analysis

The BCA summarized in the table below represents a total resource cost test, consistent with the benefit cost analysis framework described in the January 21, 2016 Order.<sup>51</sup> The benefit estimate includes avoided energy (electricity, natural gas, and oil), generation capacity, distribution capacity, and social cost of carbon.<sup>52</sup> Costs are defined as all costs associated with the energy efficiency program, including program specific costs, Administration, CRF, and evaluation, measurement, and verification, as well as customer costs. The analysis calculated the following benefit cost ratios:

	<b>2016 - 2018</b>
<b>Commercial New Construction</b>	
Benefits (million 2015\$)	\$82.46

<sup>51</sup>Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision. Order Establishing the Benefit Cost Analysis Framework. Issued and Effective January 21, 2016.

<sup>52</sup>The social cost of carbon is an estimate of the monetized damages to global society associated with an incremental increase in carbon emissions in a given year. It is intended to include changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change, etc.

Costs (million 2015\$)	\$107.85
Benefit Cost Ratio	0.8

Consistent with the CEF, NYSERDA intends to offer the Commercial New Construction Program in a fuel neutral manner, offering incentives to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State’s clean energy goals. Offering the program on a fuel neutral basis will allow us to achieve a ton of carbon savings at a cost of \$760/ton, compared to a cost of \$881/ton in an electric only scenario.<sup>53</sup> This represents a 30% improvement in \$/ton for the 2016-2018 Program as compared to the original 2016-2017 Program. The drivers for the high carbon savings costs per ton are the same as those identified for the low benefit cost ratio result.

## 2.9 Low Rise Residential New Construction

The Low-rise Residential New Construction Program did not meet all its 2016 projected targets. General market uncertainty and the expectation that reduced incentives would be offered under the CEF version of this program resulted in a surge in participation during the few months just prior to closure of the EEPS2-funded program on February 29, 2016. This surge resulted in fewer projects seeking CEF support for the balance of 2016. However, when taken together, the projects offered EEPS2 funding in January and February 2016, in combination with those projects supported by the CEF through the remainder of 2016, would have met or surpassed the projected 2016 CEF performance targets. Incentives for cooperative advertising, first plan review, and first rating incentives will no longer be offered due to several factors, including limited market interest, NYSERDA’s desire to reduce program complexity, and because some of the intended outcomes associated with these incentives are no longer being achieved. The values presented in sections 2.9.6, 2.9.7 and 2.9.8 have been updated to reflect 2016 commitments as well as revised projections for 2017 and additional funds and related metrics for 2018 to reflect the increased participation now projected, accommodating those factors detailed above. While the 2016 performance metrics were calculated relative to the then-current 2010 NYS Energy Conservation Construction Code (ECCC) of NYS, the revised 2017 and 2018 metrics rely on the ECCC of NYS adopted in October 2016 as the reference baseline.

### 2.9.1 Program Description

The 2016-2018 Low-rise Residential New Construction Program focuses on:

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<sup>53</sup> The electric only scenario was calculated by deducting the impacts of gas savings measures from the program. The program budget is likely to remain the same since no gas incentives are offered and the cost for the technical analysis to support gas measures is minimal once a whole building energy model has been created.

- Increasing information on, awareness of, and demand for deep energy savings and zero net energy construction for new and gut rehab in, generally, building up to three-stories in height, in both the market-rate and LMI sectors
- Strengthening the capacity of clean energy partners in the building design, construction and performance verification.
- Supporting New York State (NYS) and New York City (NYC) housing agencies, funding authorities, and municipalities in their efforts to secure the most efficient, durable, resilient and healthy housing, based on technical and economic feasibility, while striving to maximize effective use of the resources available to achieve those goals. These activities are significantly but not exclusively targeting the LMI housing sector.
- Identifying and promoting integrated design solutions which are replicable, with a focus on cost optimization analysis, financing strategies which recognize operational costs and savings, and management of perceived risks.
- Extending the existing Low-rise Residential New Construction Program, now structured to closely align with the Multifamily New Construction Program.

### ***Program Delivery***

- An open enrollment approach that delivers technical oversight and administrative services in a manner closely aligned with the Multifamily New Construction Program, while supporting market-based delivery of qualified technical services through recognition of third party certifications and licensing.
- Technical assistance to projects seeking to achieve high performance energy efficiency.
- Program incentives to housing developers and builders and RESNET-accredited Rating Quality Assurance Providers as direct recipients.
- Targeted technical support, available to architects, engineers, designers, and third-party verifiers or other technical consultants. More extensive support will be targeted to developers, design professionals and projects willing to pursue higher building performance, inclusive of net zero energy (NZE) performance.
- Technical support and collaboration with other NYS agencies and entities.
- Program Quality Assurance (QA) services through third parties such as RESNET-accredited Rating Quality Assurance Providers, or qualified certifiers/verifiers to one of the Passive House standards. NYSERDA staff responsibilities include: oversight for tracking participant status and incentive processing, as well as the final determination of project eligibility.

## 2.9.2 Target Market & Customer/Project Eligibility Rules

### ***Target Market***

The target market includes market rate and LMI single family homes and multi-unit residential buildings, generally up to three-stories in height, across the Market-Rate and LMI sectors, and inclusive of gut rehab projects.

### ***Eligibility***

Eligible participants include builders and developers who intend to deliver high performance housing projects. To be eligible for program participation, an applicant must be, or be capable and intend to be, a New York State electricity distribution customer of a participating utility company who pays into the SBC.

### 2.9.3 Incentives/Services Offered

Program support and incentives will be provided in three tiers:

- Tier 1: Requires energy performance at least equivalent to the U.S. Environmental Protection Agency (EPA) ENERGY STAR Certified Homes Program Version 3.0. For certain gut rehabilitation projects, requirements not deemed economically justified may be waived and the modified performance requirements would support the Energy \$mart<sup>54</sup> designation. Incentives will not be provided for Tier 1; however, the Tier is being maintained to provide Program technical support, oversight and verification on projects to validate performance, thereby increasing confidence by housing agencies and financial underwriting institutions that projects will deliver as promised.
- Tier 2: Requires energy performance at least equivalent to the EPA ENERGY STAR Certified Homes Program Version 3.1 with the following exception: for certain gut rehabilitation projects, requirements not deemed economically justified may be waived and the modified performance requirements would support the Energy \$mart designation. Tier 2 performance criteria and the related incentives will initially match those as currently published by NYSERDA<sup>55</sup>. Adjustments may be adopted to reflect advancements in the market's capacity to cost-effectively achieve increasing levels of performance or other market conditions, as well as to reflect changes to the ECCC.
- Tier 3: Requires energy performance that meets Tier 2 requirements plus an enhanced HERS Index or equivalent measure of performance which, inclusive of installed photovoltaics, indicates deep energy savings or near net-zero performance will be achieved.<sup>56</sup> Tier 3 performance criteria and the related incentives will initially match those published by NYSERDA<sup>57</sup>. Adjustments may be adopted to reflect advancements in the market's capacity to cost-effectively achieve increasing levels of performance or other market conditions, as well as to reflect changes to the NYS ECCC.

#### ***Other Incentives***

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<sup>54</sup>The Energy \$mart designation is a Program designation offered for certain gut rehabilitation projects, where meeting the EPA ENERGY STAR Certified Homes criteria such as the envelope and water management requirements may not be economically justified.

<sup>55</sup> NYSERDA's <https://www.nyserda.ny.gov/newconstruction-Res> webpage offers summary information as well as hyperlinks to details specific to the current Low-rise Residential New Construction Program.

<sup>56</sup> On-site and/or renewable generation are not eligible for installation incentives through this offering, and are not restricted by participation in this offering from receiving incentives through NY-Sun or other renewable offerings.

<sup>57</sup> NYSERDA's <https://www.nyserda.ny.gov/newconstruction-Res> webpage offers summary information as well as hyperlinks to details specific to the current Low-rise Residential New Construction Program.

An incentive per qualified dwelling unit is offered to RESNET-accredited Providers, as currently published by NYSERDA.<sup>58</sup> Depending on market needs, this offer may be continued, modified, or extended to other third-party entities deemed by NYSERDA to can deliver the required services to the market and to NYSERDA.

#### 2.9.4 Performance Management

NYSERDA will monitor a sampling of projects and analyze the resulting data. The results of this monitoring and analysis, as well as any changes to NYS energy code, and participation levels, will inform if/when adjustments to the Program are necessary.

Technical assistance may be offered to participating builders, developers and to HERS raters involved in the construction of high-performance projects.

Quality Assurance will be performed by RESNET-accredited Providers based on Residential Energy Services Network (RESNET) technical standards. Other third-party entities deemed by NYSERDA to be capable of delivering the required services to the market and to NYSERDA may additionally be relied on to deliver quality assurance.

Metrics associated with energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting. An independent evaluation effort will review data from projects to verify energy benefits. Additional impact evaluation work, including potentially engineering analysis, site visits and modeling, will occur as needed to further verify energy and other benefits. Validating baseline assumptions and as-built conditions will be important aspects of ensuring rigorous and defensible energy savings for new construction.

To draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

#### 2.9.5 Relationship to Utility Programs

Utilities currently do not offer new construction programs for this sector at this time.

Utilities offer rebates and incentives for equipment on existing buildings. For gut rehabilitation projects, there is potential for replacement of existing equipment to receive capital incentives through a utility incentive program. Utility rebates are paid to the homeowner, incentives available through the Program are paid to the builders and developers.

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<sup>58</sup> NYSERDA's <https://www.nyserda.ny.gov/newconstruction-Res> webpage offers summary information as well as hyperlinks to details specific to the current Low-rise Residential New Construction Program.



To the extent utility companies' support activities in these areas, NYSERDA will collaborate to identify synergistic approaches that move the construction market towards higher performance, minimize market disruption, and avoid market confusion.

### 2.9.6 Budgets & Expenditures<sup>59,60</sup>

<b>Budget</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Market Rate	Incentives & Services	\$1,230,000	\$1,020,000	\$1,270,000	\$3,520,000
	Program Implementation	\$107,000	\$562,000	\$648,000	\$1,317,000
	Sub-Total	\$1,337,000	\$1,582,000	\$1,918,000	\$4,837,000
LMI	Incentives & Services	\$1,290,000	\$2,340,000	\$3,150,000	\$6,780,000
	Program Implementation	\$107,000	\$625,000	\$975,000	\$1,707,000
	Sub-Total	\$1,397,000	\$2,965,000	\$4,125,000	\$8,487,000
<b>Total</b>		<b>\$2,743,000</b>	<b>\$4,547,000</b>	<b>\$6,043,000</b>	<b>\$13,324,000</b>

<b>Expenditures<sup>61</sup></b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Total	5%	20%	35%	25%	15%

### 2.9.7 Performance Metrics<sup>62</sup>

#### Market Rate

<b>Primary Metrics<sup>63</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	2,030	2,210	2,770	7,010
	MWh Lifetime	40,700	44,300	55,300	140,300

<sup>59</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>60</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>61</sup>Expenditures are estimated based on the typical design and construction schedules for single family and low-rise multifamily projects, and on the timing of NYSERDA application within that process. While it is anticipated the vast majority of projects will be completed within the time frame shown, the expenditure projections do not indicate a 2-year project completion requirement.

<sup>62</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life.

<sup>63</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

	MMBtu Annual	22,500	25,900	30,500	78,900
	MMBtu Lifetime	450,000	517,000	610,000	1,577,000
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		2,260	2,540	3,070	7,870
CO2e Emission Reduction (metric tons) Lifetime		45,300	50,700	61,400	157,400
Customer Bill Savings Annual (\$ million)		\$0.54	\$0.60	\$0.73	\$1.86
Customer Bill Savings Lifetime (\$ million)		\$10.7	\$11.9	\$14.6	\$37.20
Private Investment (\$ million)		\$4.5	\$5.9	\$7.4	\$17.73

#### LMI

Primary Metrics <sup>64</sup>		2016	2017	2018	TOTAL
Energy Efficiency	MWh Annual	1,600	2,470	3,700	7,700
	MWh Lifetime	31,900	49,300	74,000	155,200
	MMBtu Annual	15,800	21,300	29,800	66,900
	MMBtu Lifetime	315,000	425,000	596,000	1,336,000
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		1,680	2,420	3,530	7,630
CO2e Emission Reduction (metric tons) Lifetime		33,500	48,500	70,600	152,600
Customer Bill Savings Annual (\$ million)		\$0.40	\$0.59	\$0.87	\$1.86
Customer Bill Savings Lifetime (\$ million)		\$8.1	\$11.8	\$17.4	\$37.25
Private Investment (\$ million)		\$5.8	\$8.6	\$11.3	\$25.73

<sup>64</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<b>Additional Performance Tracking Metrics</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Participants <sup>65</sup>	Market Rate	723	993	1,210	2,926
	LMI	1,292	1,810	2,227	5,329
	Total	2,015	2,803	3,437	8,255

2.9.8 Benefit Cost Analysis

The BCA summarized in the table below represents a total resource cost test, consistent with the benefit cost analysis framework described in the January 21, 2016 Order.<sup>66</sup> The benefit estimate includes avoided energy (electricity, natural gas, and oil), generation capacity, distribution capacity, and social cost of carbon.<sup>67</sup> Costs are defined as all costs associated with the energy efficiency program, including program specific costs, Administration, CRF, and evaluation, measurement, and verification, as well as customer costs. The analysis calculated the following benefit cost ratios:

	<b>2016 - 2018</b>
<b>Low Rise New Construction</b>	
Benefits (million 2015\$)	\$30
Costs (million 2015\$)	\$39.08
Benefit Cost Ratio	0.8

Consistent with the CEF, NYSERDA intends to offer incentives in a fuel neutral manner, with the intent to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State’s clean energy goals. Offering the program on a fuel neutral basis will allow us to achieve a ton of carbon savings at a cost of \$859, compared to a cost of \$1,046 in an electric only scenario.<sup>68</sup>

<sup>65</sup>Dwelling units.

<sup>66</sup>Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision. Order Establishing the Benefit Cost Analysis Framework. Issued and Effective January 21, 2016.

<sup>67</sup>The social cost of carbon is an estimate of the monetized damages to global society associated with an incremental increase in carbon emissions in a given year. It is intended to include changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change, etc.

<sup>68</sup>Electric only cost scenario figure was calculated by deducting the Gas portion of the proposed Builder Home Incentive total from the combined Market Rate and LMI Program budgets (exclusive of admin and CRF) and program budget to calculate the \$/MWh .

## 2.10 Multifamily New Construction

The Multifamily New Construction Program did not meet its 2016 projected targets. The most significant factors influencing lower 2016 participation include market uncertainty and impacts associated with the expiration of the New York City-focused property tax abatement program<sup>69</sup> formerly known as 421-a, as well as NYSERDA's later than anticipated program launch. NYS and NYC have re-authorized a property tax abatement opportunity intended to encourage development of mixed income multifamily buildings; specific market response is not yet clear, but increased NYC-based housing development is anticipated. In addition, NYSERDA learned that the per project incentive caps imposed on market rate projects were found by the market to be too restrictive in certain instances, therefore adjustments to those caps will be made to more equitably reward larger projects and the per dwelling unit incentives may be adjusted to align with the Low-rise Residential New Construction Program. The number of 2016 participants committing to achieving higher building performance or Tier 3 was higher than anticipated, relative to those willing to commit to the lower performance or Tier 2, resulting in increased savings per dwelling unit, but at the higher per dwelling unit incentive and associated project cost.

While 2016 performance metrics were calculated relative to the then-current ECCC of NYS, the revised 2017 and 2018 metrics rely on the ECCC of NYS adopted in October 2016 as the reference baseline. The subsequent changes to energy code drove down the overall savings, as the baseline the incremental savings are being calculated against is more energy efficient. These factors have been incorporated within the revised projections and values shown in sections 9.10.6, 9.10.7 and 9.10.8, to reflect 2016 commitments, the revised projections for 2017, as well as the additional funding and related metrics for 2018.

### 2.10.1 Program Description

The 2016-2018 Multifamily New Construction program focuses on:

- Increasing awareness of, information about, and demand for deep energy savings and zero net energy performance in the multifamily new construction and gut rehabilitation markets.
- Strengthening the capacity of clean energy professionals to deliver design and construction services to this market sector.
- Support NYS and NYC housing agencies, funding authorities, and municipalities in their efforts to secure the most efficient, durable, resilient and healthy housing, based on technical and economic feasibility, while striving to maximize effective use of the resources

available to achieve those goals. These activities are significantly but not exclusively targeting the LMI housing sector.

- Identify and promote integrated design solutions which are replicable, with a focus on cost optimization analysis, financing strategies which recognize operational costs and savings, and management of perceived risks.

Offering technical assistance, a multi-tiered incentive structure separated into two “per dwelling unit” categories, and potentially offering targeted incentives to support development of market-based quality assurance. This Program replaced the legacy Multifamily Performance Program’s (MPP) new construction component, a program that previously served high-rise residential new construction and gut rehabilitation projects. The multi-tiered incentive structure currently offered replaced the MPP singular “per dwelling unit” incentive, focusing support and incentives toward promotion of higher levels of comprehensive building and energy performance, up to and inclusive of net zero energy performance. In contrast to MPP, the new Program encourages photovoltaics and other renewables to be layered onto a project to achieve savings thresholds. The Program structure is closely aligned with the Low-rise Residential New Construction Program, delivering technical oversight and administrative support services through a common process, thereby creating a more unified market signal for the multifamily new construction sector.

### ***Program Delivery***

The Program will be open enrollment program, delivering technical oversight and administrative support services in a manner closely aligned with the Low-rise Residential New Construction Program, supporting market-based delivery of qualified technical services through recognition of third party certifications and licensing. Housing developers and builders will be direct recipients of program incentives.

Targeted technical support will be available to architects, engineers, designers, and third-party verifiers or other technical consultants. More extensive support will be targeted to developers, design professionals and projects willing to pursue higher building performance, inclusive of NZE performance. Technical support and collaboration with other NYS agencies and entities will be offered.

Validated performance thresholds and third-party standards will be incorporated by explicit and implicit reference within NYSERDA’s program structure.

Capital Incentives will be provided.

#### **2.10.2 Target Market & Customer/Project Eligibility Rules**

##### ***Target Market***

According to recent U.S. Census data, building permits for low-, mid- and high-rise multifamily housing reached an all-time high of 50,000 dwelling units through the 3<sup>rd</sup> quarter of 2015, more than double the number issued in all of 2014. Mid- and high-rise multifamily buildings, defined as buildings 4 or more stories in height, incorporate approximately 60 percent of that total, or 30,000

dwelling units. Program activities and efforts will focus on both market rate and LMI buildings and projects within this market sector which can achieve a higher level of performance.

### ***Eligibility***

Housing developers and builders will be required to deliver completed buildings and projects which meet the minimum performance criteria outlined below, in the Incentives/Services section. Project eligibility will be fuel-neutral. To be eligible for Program participation, an applicant must be, or be capable of and intend to be, a New York State electricity distribution customer of a participating utility company which pays into the SBC.

#### **2.10.3 Incentives/Services Offered**

Technical Program Support and incentives will be provided in three tiers:

- Tier 1: Requires energy performance at least equivalent to the U.S. Environmental Protection Agency (EPA) ENERGY STAR Multifamily High-Rise program, reflecting a predicted 15% utility cost savings above the current International Energy Conservation Code (IECC) – Commercial Provisions. For certain gut rehabilitation projects, requirements not deemed economically justified may be waived and the modified performance requirements would support the Energy \$mart designation. Technical support and access to NYSERDA’s compliance review would be available for LMI projects but no direct incentives will be offered. Tier 1 is being maintained to provide Program technical support, oversight and verification on projects to validate performance, thereby increasing confidence by housing agencies and financial underwriting institutions that projects will deliver as promised.
- Tier 2: Requires energy performance at least equivalent to the EPA ENERGY STAR Multifamily High-Rise program requirements, additionally requiring a minimum of 20% predicted utility cost savings above ASHRAE 90.1 2010, or 15% above the relevant NYS commercial energy code, whichever is greater. For certain gut rehabilitation projects, requirements not deemed economically justified may be waived and the modified performance requirements would support the Energy \$mart designation. Technical support and direct incentives will be available, with LMI projects eligible for higher levels of incentives. Tier 2 performance criteria will initially match those as currently published by NYSERDA<sup>70</sup>. Future adjustments may be adopted to reflect advancements in the market’s capacity to cost-effectively achieve increasing levels of performance or other market conditions, as well as to reflect future changes to the NYS Energy Conservation Construction Code (ECCC).
- Tier 3: Projects must meet or exceed performance criteria which qualifies as deep energy savings, inclusive of near net-zero performance. This level of performance will be established by demonstrating the building will achieve a NYSERDA-determined minimum percentage of energy cost savings above the relevant NYS commercial energy code. As

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<sup>70</sup> NYSERDA’s <https://www.nyserda.ny.gov/newconstruction-Res> webpage offers summary information as well hyperlinks to details specific to the current Multifamily New Construction Program.

alternatives, certification under high performance third-party energy performance standards such as PHIUS+ or the German-based Passive House Institute, may be deemed to be acceptable by NYSERDA. Technical support and direct incentives will be available, with LMI projects being eligible for higher levels of incentives.<sup>71</sup> Tier 3 performance criteria will initially match those as currently published by NYSERDA.<sup>70</sup> Future adjustments may be adopted to reflect advancements in the market's capacity to cost-effectively achieve increasing levels of performance or other market conditions, as well as to reflect future changes to the NYS ECCC.

#### Other Incentives:

- Depending on market needs and NYSERDA's goals related to market development in this area, an incentive per qualified dwelling unit may be offered to RESNET-accredited Providers, similar to offer as currently published by NYSERDA<sup>70</sup> for projects receiving support through the Low Rise Residential New Construction Program. Depending on market needs, targeted incentives may additionally be extended to other third party entities deemed by NYSERDA to be capable of delivering the required services to the market and to NYSERDA as a mechanism to support development of market-based quality assurance.

#### 2.10.4 Performance Management

Overall, NYSERDA will regularly review program participation and project performance, as well as expected updates to the New York State Energy Conservation Construction Code, to determine whether changes in incentives, caps or eligible projects are needed to improve efficacy of program implementation. Program staff and contractors will provide guidance and review of building designs, energy models, and construction practices; while also directing support toward and leveraging third party verifiers and certification organizations which target high performance design and construction. Directed quality assurance and support will be provided by program staff and contractors, while leveraging third party verifiers and certification organizations which target high performance building design and construction.

Metrics associated with energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting. An independent evaluation effort will review data from projects in order to verify energy benefits. Additional impact evaluation work, including potentially engineering analysis, site visits and modeling, will occur as needed to further verify energy and other benefits. Validating baseline assumptions and as-built conditions will be important aspects of ensuring rigorous and defensible energy savings for new construction.

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<sup>71</sup>Although on-site and/or renewable generation are not eligible for installation incentives through this offering, integration or use of renewable generation will be strongly encouraged for projects aiming to meet Tier 3 NYSERDA-determined energy performance thresholds. The resulting on-site and and/or renewable generation solutions are not restricted by participation in this Program from receiving incentives through NY-Sun or other renewable offerings.

In order to draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

#### 2.10.5 Relationship to Utility Programs

Utilities currently do not offer new construction programs at this time. Utilities do offer rebates and incentives for equipment on existing buildings. For gut rehabilitation projects, there is potential for replacement of existing equipment to receive capital incentives through a utility incentive program.

To the extent utility companies' support activities in these areas, NYSERDA will collaborate to identify synergistic approaches that move the construction market towards higher performance, minimize market disruption, and avoid market confusion.

#### 2.10.6 Budgets & Expenditures<sup>72,73</sup>

<b>Budget</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Market Rate	Incentives & Services	\$480,000	\$624,000	\$882,000	\$1,986,000
	Program Implementation	\$165,000	\$310,000	\$273,000	\$748,000
	Sub-Total	\$645,000	\$934,000	\$1,155,000	\$2,734,000
LMI	Incentives & Services	\$2,950,000	\$2,790,000	\$3,280,000	\$9,020,000
	Program Implementation	\$309,000	\$600,000	\$950,000	\$1,859,000
	Sub-Total	\$3,259,000	\$3,390,000	\$4,230,000	\$10,879,000
<b>Total</b>		<b>\$3,904,000</b>	<b>\$4,324,000</b>	<b>\$5,385,000</b>	<b>\$13,613,000</b>

<sup>72</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>73</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.



<b>Expenditures<sup>74</sup></b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Total	5%	5%	20%	30%	25%	15%

## 2.10.7 Performance Metrics<sup>75,76</sup>

### Market Rate

<b>Primary Metrics<sup>77</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	571	1,960	2,740	5,271
	MWh Lifetime	11,400	39,300	54,900	105,600
	MMBtu Annual	3,780	8,910	15,800	28,490
	MMBtu Lifetime	75,500	178,000	316,000	569,500
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		501	1,510	2,280	4,291
CO2e Emission Reduction (metric tons) Lifetime		10,000	30,100	45,600	85,700
Customer Bill Savings Annual (\$ million)		\$0.10	\$0.31	\$0.45	\$0.86
Customer Bill Savings Lifetime (\$ million)		\$1.9	\$6.2	\$9.0	\$17.19
Private Investment (\$ million)		\$2.7	\$7.5	\$10.6	\$20.82

<sup>74</sup>Expenditures are estimated based on the typical design and construction schedules for multifamily projects, and on the timing of NYSERDA application within that process. While it is anticipated the vast majority of projects will be completed within the time frame shown, the expenditure projections do not indicate a 4-year project completion requirement.

<sup>75</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life.

<sup>76</sup> The 2016 performance metrics were calculated relative to the then-current ECCC of NYS. The revised 2017 and 2018 metrics reflect reliance on the ECCC of NYS adopted in October 2016 as the reference baseline.

<sup>77</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

**LMI**

<b>Primary Metrics<sup>78</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	5,120	4,910	5,490	15,520
	MWh Lifetime	102,000	98,200	110,000	310,200
	MMBtu Annual	27,200	22,300	31,600	81,100
	MMBtu Lifetime	544,000	446,000	632,000	1,622,000
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO <sub>2</sub> e Emission Reduction (metric tons) Annual		4,130	3,760	4,560	12,450
CO <sub>2</sub> e Emission Reduction (metric tons) Lifetime		82,700	75,300	91,300	249,300
Customer Bill Savings Annual (\$ million)		\$0.83	\$0.78	\$0.90	\$2.51
Customer Bill Savings Lifetime (\$ million)		\$16.6	\$15.5	\$18.1	\$50.20
Private Investment (\$ million)		\$22.4	\$18.9	\$21.1	\$62.40

<b>Additional Performance Tracking Metrics</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Participants <sup>79</sup>	Market Rate	289	1,000	1,400	2,689
	LMI	2,557	2,500	2,800	7,857
	Total	2,846	3,500	4,200	10,546

<sup>78</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<sup>79</sup> Dwelling units.

## 2.10.8 Benefit Cost Analysis

The BCA summarized in the table below represents a total resource cost test, consistent with the benefit cost analysis framework described in the January 21, 2016 Order.<sup>80</sup> The benefit estimate includes avoided energy (electricity, natural gas, and oil), generation capacity, distribution capacity, and social cost of carbon.<sup>81</sup> Costs are defined as all costs associated with the energy efficiency program, including program specific costs, Administration, CRF, and evaluation, measurement, and verification, as well as customer costs. The analysis calculated the following benefit cost ratios:

	2016 - 2018
<b>Multifamily New Construction</b>	
Benefits (million 2015\$)	\$45
Costs (million 2015\$)	\$47.18
Benefit Cost Ratio	0.9

Consistent with the CEF, NYSERDA intends to offer incentives in a fuel neutral manner, with the intent to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State's clean energy goals. Offering the program on a fuel neutral basis will allow us to achieve a ton of carbon savings at a cost of \$813, compared to a cost of \$913 in an electric-only scenario. The costs for the electric-only scenario costs were determined by calculating weighted average of the electric-only LMI and Market Rate \$/MWh values, and an assumed incentive level which targets a comprehensive building approach to achieving electric-only savings, ensuring electric space conditioning and other end uses were incorporated, while relying on the full program budget to estimate MWh savings potential.

## 2.11 Anaerobic Digesters

NYSERDA launched the Anaerobic Digester Resource Acquisition transition program in 2016 as a first-come, first-served formula-based incentive program, consistent with the prior Renewable Portfolio Standard Customer-Sited Tier program. A total of \$4 million was committed in 2016, representing 2 projects and 1.13 MW. NYSERDA will pivot the format of the program in 2017 to a competitive selection format in an effort to strategically source pilot projects that have the potential to yield improved economic value and thereby proceed at reduced incentives from the ratepayers.

NYSERDA's Anaerobic Digester Gas (ADG)-to-Electricity program had traditionally granted up to \$2 million per project at dairy farms and wastewater treatment plants. Historically, uptake of funds for the ADG-to-Electricity program had been low relative to comparable technologies. Further, over the

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<sup>80</sup>Case 14-M-0101, Proceeding on the Motion of the Commission in Regard to Reforming the Energy Vision. Order Establishing the Benefit Cost Analysis Framework. Issued and Effective January 21, 2016.

<sup>81</sup>The social cost of carbon is an estimate of the monetized damages to global society associated with an incremental increase in carbon emissions in a given year. It is intended to include changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change, etc.

program's life-span, 50% of applications have dropped out of the program. Partly for these reasons, NYSERDA's budget for the technology on an annual basis has been set at an appropriately decreased level in the CEF. To further address the clean energy needs of New York's agricultural sector, NYSERDA and New York State Department of Agriculture and Markets continue to co-chair a "Clean Energy for Agriculture Task Force," which delivered recommendations to increase deployment of renewable energy and energy efficiency on farms, including ADG-to-Electricity, in March 2017.

The work of the Clean Energy for Agriculture Task Force has helped NYSERDA formulate concepts for shifting strategy to initiatives and pioneering projects that offer the prospect of reducing costs, improving performance and value, and developing and demonstrating sustainable business models that will enable projects to pursue market-based compensation to be available via REV. Therefore, NYSERDA is now pivoting the ADG-to-Electricity program to provide support for analysis and coaching regarding cost-reduction and revenue-enhancement strategies, and incentives for competitively-selected projects to pilot a number of installations that demonstrate such features.

### 2.11.1 Program Description

The ADG-to-Electricity Incentive program offering for 2017-2018 will continue to provide financial support to assist typically rural facilities with projects to install on-site renewable distributed generation equipment to help reduce their energy expenses as well as their carbon footprint, but the incentives will now be offered via a competition.

NYSERDA anticipates that one or more project developers, each building a cluster of projects in close geographic proximity, can provide economy-of-scale to reduce various costs (e.g., customer acquisition, design/engineering, equipment procurement, and construction mobilization).

Furthermore, the scale represented by a cluster of projects can lead to:

- Achievement of long-term, stable relationships with sources of organic substrates (such as food wastes) that can benefit projects via revenues for tipping fees, as well as increasing the amount of biogas and the resultant electricity that the projects can generate
- Administrative efficiencies and economic gains associated with marketing of the ADG-to-Electricity outputs, such as environmental attributes, "green" branding, and digested solids

NYSERDA envisions acting in the role of convener, to help create meet-and-greet events where prospective host sites, food waste suppliers, project developers, and other stakeholders, can explore formation of teams leading to clusters of projects. Additionally, NYSERDA will work with stakeholders to provide support for analysis and coaching regarding cost-reduction and revenue-enhancement strategies. NYSERDA will simultaneously develop a competitive solicitation to invite proposals that seek incentive funds to install a pilot project; such a competitive solicitation will likely be issued near the end of 2017 with proposals due in early 2018.

#### ***Program Delivery***

Proposers will submit required documentation in accordance with a due date. The proposals will be reviewed by a Technical Evaluation Panel consisting of NYSERDA and non-conflicted external experts, to determine eligibility of and preference for the project. Eligibility review will include, but

is not limited to, ensuring that the project proposes to use commercially-mature equipment, and that the host sites pay the System Benefits Charge on their electric bill. Additionally, the preference review will include, but is not limited to, relative magnitude of subsidy (dollars-per-megawatt-hour), pioneering aspects to reduce costs and enhance revenues, and the skills and capability of proposing team to successfully demonstrate innovative project aspects. Teams whose proposals are selected by NYSERDA to receive an award will be offered a contract specifying deliverables that would need to be achieved in order to be eligible to submit an invoice to NYSERDA (NYSERDA will disburse funds after proof of successful completion of project milestones). The contract can be established such that NYSERDA incentive payments can be made to the project developer/installer, the host customer, or a third party.

### ***Personnel and Roles***

- **NYSERDA staff:** Program management, Technical Evaluation Panel review, general project management, and project payments.
- **Third party technical reviewers:** Participate directly on the Technical Evaluation Panel review.
- **Third party technical contractors:** Assist NYSERDA staff with preparation for NYSERDA staff participation on the Technical Evaluation Panel review as needed based on project complexity and/or workload, and conduct project site inspections during and/or after construction as directed by NYSERDA.
- **Outreach contractors:** Through a competitive solicitation, NYSERDA has previously selected a team led by Cornell University to provide Anaerobic Digester Assistance (also referred to as ADG Ombudsman services). The remaining term of this contract, including an option for a one-year extension, will enable this service into late 2018.

NYSERDA has provided many years of incentive support to ADG-to-Electricity systems, but, for various reasons, ADG systems continue to have very low penetration in the marketplace and relatively high costs. For example, the adoption of NYSERDA's Anaerobic Digester Gas-to-Electricity program has progressed slowly despite multiple potential applications and business model solutions. NYSERDA's ADG Ombudsman can provide guidance to dairy farmers during their exploration and implementation of ADG-to-Electricity. With the recent acquisition of market insights that have pinpointed meaningful intervention strategies (such as via the pending report from the Clean Energy for Agriculture Task Force), NYSERDA is now ready to pivot away from the general features of the historic incentive program structure (rolling admission first-come-first-served incentives) in favor of a competitive-selection program structure.

In 2017, NYSERDA is shifting strategy to initiatives and pioneering projects that offer the prospect of reducing costs, improving performance and value, and developing and demonstrating sustainable business models through demonstration projects that will highlight best practices (such efforts will strive to determine and inform marketplace participants of ADG-to-Electricity project

attributes that can maximize the value to be available via REV<sup>82</sup>) -- in 2016 and 2017 NYSERDA conducted a small amount of initial exploration of these opportunities and believes that such an adjustment will provide more impact toward CEF goals.

NYSERDA coached the utilities to each establish a utility employee to serve as a Distributed Generation Ombudsman for their territory, an important role that has been successfully demonstrated at Con Edison.

### 2.11.2 Target Market & Customer/Project Eligibility Rules

#### ***Target Market***

The target market includes all eligible customers seeking to have an ADG-to-Electricity system installed in a grid-connected manner. The ADG-to-Electricity system must consist of commercially-available technologies and the system design must be well-conceived (e.g., the digester portion is appropriate for the amount and type of organic feedstock, and the electric generator portion is appropriate for the producible quantity and characteristic of biogas), and the ADG biogas fuel must be derived from eligible biomass feedstocks.

#### ***Eligibility***

Participants seeking to serve as the host site for an ADG-to-Electricity project must be New York State electricity distribution customers of a participating utility company who pay the SBC (it is expected that such host sites will be members of a proposal that addresses a cluster of projects, as opposed to a proposal that represents a single site, in order to leverage the economic values that can be derived from clustering and thereby compete effectively in relation to other proposals that NYSERDA may receive). Host sites can be, but are not limited to, dairy farms, wastewater treatment plants, and sources of food wastes (such as food processing industries, colleges, hospitals, prisons, etc.). The available incentive budget in 2016 was \$4,000,000 and was fully-awarded to projects; NYSERDA anticipates combining the available incentive budget of 2017 of \$4,000,000 and the available incentive budget of 2018 of \$4,000,000 into a competitive solicitation to be issued approximately in late 2017 offering the available total of \$8 million.

### 2.11.3 Incentives/Services Offered

There was no significant changes in 2016 compared to the previous NYSERDA offering. For 2016, the NYSERDA incentive was a combination of capacity incentives, interconnection support incentives, and performance-based incentives. The maximum incentive available was \$2,000,000 per project/site.

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<sup>82</sup>In a broader perspective, New York State is pursuing the Reforming the Energy Vision (REV) strategies, an effort which, through regulatory reform, is intended to provide appropriate compensation for the value that distributed energy resources bring to the localized and overall management of the electric grid. Distributed generation, including but not limited to ADG-to-Electricity systems, are a type of distributed energy resource that will find opportunities for improved value propositions under REV. NYSERDA is engaged with the REV proceeding, and will provide information and insights throughout the process to help establish a marketplace where distributed energy resources can leverage their particular values. Through REV, the standby tariff, and the rules for electrical interconnection (Standard Interconnection Requirement -- SIR) are being assessed for improvements, and this is expected to provide important benefits to distributed generation, including but not limited to ADG-to-Electricity systems.

Changes to the program for 2017-2018 will be as generally described herein and will be further detailed in a competitive solicitation, anticipated to be issued near the end of 2017. Such competitive solicitation will be developed taking into consideration feedback from stakeholders to be gathered throughout the latter half of 2017, and will specify the combination of features of the incentives (e.g., whether the incentive structure will consist of one or more aspects such as capacity incentives, interconnection support incentives, performance-based incentives, or other styles of incentives), and whether a maximum incentive per project/per site should be incorporated and if so what those limits should be.

Noting that NYSERDA's pivot to a competitive solicitation is intended to strategically source pilot projects that can proceed at lower cost to ratepayers, it is expected that the magnitude of subsidy requested by a proposal (dollars-per-megawatt-hour) should be significantly lower than the dollar-per-megawatt-hour cost to ratepayers experienced in the prior ADG-to-Electricity program. NYSERDA may establish, and withhold from publication, a maximum dollars-per-megawatt-hour "upset price" above which projects would not be awarded.

#### 2.11.4 Performance Management

NYSERDA has regularly monitored market interest and uptake of available funds to inform program adjustments as needed based on market response. NYSERDA will also monitor project completion timelines to ensure installation and commissioning of all equipment generally occurs within 14 months of a fully executed contract with NYSERDA (projects failing to meet this timeline may be subject to termination). Metrics associated with energy generation, capacity installed, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting.

Program plans include a NYSERDA site inspection for each project, hourly-interval data collection on system performance, and site-level measurement and verification. This data will be used to monitor performance of installed systems (and to support performance-based incentive payments if such feature gets specified in the solicitation). An independent evaluation effort will review data from the program site inspections, data collection and M&V to verify energy benefits. Additional impact evaluation work will only occur as needed to verify energy and other benefits.

In order to draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit.

#### 2.11.5 Relationship to Utility Programs

In the past, utilities have not administered programs to incentivize installation of ADG-to-Electricity systems, and it is expected that utilities will not commence administration of programs to incentivize installation of ADG-to-Electricity systems.

### 2.11.6 Budgets & Expenditures<sup>83,84</sup>

<b>Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Incentives & Services	\$4,000,000	\$4,000,000	\$4,000,000	\$12,000,000
Program Implementation	\$50,000	\$50,000	\$50,000	\$150,000
<b>Total</b>	<b>\$4,050,000</b>	<b>\$4,050,000</b>	<b>\$4,050,000</b>	<b>\$12,150,000</b>

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Further Out Years<sup>85</sup></b>
Total	5%	5%	10%	15%	65%

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<sup>83</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>84</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>85</sup> The program has, and may continue to, disburse a portion of the award in the form of performance-based payments that will occur over a ten-year duration.



### 2.11.7 Performance Metrics<sup>86</sup>

<b>Primary Metrics<sup>87</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MMBtu Annual	-	-	-	-
	MMBtu Lifetime	-	-	-	-
	MW	-	-	-	-
Renewable Energy	MWh Annual	7,440	15,000	15,000	37,440
	MWh Lifetime	74,400	150,000	150,000	374,400
	MW	-	-	-	-
CO <sub>2</sub> e Emission Reduction (metric tons) Annual		3,920	8,000	8,000	19,920
CO <sub>2</sub> e Emission Reduction (metric tons) Lifetime		39,200	80,000	80,000	199,200
Customer Bill Savings Annual (\$ million)		\$0.99	\$2.0	\$2.0	\$4.99
Customer Bill Savings Lifetime (\$ million)		\$9.99	\$20.0	\$20.0	\$49.99
Private Investment (\$ million)		\$19.0	\$40.0	\$40.0	\$99.00

<b>Additional Performance Tracking Metrics</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Participants	2	4	4	10

### 2.11.8 Fuel Neutrality

The majority of program efforts will be electric focused (i.e., incentives for installation of ADG-to-Electricity systems). The program may conduct a small amount of initial exploration of market transformation activities, which may, or may not, involve fuel-neutral-type projects. If fuel-neutral type

<sup>86</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Incentive commitments in 2017 and 2018 will be through a competition; NYSERDA currently has limited insight to the competitive pricing that could be achieved, therefore, a presumed improvement (compared to previous experience in 2016, for a given financial incentive borne by the ratepayers, a doubling of the benefits produced by projects) is herein used to create projections but may be subject to revision as NYSERDA gains more experience.

<sup>87</sup> Benefits in annual columns are rounded to three significant figures; in total column are rounded to four significant figures. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

projects are considered, they will be assessed on a case-by-case basis to ensure conformance with CEF requirements regarding fuel neutrality.

## 2.12 Fuel Cells

NYSERDA did not move forward with the Fuel Cell Resource Acquisition Transition Program as planned. NYSERDA is currently working with stakeholders and equipment vendors and evaluating options for the fuel cell market and will reflect fuel cell activities in a future revision.

## 2.13 Small Wind

The Small Wind Program did not meet its 2016 projected targets. The Small Wind Program was intended to provide the marketplace with support for turbines ranging in size 2 MW and smaller, where the electricity produced would primarily be used behind the customer's meter(s) via net metering or remote net metering. As evidenced in 2016 by the size of turbines matched to customers' loads who have participated in this Program, a very small turbine (size 10 kW) was predominantly chosen. As a result, since the Program's incentive formula provides a sliding-scale dollars-per-megawatt rate which is highest for these very small turbines (rate is lower for larger turbines which can benefit from economy-of-scale), the Program underachieved in 2016 for acquired megawatts relative to committed budget, and this trend is expected to continue in 2017 and 2018. The benefits in section 2.13.7 have been updated to reflect 2016 actuals, as well as revising the 2017 and 2018 anticipated performance metrics.

### 2.13.1 Program Description

The Small Wind Incentive program offering provides financial support to assist typically rural facilities with projects to install on-site renewable distributed generation equipment to help reduce their energy expenses as well as their carbon footprint.

This program will be an extension of the previous RPS CST Small Wind program.

#### ***Program Delivery***

Applicants will submit required documentation to be reviewed by NYSERDA to determine eligibility of the project (a list of Eligible Equipment is maintained by NYSERDA). Each project will receive a purchase order upon approval. Installation is completed by firms/vendors (on NYSERDA's list of Eligible Installers) that the customer retains on their own. Technical Review is conducted by NYSERDA staff. Cost-sharing or incentives will be administered by NYSERDA after proof of successful completion of project milestones. NYSERDA incentive payments will be made to the project's Eligible Installer, who must pass the incentive along in its entirety to the host customer).

The Small Wind program offering will be open-enrollment. Applications will be accepted on a first-come, first-served basis dependent on funding availability.

## ***Personnel and Roles***

- **NYSERDA staff:** Program management, project eligibility review, general project management, and project payments.

NYSERDA's experience with small wind turbines over the past eight years confirms the persistence of a long time horizon until these solutions approach cost-competitiveness. In order to provide some market stability and bridge until acquisition of market insights can pinpoint meaningful intervention strategies, the general features of the historic incentive program structure (rolling admission first-come-first-served incentives) for Small Wind will continue, subject to the outcome of current discussions with stakeholders. The budget level will be commensurate with the recent historic actual uptake experienced during the planning cycle of the CEF.

By 2017, NYSERDA anticipates shifting strategy to initiatives and pioneering projects that offer the prospect of reducing soft costs, improving performance and value, and developing and demonstrating sustainable business models through demonstration projects and best practices studies (such efforts will strive to determine and inform marketplace participants of small on-site wind turbine project attributes that can maximize the value to be available via REV<sup>88</sup>) -- in 2016 and 2017 NYSERDA will conduct a small amount of initial exploration of these opportunities. If, in consultation with stakeholders, NYSERDA determines that such an adjustment will provide more impact toward CEF goals, we will file an amendment outlining the new strategies.

NYSERDA will coach the utilities to each establish a utility employee to serve as a Distributed Generation Ombudsman for their territory, an important role that has been successfully demonstrated at Con Edison.

### 2.13.2 Target Market & Customer/Project Eligibility Rules

#### ***Target Market***

The target market includes all eligible customers seeking to have an eligible wind turbine installed by an eligible installer in a grid-connected manner. A list of eligible wind turbines up to a given size is maintained by the Interstate Turbine Advisory Council (ITAC) (<http://www.cesa.org/projects/ITAC/itac-unified-list-of-wind-turbines/>); commercially-available turbines larger than those assessed by ITAC, but not exceeding 2,000 kW nameplate rating, will be assessed for program eligibility by NYSERDA on a case-by-case basis considering various factors including but not limited to proven record for power performance, reliability, safety, and acoustics. A list of eligible installers is maintained by NYSERDA.

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<sup>88</sup>In a broader perspective, New York State is pursuing the Reforming the Energy Vision (REV) strategies, an effort which, through regulatory reform, is intended to provide appropriate compensation for the value that distributed energy resources bring to the localized and overall management of the electric grid. Distributed generation, including but not limited to small on-site wind turbines, are a type of distributed energy resource that will find opportunities for improved value propositions under REV. NYSERDA is engaged with the REV proceeding, and will provide information and insights throughout the process to help establish a marketplace where distributed energy resources can leverage their particular values. In particular, through REV, the standby tariff, and the rules for electrical interconnection (Standard Interconnection Requirement -- SIR) are being assessed for improvements, and this is expected to provide important benefits to distributed generation, including but not limited to small on-site wind turbines.

## ***Eligibility***

The Small Wind Incentive program is eligible to all sectors, including but not limited to residential, commercial, industrial, agricultural, institutional, educational, not-for-profit, and government-owned facilities. Participants must be New York State electricity distribution customers of a participating utility company who pay into the SBC.

### **2.13.3 Incentives/Services Offered**

There will be no significant changes in 2016 to the previous NYSERDA offering. Changes to the program for 2017 will be detailed in a subsequent plan, to be issued prior to such changes.

For 2016, the NYSERDA incentive will be based on the expected annual energy output (AEO) of the proposed wind energy system, at the proposed location. If multiple wind turbines are installed at a site, the NYSERDA incentive is based on the AEO of all wind turbines combined in aggregate (not to exceed 2,000 kW) and is not based on the AEO of each individual wind turbine. The AEO must be calculated by a NYSERDA-approved wind resource assessment tool. NYSERDA will apply a retro-graded formula to the AEO in order to compute the magnitude of the incentive (i.e., a higher incentive rate will be applied to the first block of production within the AEO, and a lower incentive rate will be applied to the next block of production within the AEO, etc.). The maximum incentive available is \$1,000,000 per site/customer. The maximum total equipment size is 2 MW (2,000 kW) per site/customer. The NYSERDA incentive will not exceed 50% of the total installed cost of the wind energy system.

### **2.13.4 Performance Management**

NYSERDA will regularly monitor market interest and uptake of available funds and will make adjustments as needed based on market response. NYSERDA will also monitor project construction timelines; all the wind energy system components should be delivered to the customer's site within 120 days of the NYSERDA-contract starting date (projects failing to meet this timeline may be subject to termination).

Metrics associated with energy generation, capacity installed, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting.

All implementation assistance projects, as part of this program, will be reviewed by a NYSERDA technical reviewer prior to approval and payment. This Program is not intended to provide technical review services for in-eligible projects.

In addition to the technical review services stated above, all participants will be subject to NYSERDA inspection, and a sampling of projects will undergo project-level data collection and M&V. An independent evaluation effort will review data from site inspections, project-level data collection and M&V to verify energy benefits. Additional impact evaluation work will only occur as needed to verify energy and other benefits.

In order to draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with

the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

### 2.13.5 Relationship to Utility Programs

In the past, utilities have not administered programs to incentivize installation of small on-site wind turbines, and it is expected that in 2016 utilities will not commence administration of programs to incentivize installation of small on-site wind turbines.

### 2.13.6 Budgets & Expenditures<sup>89,90</sup>

<b>Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Incentives & Services	\$2,000,000	\$2,000,000	\$2,000,000	\$6,000,000
Program Implementation	\$30,000	\$30,000	\$30,000	\$90,000
Total	\$2,030,000	\$2,030,000	\$2,030,000	\$6,090,000

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
Total	17%	33%	33%	16%

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<sup>89</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>90</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

### 2.13.7 Performance Metrics<sup>91</sup>

Primary Metrics <sup>92</sup>		2016	2017	2018	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MMBtu Annual	-	-	-	-
	MMBtu Lifetime	-	-	-	-
	MW	-	-	-	-
Renewable Energy	MWh Annual	1,000	2,000	2,000	5,000
	MWh Lifetime	18,000	32,000	32,000	82,000
	MW	0.4	0.7	0.7	1.8
CO2e Emission Reduction (metric tons) Annual		1,000	1,000	1,000	3,000
CO2e Emission Reduction (metric tons) Lifetime		10,000	17,000	17,000	44,000
Customer Bill Savings Annual (\$ million)		\$0.16	\$0.28	\$0.28	\$0.72
Customer Bill Savings Lifetime (\$ million)		\$3.2	\$5.6	\$5.6	\$14.40
Private Investment (\$ million)		\$1.6	\$2.8	\$2.8	\$7.20

Additional Performance Tracking Metrics	2016	2017	2018	Total
Participants	29	50	50	129

## 2.14 Solar Thermal

### 2.14.1 Program Description

The Solar Thermal Program provided financial incentives for the installation of new Solar Thermal hot water systems. The program was only available for electrically heated domestic hot water and was made available from March 1, 2016 to December 31, 2016.

This Program replaced the Solar Thermal Program that was funded under RPS. The Solar Thermal did not meet 2016 goals. The values in section 2.14.6 and 2.14.7 have been updated to reflect 2016 actuals. The remaining unspent budget from this initiative will be repurposed to fund a new solar

<sup>91</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life.

<sup>92</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

thermal pilot in the Renewable Heating and Cooling Chapter, in the Heat Pumps and Solar Thermal Initiative.

### ***Program Delivery***

The incentives were available on a first-come, first-served basis, and were applied to the total project cost based on displaced kWh, provided directly to the participating contractor.

#### 2.14.2 Target Market & Customer/Project Eligibility Rules

##### ***Target Market***

The target market included all eligible customers seeking to have a solar thermal system installed by an eligible installer.

##### ***Eligibility***

The Solar Thermal program was eligible to residential, commercial, agricultural, not-for-profit, and government-owned facilities. Participants must have been New York State electricity distribution customers of a participating utility company who pay into the SBC.

Projects identified the method used for establishing the existing thermal load, and displaced energy usage calculated in kWh. System offset cannot exceed 80% of existing domestic hot water (DHW) load.

Installers calculated all potential system output losses (kWh, or equivalent BTU for fossil fuel based systems, generated after all losses associated with shading, system orientation, tilt angle, etc. are applied. System must be installed in accordance with the design and solar hot water system components submitted in the application and approved by NYSERDA.

#### 2.14.3 Incentives/Services Offered

This Solar Thermal Incentive program is a one-year extension, or until the money runs out, of the solar thermal program previously offered under the Renewable Portfolio Standard Customer Sited Tier (CST). Effective March 1, 2016 the Solar Thermal Incentive will be reduced to the following levels, ensuring that the NYSERDA incentive is not more than half of the system cost:

- Residential installations: \$1.00/kWh offset per year up to \$5,000.
- Commercial/Industrial: \$0.30/kWh offset per year up to \$75,000.
- Agricultural/Not-for-Profit/Government: \$0.40 per kWh offset per year up to \$75,000.
- Incentives may be adjusted in the future, based on market uptake, system costs and funding availability.

#### 2.14.4 Performance Management

NYSERDA regularly monitored market interest and uptake of available funds by end use sector in order to make adjustments to the incentive offerings as needed based on market response. NYSERDA will also monitor project completion timelines. In addition, growth and geographic

representation of the list of eligible installers was monitored to ensure the installer network can support consumer demand.

All technical and implementation assistance projects, as part of this program, will be reviewed by a NYSERDA technical reviewer prior to approval and payment.

Metrics associated with energy savings, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects in development and installed and will be included, in aggregate, in CEF reporting. An independent evaluation effort will review data from these programmatic site inspections, data collection and M&V to verify energy benefits. Additional impact evaluation work will only occur as needed to verify energy and other benefits.

In order to draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

#### 2.14.5 Relationship to Utility Programs

Utilities do not currently have programs supporting solar hot water installations.

#### 2.14.6 Budgets & Expenditures<sup>93,94</sup>

<b>Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Incentives & Services	\$299,000	-	-	\$299,000
Program Implementation	\$100,000	-	-	\$100,000
<b>Total</b>	<b>\$399,000</b>	<b>-</b>	<b>-</b>	<b>\$399,000</b>

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>
<b>Total</b>	<b>87%</b>	<b>13%</b>

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<sup>93</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit. By 2017, NYSERDA anticipates shifting strategy to initiatives that offer the prospect of reducing soft costs, improving value, demonstrating sustainable business models, and potentially integrating multiple renewable heating and cooling options into one market offering. If in consultation with stakeholders, NYSERDA determines that such an adjustment will provide more Impact toward CEF goals, we will file an amendment outlining the new strategies.

<sup>94</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.



## 2.14.7 Performance Metrics<sup>95</sup>

Primary Metrics <sup>96</sup>		2016	2017	2018	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MMBtu Annual	-	-	-	-
	MMBtu Lifetime	-	-	-	-
	MW	-	-	-	-
Renewable Energy	MWh Annual	830	-	-	830
	MWh Lifetime	12,500	-	-	12,500
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		437	-	-	437
CO2e Emission Reduction (metric tons) Lifetime		6,550	-	-	6,550
Customer Bill Savings Annual (\$ million)		\$0.11	-	-	\$0.11
Customer Bill Savings Lifetime (\$ million)		\$1.66	-	-	\$1.66
Private Investment (\$ million)		\$0.82	-	-	\$0.82

Additional Performance Tracking Metrics	2016	2017	2018	Total
Participants <sup>97</sup>	42	-	-	42
Eligible Installers	20	-	-	20

## 2.15 Combined Heat & Power

While the Resource Acquisition Transition chapter was characterized in the CEF Order as to “generally reflect a merging and updating of NYSERDA’s EEPS and RPS-Customer Sited Tier (CST) Operating Plans...”, the CHP Program, a previous T&MD offering, is also included herein. Prior to the CEF, the CHP program included both resource acquisition and market transformation<sup>98</sup>

<sup>95</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life.

<sup>96</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA’s programs.

<sup>97</sup> Number of systems installed.

<sup>98</sup> Market transformation approaches are ongoing and will continue to be based on a theory of change: a collection of interventions will advance a modular CHP market which will reduce soft costs and development time and increase penetration of CHP. A goal/stable end-state is to achieve a CHP market that has adequate and readily-accessible information to spur decision making, shows signs of becoming self-sustaining spanning a sufficient swath of localities and project sizes, and becomes readily deployable either for meeting the needs of an individual building or for serving as the heart of a community microgrid. A well-functioning CHP market will support State Energy Plan goals for

strategies; these will be continued and transitioned together under the CEF.<sup>99</sup> The CHP performance metrics in section 2.15.7 have been updated to correct an error in the value used to calculate the natural gas required to run CHP systems. The revised carbon and bill savings metrics take this updated natural gas value into account.

### 2.15.1 Program Description

The proposed interventions will advance a modular CHP market which will reduce soft costs and development time and increase penetration of CHP. The major activity will focus on continuing to provide cost-shared incentives to support the installation of CHP equipment at eligible host site locations. Additionally, and to a lesser extent, the program will continue to provide cost-shared incentives to support site-specific feasibility studies. Also, the program will continue to procure a variety of technical outreach services to raise awareness of the opportunity for and value of CHP among good-prospect candidate sites. In order to monitor progress towards the initiative's intended outcomes, NYSERDA will conduct a Longitudinal Market Evaluation to assess the current penetration rate of CHP as a benchmark of current market conditions.

As a resource acquisition activity, the incentive program will be a continuation/modification of NYSERDA's previous CHP Acceleration and Aggregation Program and CHP Performance Program. These two separate previous programs will be merged into a single offering, and will be issued as NYSERDA's CHP Program and labeled as PON 2568.

#### ***Program Delivery***

The resource acquisition activity program delivery method will consist of formula-based incentives tailored to the project's site-specific conditions (NYSERDA will provide cost sharing that will encompass implementation assistance in installing projects; for one subset of projects NYSERDA incentive payments will be made to the project developer, for another subset of projects NYSERDA incentive payments can be made to the project developer/installer, the host customer, or a third party); project procurement method will be open-enrollment; NYSERDA staff will receive applications, determine their eligibility, issue contracts, and approve and issue payments.

The market transformation activities will continue to strive to reduce soft costs, reduce cycle times, and increase monetization of values, by simplifying and accelerating customer acquisition, facilitating project replication through standardized model contract terms and conditions, and establishing consensus-based methodologies for calculating/analyzing costs/savings data and for

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energy, emissions and building energy use reduction. A testable hypothesis is that scale-up of market penetration of CHP will occur through migration to preference for modular CHP, which will occur by continuing to build: sufficient data proving the economic and performance value of CHP to show how it can work for prospective customers; awareness of the availability and value of using turnkey solutions for CHP of all size ranges; and a means for prospective customers to easily access qualified vendors.

<sup>99</sup> Market readiness for continuation of these market transformation activities is displayed by the extensiveness of existing and emerging partners, which indicates that the market is ready to take this on. There are currently 13 enrolled vendors of modular CHP packages and interest expressed by 2 additional vendors of modular CHP packages. There are also 13 Original Equipment Manufacturers of "prime mover" subcomponent of modular CHP packages, as well as 11 other CHP project developers active in NYS. Approximately two dozen consultants with expertise in site-specific CHP feasibility studies are active in NYS, some of which are currently enrolled in NYSERDA's FlexTech program. Allies providing tools and free services for CHP self-study/initial screening/detailed feasibility analysis: USDOE's Northeast Regional CHP Technical Assistance Partnership Program, USEPA's CHP Partnership Program.

assigning a monetized value to the enhanced resiliency provided by CHP. Best practices studies will strive to determine and inform marketplace participants of CHP project attributes that can maximize the value to be available via REV. Key milestones/proof points will be tracked to ensure that these market transformation activities are continue to be effective<sup>100</sup>. Measures of success will be used to determine when market transformation has adequately occurred so as to enable NYSERDA to exit<sup>101</sup>.

- Analysis of NYSERDA-cost-shared CHP projects shows that the marketplace has achieved a 30% reduction in average project development cycle time (from approval of project to operation date) for projects over a span of the past ten years. As a quantified projection of benefits to customers, the continuation of these market transformation activities will seek to more-quickly achieve the next 30% compression of cycle time, expected to be achieved over the next five years.
- Analysis of NYSERDA-cost-shared CHP projects shows that the marketplace has achieved a 25% reduction in installed cost (for comparable projects based on size, utilization, and capability), over a span of the past ten years (the average total cost has been reduced from \$6.23 per Watt to \$4.64 per Watt, in 2015 constant-year dollars). As a quantified projection of benefits to customers, the continuation of these market transformation activities will seek to more-quickly achieve the next 25% reduction of installed costs, expected to be achieved over the next five years.
- Additional benefits to customers are expected, including but not limited to the following: A continuation of improved marketplace dynamics with projects providing greater level of value and certainty to consumer, with 5-year warranty on new systems, a performance guarantee not historically provided to the market; emergence of Power Purchase Agreements among a substantial portion of projects; and customer realizes reduced payback with incentives (from 5-6 years to 3-4 years), warranty, shorter development cycle, easier decision-making, all leading to steady market growth.
- Extensive stakeholder engagement was conducted to elucidate the previous launch and planned continuation of these market transformation strategies, including but not limited to messaging

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<sup>100</sup> Proof Point 1: Convincing reference cases developed -- CHP Coach accelerates market by capturing, consolidating, and transferring lessons learned; NYSERDA, in coordination with industry partners, standardizes methodologies for calculating/analyzing costs and savings data; aggregated data sets are robust enough to develop technical and financial screenings to enable quick progression from Learner to Shopper, and cited as influential by decision makers. Proof Point 2: Guidance documents deliver value in customer decision making process. Proof Point 3: Qualified vendors easily accessible by customers -- Qualified vendors have customers in queue, ready for CHP installation; open qualified list attracts new vendors to the New York State market, and evolution to a regional/national list of qualified vendors further attracts additional solution providers to the New York State market. Proof Point 4: System performance/delivery of benefits -- Declining number and/or severity of deficiencies found during recommissioning efforts, indicating that vendors are internalizing lessons learned and best practices; protocols for monetization of the enhanced resiliency of CHP become accepted in the marketplace, thus improving the cost-effectiveness of CHP.

<sup>101</sup> NYSERDA will base exit decisions for incentives and certain other activities on progress for each of the four market segments - smaller than 50 kW, 50-500 kW, 500-5000 kW, and larger than 5000 kW. These segments align with range of focus of service providers and serve as proxies for their target customer groups. Progress will be defined as: (1) establishment of conditions that can support a well-functioning marketplace which can persist in the absence of NYSERDA-issued incentives, and (2) actual traction in the marketplace demonstrates achievement of desirable benchmarks and trends.

and coordination with stakeholders at conferences and webinars; meetings with NECHPI; meetings with CHP vendors; meeting with the Real Estate Board of New York (REBNY) (as consortium that is representative of a class of customers).

#### 2.15.2 Target Market & Customer/Project Eligibility Rules

##### ***Target Market***

The target market for Implementation Assistance includes all eligible customers seeking to have a CHP system installed in a grid-connected manner. The CHP system must consist of commercially-available technologies, the system design must be well-conceived, and the system must be fueled using pristine/unadulterated gaseous fuels (e.g., pipeline natural gas, compressed natural gas, propane).

##### ***Eligibility***

Implementation Assistance is eligible to all sectors, including but not limited to residential, commercial, industrial, agricultural, institutional, educational, not-for-profit, and government-owned facilities. Participants must be New York State electricity distribution customers of a participating utility company who pay into the SBC.

In general, Market Transformation efforts and activities will continue to be broad-based and applicable throughout New York State (for example, such as the development of best practices guidebooks, and learner/shopper/buyer tutorial literature/webcasts). In general, these efforts will continue to be conducted via competitively-selected technical assistance contractors who can demonstrate expertise with identification and characterization of the target market reflecting knowledge of the technology, consumers, potential savings, market readiness, and other key market features.

#### 2.15.3 Incentives/Services Offered

##### ***Resource Acquisition***

There are a few significant changes beginning March 1, 2016 and persisting through 2018, compared to the previous NYSERDA offering: the two offerings will be merged into a single offering; the size range of the “packaged” CHP systems will consist of systems size 3 MW and smaller with no minimum size limit; the size range of the “custom engineered” CHP systems will consist of systems size 1 MW and larger with no maximum size limit; in the overlap range of 1 MW to 3 MW applicants can choose a packaged system or a custom-engineered system and the incentive will be identical regardless of chosen option; custom-engineered systems will receive all payments in the form of capacity-based incentive payments that will be disbursed in a series of milestone payments (the program will no longer format a fraction of the payments as performance-based style).

The maximum incentive available is \$2,500,000 per eligible project (a site, such as a campus, may conduct one project as a centralized installation that serves the entire campus, or may conduct multiple projects for example one in each building serving just that building). Two types of bonuses will be offered (Target Zones, and Critical Infrastructure), not to exceed the maximum cap of \$2,500,000. Incentives will periodically be reduced along a declining glide path commensurate with other replacement sources of revenues (and/or project cost reductions attributable to market simplifications). Initial glide path of 5% reduction from original incentive will be applicable for complete applications received on 9/1/2016 or later; 10% reduction from original incentive for complete applications received on 3/1/2017 or later; 15% reduction from original incentive for complete applications received on 9/1/2017 or later; further visibility of reductions to be made public with approximately 6-month advance notice.

### ***Market Transformation***

Several strategies have been ongoing and will continue to be pursued, such as initiatives and pioneering projects that offer the prospect of reducing soft costs, improving performance and value, and developing and demonstrating sustainable business models, including but not limited to the following:

- Matchmaking -- further expand the existing list of qualified vendors offering vetted CHP packages (i.e., a CHP Catalog), and continue to facilitate interactions between prospective customers and vendors (e.g., Expos, etc.).
- Information for customers and vendors.
  - Publish customer-centric Learner/Shopper/Buyer Guidance document: Why is CHP good? What is right for me? How do I down-select among vendors and negotiate a contract?
  - Publish vendor-centric Targeting/Pitching/Closing Guidance document: mapping to help identify good prospects, best practices for system design and economic assessment, explanation and benchmarking of contract terms and conditions.
  - Compile/create guidance regarding equitable standard terms and conditions for CHP contracts (e.g., for various types of transactions, such as buy, lease, power purchase agreement, performance contracting, etc.).
- Technical assistance -- continue to provide free unbiased coaching to prospective customers during preliminary screening phase, provide cost-sharing and referrals for site-specific feasibility studies conducted by FlexTech consultants.
- Quality assurance -- continue to fund project recommissioning to assess and improve project persistence of performance, compile and archive performance data, and apply data analytics to the portfolio of recommissioned projects to discern and then disseminate lessons learned and thereby further raise the competency of market actors.
- Recommissioning services market capability -- demonstrate the value proposition of CHP recommissioning, and create and disseminate protocols for CHP recommissioning.

- Market research
  - Continue to discern opportunities for cost reductions (primarily across soft costs, such as permits and approvals -- e.g., interconnection, building permits, construction codes, etc.), and opportunities for increasing revenues (such as demand response value, resiliency value, etc.),
  - Maintain extensive stakeholder engagement to ensure responsiveness to needs of the marketplace and voice of customer, and
  - Continue to field test and validate niche-filling emergent commercial products.
- Replication support in key market segments
  - Building Fleets – continue to conduct dedicated outreach to decision makers that own a fleet of similar buildings (e.g., a chain of supermarkets, a chain of hotels, a chain of fast-casual restaurants, etc.) to nurture their initial trial of one/few installations with intent for subsequent wider-scale rollout of replicates if initial trial proves convincing.
  - Process Fleets – continue to identify and facilitate focus on highly-replicable immediate opportunities for the marketplace (e.g., existing packages A, B, and C are each excellent fits for high-volume activity automobile car washes).
  - Other Replication Opportunities -- strategies to identify and support opportunities for replication in other key market segments will continue to be explored.

#### 2.15.4 Performance Management

NYSERDA will regularly monitor market interest and uptake of available funds and will make adjustments as needed based on market response. NYSERDA will also monitor project completion timelines to ensure installation and commissioning of all equipment generally occurs within 12 months of a fully executed contract with NYSERDA (projects failing to meet this timeline may be subject to termination). Other indicators to be monitored by NYSERDA include:

- Number of CHP Vendors enrolled in NYSERDA program
- Number of CHP Vendors with projects and measure of projects per vendor (assess concentration/spread)
- Number of projects using modular approach
- Time compression of implementation timeline for participants
- Reduction in soft costs
- Total electrical interconnections (to be used to discern trends in broader marketplace beyond those systems directly incentivized)

Metrics associated with energy generation, capacity installed, energy bill savings, emission reductions and private investment/funds leveraged will be tracked for all projects and will be included, in aggregate, in CEF reporting.

All implementation assistance projects, as part of this program, will be reviewed by a NYSERDA technical reviewer prior to approval and payment. This Program is not intended to provide technical review services for in-eligible projects. In addition to the technical review services, program plans include a NYSERDA site inspection for each project, hourly-interval data collection on system performance, and a sampling of projects will undergo project-level measurement and verification. This data will be used to monitor performance of installed systems. An independent evaluation effort will review data from site inspections, data collection and M&V to verify energy benefits. Additional impact evaluation work will only occur as needed to verify energy and other benefits.

Market Transformation Performance Management will also be pursued via Longitudinal Market Evaluation (secondary data and primary data collection through surveys of key market actors) to assess: (1) current penetration rate of CHP within construction of buildings in identified target markets, including identifying and quantifying (#, \$, MW, etc.) replication outside of program, the proportion of modular CHP and number of portfolios implementing CHP; (2) CHP vendor market change including number of vendors, activity level (concentration/spread), revenue; (3) soft cost characterization and quantification, (4) sales process effectiveness and time compression, including trend of the number of good prospects that become aware of the value of CHP, trend of the conversion rate from awareness to action-taking, and trend of timeframes of the progression from unaware to aware, and from aware to action. NYSERDA will develop and implement an overall evaluation strategy that draws on the logic model and tests the assumptions of the intervention design against measured market results.

In order to draw a sample and conduct an analysis that is representative and robust, evaluation M&V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&V review work and rolling M&V samples are two such strategies that will be applied, as appropriate to the program, in developing M&V plans.

#### 2.15.5 Relationship to Utility Programs

In the past, utilities have not administered programs to incentivize installation of CHP systems, and it is expected that in 2016-2018 utilities will not commence administration of programs to incentivize installation of CHP systems. The one exception so far has been a recent joint partnership between NYSERDA and Con Edison for CHP projects to be installed in the Brooklyn-Queens Demand Management territory (BQDM), where Con Edison is seeking to provide supplemental incentives to CHP projects that qualify for NYSERDA incentives.

Utility-run Energy Efficiency programs (conducting a “building tune-up”) will complement subsequent consideration of CHP. There is a need to work with utilities to encourage them to:

- Furnish data on total number of CHP electrical interconnections occurring over time.
- Assist with outreach to prospective customers.
- Streamline of the customer’s access to their load data for sharing with solution providers of their choice.

- Establish utility employees serving as DG Ombudsmen.
- Map of how well the utility infrastructure will accommodate CHP (push -- emphasis is vendor vantage point -- it appears to be buildable at these sites).
- Map of where the utility infrastructure will benefit the most from CHP (pull -- emphasis is utility vantage point -- impending utility price spikes appear to make these sites more cost-competitive).
- Simplify/streamline electrical interconnection process.
- Simplify/streamline natural gas interconnection process.

NYSERDA will provide advising support for utility progress toward regulatory tariff changes on standby rates, and CHP-related components of utility DSIP plans.

#### 2.15.6 Budgets & Expenditures<sup>102,103</sup>

<b>Budget<sup>104</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Installations	Incentives & Services	\$22,000,000 <sup>105</sup>	\$9,000,000 <sup>106</sup>	\$5,400,000 <sup>107</sup>	\$36,400,000
	Program Implementation	\$50,000	\$50,000	\$50,000	\$150,000
	Sub-Total	\$22,050,000	\$9,050,000	\$5,450,000	\$36,550,000
Market Transformation of Marketplace	Market Transformation-style Project Procurements <sup>108</sup>	\$3,950,000	\$3,950,000	\$3,950,000	\$11,850,000
	Program Implementation	\$50,000	\$50,000	\$50,000	\$150,000
	Sub-Total	\$4,000,000	\$4,000,000	\$4,000,000	\$12,000,000
<b>Total</b>		<b>\$26,050,000</b>	<b>\$13,050,000</b>	<b>\$9,450,000</b>	<b>\$48,550,000</b>

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
Total	12%	37%	29%	21%

<sup>102</sup>Incentives & Services defined as incentives/rebates paid to customers/participants and payments made directly to contractors in lieu of payment from customers for services such as an energy audit.

<sup>103</sup> Program Implementation defined as all non-incentive program costs including costs associated with contractors implementing programs on NYSERDA's behalf or other costs associated with the implementation of the program. Does not include EM&V, Administrative or CRF Costs which will be represented at the portfolio level.

<sup>104</sup>NYSERDA reserves the right to adjust budget allocations within this CHP program among categories of efforts and/or among budget years, in response to changing market conditions, and in particular if more-impactful approaches that offer the prospect of reducing soft costs, improving performance and value, and developing and demonstrating sustainable business models are confirmed earlier than anticipated.

<sup>105</sup>Of the \$22,000,000 budget, \$19,750,000 is earmarked for incentives for installation of CHP equipment (and, no more than \$9,000,000 of this is to be available for projects larger than 3 MW), and the remaining \$2,250,000 is earmarked for site-specific CHP feasibility studies.

<sup>106</sup>Of the \$9,000,000 budget, \$7,200,000 is earmarked for incentives for installation of CHP equipment (none of this is to be available for projects larger than 3 MW), and the remaining \$1,800,000 is earmarked for site-specific CHP feasibility studies.

<sup>107</sup>Of the \$5,400,000 budget, \$4,500,000 is earmarked for incentives for installation of CHP equipment (none of this is to be available for projects larger than 3 MW), and the remaining \$900,000 is earmarked for site-specific CHP feasibility studies.

<sup>108</sup>Market Transformation-style Projects defined as expenditures made to increase the understanding of market forces with the intent of revealing self-sustaining business models that can be broadly shared with and adopted by market actors.



## 2.15.7 Performance Metrics<sup>109</sup>

### Resource Acquisition Metrics (Direct Impacts)<sup>110</sup>

Primary Metrics <sup>111</sup>		2016	2017	2018	TOTAL
Energy Efficiency	MWh Annual	170,000	30,000	20,000	220,000
	MWh Lifetime	2,500,000	450,000	270,000	3,220,000
	MMBtu Annual	-	-	-	-
	MMBtu Lifetime	-	-	-	-
	MW	30.0	5.5	3.5	39.0
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		39,000	6,500	4,600	49,900
CO2e Emission Reduction (metric tons) Lifetime		582,000	97,400	69,200	748,100
Customer Bill Savings Annual (\$ million)		\$17.3	\$3.0	\$2.0	\$22.40
Customer Bill Savings Lifetime (\$ million)		\$260.0	\$45.4	\$30.7	\$336.10
Private Investment (\$ million)		\$176.0	\$14.0	\$8.0	\$117.00

<sup>109</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life.

<sup>110</sup> Energy Efficiency values represent MWh savings from the use of CHP systems; natural gas required to run CHP systems (1,241,000 MMBtu cumulative annual and 18,620,000 MMBtu lifetime) is netted out of the emission reduction and customer bill savings values shown in this table. Emission reductions and customer bill savings are net, including both MWh that add to the benefits and additional natural gas required to run CHP systems that subtract from the benefits.

<sup>111</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

**Market Transformation of Marketplace<sup>112</sup>**

<b>Primary Metrics<sup>113</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	5,000	22,000	40,000	67,000
	MWh Lifetime	75,000	330,000	600,000	1,005,000
	MMBtu Annual	-	-	-	-
	MMBtu Lifetime	-	-	-	-
	MW	1.0	4.0	7.0	12.0
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		942	4,800	9,200	15,000
CO2e Emission Reduction (metric tons) Lifetime		14,100	72,300	138,000	224,700
Customer Bill Savings Annual (\$ million)		\$0.49	\$2.20	\$4.09	\$6.80
Customer Bill Savings Lifetime (\$ million)		\$7.3	\$33.3	\$61.4	\$102.00
Private Investment (\$ million)		\$3.0	\$12.0	\$20.0	\$35.00

<b>Additional Performance Tracking Metrics</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Participants	Installations	43	27	16	86
	MT Marketplace	2	8	14	24
	Total	45	35	30	110

<sup>112</sup> Energy Efficiency values represent MWh savings from the use of CHP systems; natural gas required to run CHP systems (381,900 MMBtu cumulative annual and 5,729,000 MMBtu lifetime) is netted out of the emission reduction and customer bill savings values shown in this table. Emission reductions and customer bill savings are net, including both MWh that add to the benefits and additional natural gas required to run CHP systems that subtract from the benefits.

<sup>113</sup> Benefits are rounded to the nearest 1,000. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

Project Cost Reductions	Market transformation activities will seek to more-quickly achieve the next 25% reduction of installed costs, expected to be achieved over the next five years.	
Project Timeline Compressions	Market transformation activities will seek to more-quickly achieve the next 30% compression of cycle time, expected to be achieved over the next five years.	

## Appendix A – Investment Plan Review Supplement

### Commercial

#### Results to Date – Metrics

Benefit metrics for this program currently lag behind cumulative current targets through Q2 2017, ranging from 10% to 88% of the various targets being attained. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	10,783	10,783	26,050	41%	109,600	10%
	MWh Lifetime	-	-	-	177,921	177,921	430,000	41%	1,809,000	10%
	MMBtu Annual	-	-	-	89,243	89,243	230,500	39%	980,000	9%
	MMBtu Lifetime	-	-	-	1,472,517	1,472,517	3,795,000	39%	16,170,000	9%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	10,458	10,458	26,960	39%	114,200	9%
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	172,564	172,564	446,500	39%	1,891,000	9%
	Annual Dollars	-	-	-	\$1.96	\$1.96	\$5.83	34%	\$24.63	8%
Private Investment (millions)	Lifetime Dollars	-	-	-	\$32.40	\$32.40	\$96.30	34%	\$406.80	8%
	Dollars	-	-	-	\$2.48	\$2.48	\$25.40	10%	\$92.00	3%
Implementation Assistance	Participants	-	-	-	1	1	10	10%	20	5%
Technical Assistance		-	-	-	91	91	103	88%	320	28%

#### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

#### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

#### Plan for Continuation/Modification/Termination

The Flexible Technical Assistance Program (FlexTech) component of the Commercial Resource Acquisition Transition initiative was modified in June 2017 to extend the program through 2019, with additional budget and benefits. This extension is a result of market feedback uncovering a continued need for reliable, objective technical assessments of clean energy options for facilities. In addition, local utilities have discontinued or reduced their study assistance programs and are coordinating with NYSERDA to direct the marketplace to this Program. Following this modification, the initiative will continue as planned.

The Commercial Implementation Assistance component of the Resource Acquisition Transition plan did not meet its 2016 projected targets. The Commercial Implementation Assistance Program was intended to provide the marketplace with a transition from NYSERDA's previous Existing Facilities Program to local utility incentive programs, funding only items that the local utility programs could not. As evidenced by the lack of participation in this Program and increased participation in local utility programs, vendors and customers had already made this transition. Program revisions made in Fall 2016 also did not result in increased participation. As a result, the Program closed at the end of April 2017. The budgets and benefits have been updated to reflect actual program performance.

## Industrial

### Results to Date – Metrics

The program is generally performing well and is on track to meet its targets, although performance against MWh energy efficiency and technical assistance participant cumulative current targets through Q2 2017 is somewhat lower than anticipated at 78% and 90%, respectively. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	2,623	2,134	4,758	149,633	154,391	199,200	78%	421,700	37%
	MWh Lifetime	39,352	32,015	71,366	2,244,500	2,315,866	2,995,000	77%	6,325,000	37%
	MMBtu Annual	15,114	9,788	24,902	2,652,634	2,677,536	1,685,000	159%	3,586,000	75%
	MMBtu Lifetime	226,710	146,820	373,530	39,789,508	40,163,038	25,250,000	159%	53,790,000	75%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	Annual Tons	2,165	1,631	3,797	278,192	281,988	248,500	113%	521,400	54%
	Lifetime Tons	32,480	24,470	56,950	4,172,875	4,229,826	3,730,000	113%	7,821,000	54%
Customer Bill Savings (millions)	Annual Dollars	\$0.40	\$0.34	\$0.75	\$30.81	\$31.55	\$30.50	103%	\$64.12	49%
	Lifetime Dollars	\$6.06	\$5.12	\$11.18	\$462.08	\$473.27	\$457.00	104%	\$961.80	49%
Private Investment (millions)	Dollars	\$3.59	\$2.80	\$6.39	\$270.72	\$277.10	\$245.00	113%	\$761.10	36%
IPE	Participants	6	6	12	86	98	86	114%	218	45%
Technical Assistance	Participants	-	-	-	27	27	30	90%	80	34%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Industrial Resource Acquisition Transition Program did not meet its 2016 projected targets. Market uptake for the new industrial clean energy initiatives is progressing, but at a slower pace than anticipated, signaling the need to extend this strategy. The initiative was revised in June 2017 to add an additional year of incentive funding (2019) and the total number of participants has been reduced to consider the number of applications and project sizes the program has seen so far. This will allow for continuity and minimal disruption to the sector stakeholders and market actors while delivering outreach and education on new clean energy offerings, continuing coordination with utilities, and launching additional industrial initiatives. The values in sections budget and benefits values have been updated to reflect 2016 actuals, as well as updating the timing for the overall budget and performance metrics. Following these modifications, the initiative will continue as planned.

## Agriculture

### Results to Date – Metrics

All benefit metrics for this program exceed their cumulative current target through Q2 2017, which were updated in June 2017. The MMBtu savings are six times the cumulative current target through Q2 2017 and are attributed to the unanticipated higher savings opportunities in fuels coming from greenhouse participants and may not indicate future trends. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	2,193	3,770	5,963	3,125	9,087	6,500	140%	14,000	65%
	MWh Lifetime	32,889	56,553	89,442	46,869	136,311	97,500	140%	210,000	65%
	MMBtu Annual	1,906	13,570	15,476	320	15,796	2,500	632%	7,000	226%
	MMBtu Lifetime	28,584	203,552	232,136	4,801	236,937	37,500	632%	105,000	226%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	231	441	672	-	672	*	-	*	-
	MWh Lifetime	3,470	6,616	10,086	-	10,086	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	1,370	2,935	4,305	1,661	5,966	3,500	170%	8,000	75%
Customer Bill Savings (millions)	Lifetime Tons	20,547	44,031	64,578	24,916	89,494	52,500	170%	120,000	75%
	Annual Dollars	\$0.39	\$0.75	\$1.14	\$0.46	\$1.60	\$0.97	165%	\$2.09	76%
Private Investment (millions)	Lifetime Dollars	\$5.83	\$11.25	\$17.07	\$6.86	\$23.93	\$14.50	165%	\$31.35	76%
	Dollars	\$3.25	\$4.97	\$8.22	\$2.45	\$10.67	\$5.77	185%	\$12.24	87%
Participants	Participants	175	109	284	149	433	361	120%	765	57%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Agriculture Resource Acquisition Transition Program did not meet its 2016 projected targets, and was subsequently updated in June 2017 to extend the program to 2018 to account for a longer than expected program ramp up in the market. Extending the program through 2018 will also inform future Clean Energy Fund agriculture best practices. The timing for the overall budget and performance metrics was updated to reflect this longer program, including reflecting actual values for 2016. Additionally, the total estimated MMBTU savings were reduced due to the incorporation of additional data from the Agriculture Energy Audit Program into the modeling. Following these modifications, the initiative continued as planned.

## Multifamily Market-Rate

### Results to Date – Metrics

The Market-Rate Resource Acquisition Transition Program targets were updated in June 2017 to reflect expected program budget and benefit commitments at the time of program closure. The program is on track to meet the revised participant enrollment and MWh cumulative current targets through Q2 2017. The two reported projects to date are primarily electric, resulting in energy efficiency MWh savings progress coming in higher than fuel savings. Participant progress is at 100% if entire 2017 target is considered. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	-	-	-	21	21	21	102%	41	51%
	MWh Lifetime	-	-	-	312	312	309	101%	617	51%
	MMBtu Annual	-	36	36	512	548	4,935	11%	9,870	6%
	MMBtu Lifetime	-	546	546	7,680	8,226	74,000	11%	148,000	6%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	2	2	38	40	299	13%	598	7%
	Lifetime Tons	-	29	29	573	602	4,485	13%	8,970	7%
Customer Bill Savings (millions)	Annual Dollars	-	\$0.00	\$0.00	\$0.01	\$0.01	\$0.06	11%	\$0.11	5%
	Lifetime Dollars	-	\$0.00	\$0.00	\$0.09	\$0.09	\$0.82	11%	\$1.63	5%
Private Investment (millions)	Dollars	-	\$0.07	\$0.07	-	\$0.07	\$0.21	33%	\$0.42	17%
Participants	Participants	-	18	18	168	186	93	200%	186	100%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Multifamily Market Rate Resource Acquisition Transition Program did not meet its 2016 projected targets. Due to a lack of market uptake, the program was closed in August 2017 after a thirty-day notice period. The program metrics, outputs, outcomes and milestones were reduced in July 2017 to reflect anticipated program activity for the duration of the program through August 2017.

## Single-Family Market-Rate

### Results to Date – Metrics

The program is largely on track and is well-positioned to meet targets, with progress against cumulative current targets through Q2 2017 ranging from 80% to 90%. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	1,306	274	1,580	69	1,649	1,845	89%	3,504	47%
	MWh Lifetime	19,589	4,116	23,705	1,030	24,735	27,600	90%	52,550	47%
	MMBtu Annual	72,480	13,497	85,976	5,064	91,040	108,000	84%	230,700	39%
	MMBtu Lifetime	1,811,990	337,415	2,149,405	126,600	2,276,005	2,700,000	84%	5,766,000	39%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	Annual Tons	5,119	972	6,091	346	6,437	7,510	86%	15,820	41%
	Lifetime Tons	121,101	22,866	143,967	8,283	152,250	176,000	87%	371,900	41%
Customer Bill Savings (millions)	Annual Dollars	\$1.28	\$0.24	\$1.52	\$0.09	\$1.61	\$1.93	84%	\$4.07	40%
	Lifetime Dollars	\$30.10	\$5.72	\$35.82	\$2.16	\$37.98	\$45.20	84%	\$95.71	40%
Private Investment (millions)	Dollars	\$20.96	\$4.59	\$25.56	\$1.44	\$27.00	\$33.80	80%	\$77.23	35%
Participants	Participants	2,729	673	3,402	211	3,613	4,188	86%	9,300	39%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Single-Family Market Rate Resource Acquisition Transition Program did not meet its 2016 projected targets due to lower than anticipated program participation. The program was updated in June 2017 to revise the budget and benefit commitment projections to reflect 2016 actual commitments, and improve projections of the timing for the overall budget and benefit values to reflect the actual rate of program uptake. NYSERDA also added funding to support improved data analysis and performance management, technical assistance resources, as well as consumer education, events, and marketing activities to improve existing program activities, while beginning the process of transitioning to a market-based approach for this sector. NYSERDA also extended the program through 2018 to support the market in the transition out of the program and while other CEF initiatives aimed to increase customer demand and reduce barriers to contractors are being developed. Following these modifications, the initiative will continue as planned.



## Commercial New Construction

### Results to Date – Metrics

The program is currently exceeding all its cumulative current targets through Q2 2017, with the exception of the participant enrollment target, which is currently at 75% of target. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	-	-	-	41,050	41,050	28,800	143%	66,200	62%
	MWh Lifetime	-	-	-	820,995	820,995	576,000	143%	1,324,000	62%
	MMBtu Annual	-	-	-	51,833	51,833	43,200	120%	105,100	49%
	MMBtu Lifetime	-	-	-	1,036,663	1,036,663	864,500	120%	2,105,000	49%
	MW	-	-	-	11	11	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	24,355	24,355	17,400	140%	40,300	60%
	Lifetime Tons	-	-	-	487,091	487,091	349,000	140%	808,000	60%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$6.67	\$6.67	\$4.09	163%	\$9.41	71%
	Lifetime Dollars	-	-	-	\$133.43	\$133.43	\$81.75	163%	\$188.30	71%
Private Investment (millions)	Dollars	-	-	-	-	-	\$27.30	-	\$42.07	-
Participants	Participants	-	-	-	55	55	73	75%	147	37%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Commercial New Construction Program tracked closely to its 2016 projected targets and exceeded projected commitments in annual MMBtu and annual greenhouse gas reductions. While applications were somewhat lower than anticipated, the average square footage per application was approximately 50% higher than initial estimates. The Program is expected to maintain course during 2017. Applicants have shown interest and are participating in the deep energy savings/zero net energy early technical support; prospective applicants of smaller projects have also expressed interest in participating. Due to the continued interest and feedback from market participants, NYSERDA extended the program through 2018 in June 2017. The extension will further encourage deep energy savings and zero net energy projects, while also removing the participation threshold to offer technical support to smaller conventional projects.

In response to lessons learned during 2016, including the importance of including all stakeholders during programming and design phases of deep savings and zero net energy projects; and in response to reduced funding availability, the 2018 Program extension will provide support for projects following an Integrated Project Delivery (also known as Integrated Design) protocol. Funding for the Integrated Project Delivery opportunity will be partially funded through removal of incentives for green building certification. The budget and benefits have been updated to reflect 2016 actual commitments, as well as revised projections for 2017 and additional funds and related metrics for 2018. Following these modifications, the initiative will continue as planned.

## Low-Rise New Construction Low-to-Moderate Income

### Results to Date – Metrics

The program is generally exceeding its cumulative current targets through Q2 2017, except for targets associated with participants and private investment, which are lagging. The private investment reported will be updated to show greater progress in the Q3 CEF report. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	2	7	9	2,875	2,883	2,835	102%	7,770	37%
	MWh Lifetime	45	134	179	57,490	57,669	56,550	102%	155,200	37%
	MMBtu Annual	58	174	232	27,654	27,886	26,450	105%	66,900	42%
	MMBtu Lifetime	1,152	3,480	4,632	553,087	557,719	527,500	106%	1,336,000	42%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	4	13	17	2,990	3,007	2,890	104%	7,630	39%
	Lifetime Tons	85	256	340	59,806	60,147	57,750	104%	152,600	39%
Customer Bill Savings (millions)	Annual Dollars	\$0.00	\$0.00	\$0.00	\$0.74	\$0.74	\$0.70	106%	\$1.86	40%
	Lifetime Dollars	\$0.01	\$0.04	\$0.05	\$14.78	\$14.84	\$13.95	106%	\$37.25	40%
Private Investment (millions)	Dollars	\$0.01	-	\$0.01	-	\$0.01	\$10.13	0.1%	\$25.73	0.04%
Participants	Participants	2	3	5	1,618	1,623	2,197	74%	5,329	30%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Low-rise Residential New Construction Program did not meet all its 2016 projected targets. The program was revised in June 2017, and the budget and benefit values have been updated to reflect 2016 actual commitments, revised projections for 2017, and additional funds and related metrics for 2018 to reflect projected increased participation. While the 2016 performance metrics were calculated relative to the then-current 2010 NYS Energy Conservation Construction Code (ECCC) of NYS, the revised 2017 and 2018 metrics rely on the ECCC of NYS adopted in October 2016 as the reference baseline. Going forward, incentives for cooperative advertising, first plan review, and first rating incentives will no longer be offered due to several factors, including limited market interest, NYSERDA's desire to reduce program complexity, and because some of the intended outcomes associated with these incentives are no longer being achieved.

## Low-Rise New Construction Market-Rate

### Results to Date – Metrics

Most benefit metrics for the Low-Rise New Construction Market-Rate Resource Acquisition Transition Program are currently exceeding their cumulative current targets through Q2 2017. The private investment reported will be updated to show greater progress in the Q3 CEF report. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	1,197	327	1,524	1,997	3,521	3,135	112%	7,010	50%
	MWh Lifetime	23,932	6,543	30,475	39,936	70,411	62,850	112%	140,300	50%
	MMBtu Annual	31,176	10,818	41,994	6,219	48,213	35,450	136%	78,900	61%
	MMBtu Lifetime	623,520	216,367	839,887	124,376	964,263	708,500	136%	1,577,000	61%
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	2,308	747	3,055	1,381	4,436	3,530	126%	7,870	56%
	Lifetime Tons	46,152	14,945	61,097	27,625	88,723	70,650	126%	157,400	56%
Customer Bill Savings (millions)	Annual Dollars	\$0.44	\$0.12	\$0.56	\$0.38	\$0.94	\$0.83	113%	\$1.86	51%
	Lifetime Dollars	\$8.84	\$2.46	\$11.30	\$7.51	\$18.81	\$16.65	113%	\$37.20	51%
Private Investment (millions)	Dollars	\$1.95	\$0.61	\$2.56	-	\$2.56	\$7.44	34%	\$17.73	14%
Participants	Participants	364	133	497	343	840	1,220	69%	2,926	29%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Low-rise Residential New Construction Program did not meet all its 2016 projected targets. The program was revised in June 2017, and the budget and benefit values have been updated to reflect 2016 actual commitments, revised projections for 2017, and additional funds and related metrics for 2018 to reflect projected increased participation. While the 2016 performance metrics were calculated relative to the then-current 2010 NYS Energy Conservation Construction Code (ECCC) of NYS, the revised 2017 and 2018 metrics rely on the ECCC of NYS adopted in October 2016 as the reference baseline. Going forward, incentives for cooperative advertising, first plan review, and first rating incentives will no longer be offered due to several factors, including limited market interest, NYSERDA's desire to reduce program complexity, and because some of the intended outcomes associated with these incentives are no longer being achieved.

## Multifamily New Construction Low-to-Moderate Income

### Results to Date – Metrics

Benefit metrics for the Multifamily New Construction Low-to-Moderate Income Resource Acquisition Transition Program are currently lagging behind annual targets, ranging from 81% to 98% of the various cumulative current targets through Q2 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	-	-	-	6,303	6,303	7,575	83%	15,520	41%
	MWh Lifetime	-	-	-	126,066	126,066	151,100	83%	310,200	41%
	MMBtu Annual	-	-	-	31,255	31,255	38,350	81%	81,100	39%
	MMBtu Lifetime	-	-	-	625,098	625,098	767,000	81%	1,622,000	39%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	4,978	4,978	6,010	83%	12,450	40%
	Lifetime Tons	-	-	-	99,563	99,563	120,350	83%	249,300	40%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$1.20	\$1.20	\$1.22	98%	\$2.51	48%
	Lifetime Dollars	-	-	-	\$23.96	\$23.96	\$24.35	98%	\$50.20	48%
Private Investment (millions)	Dollars	-	-	-	-	-	\$31.85	-	\$62.40	-
Participants	Participants	-	-	-	3,205	3,205	3,807	84%	7,857	41%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Multifamily New Construction Program did not meet its 2016 projected targets. NYSERDA learned that the per project incentive caps imposed on market rate projects were found by the market to be too restrictive in certain instances, therefore adjustments to those caps were made to more equitably reward larger projects. Additionally, the number of 2016 participants committing to achieving higher building performance or Tier 3 was higher than anticipated, relative to those willing to commit to the lower performance or Tier 2, resulting in increased savings per dwelling unit, but at the higher per dwelling unit incentive and associated project cost, impacting committed budget and benefit values.

The program was revised in June 2017 to update budget and benefit projections and values, which reflect 2016 commitments, the revised projections for 2017, as well as the additional funding and related metrics for 2018. While 2016 performance metrics were calculated relative to the then-current ECCC of NYS, the revised 2017 and 2018 metrics rely on the ECCC of NYS adopted in October 2016 as the reference baseline. The subsequent changes to energy code drove down the overall savings, as the baseline the incremental savings are being calculated against is more energy efficient.

## Multifamily New Construction Market-Rate

### Results to Date – Metrics

Benefit metrics for the Multifamily New Construction Market-Rate Resource Acquisition Transition Program currently lag behind annual targets, ranging from 60% to 88% of cumulative current targets through Q2 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	-	-	-	1,025	1,025	1,551	66%	5,271	19%
	MWh Lifetime	-	-	-	20,497	20,497	31,050	66%	105,600	19%
	MMBtu Annual	-	-	-	7,241	7,241	8,235	88%	28,490	25%
	MMBtu Lifetime	-	-	-	144,824	144,824	164,500	88%	569,500	25%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	924	924	1,256	74%	4,291	22%
	Lifetime Tons	-	-	-	18,484	18,484	25,050	74%	85,700	22%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$0.20	\$0.20	\$0.25	80%	\$0.86	24%
	Lifetime Dollars	-	-	-	\$4.04	\$4.04	\$5.05	80%	\$17.19	24%
Private Investment (millions)	Dollars	-	-	-	-	-	\$6.45	-	\$20.82	-
Participants	Participants	-	-	-	471	471	789	60%	2,689	18%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Multifamily New Construction Program did not meet its 2016 projected targets. NYSERDA learned that the per project incentive caps imposed on market rate projects were found by the market to be too restrictive in certain instances, therefore adjustments to those caps were made to more equitably reward larger projects. Additionally, the number of 2016 participants committing to achieving higher building performance or Tier 3 was higher than anticipated, relative to those willing to commit to the lower performance or Tier 2, resulting in increased savings per dwelling unit, but at the higher per dwelling unit incentive and associated project cost, impacting committed budget and benefit values.

The program was revised in June 2017 to update budget and benefit projections and values, which reflect 2016 commitments, the revised projections for 2017, as well as the additional funding and related metrics for 2018. While 2016 performance metrics were calculated relative to the then-current ECCC of NYS, the revised 2017 and 2018 metrics rely on the ECCC of NYS adopted in October 2016 as the reference baseline. The subsequent changes to energy code drove down the overall savings, as the baseline the incremental savings are being calculated against is more energy efficient.

## Anaerobic Digesters

### Results to Date – Metrics

Except for the renewable energy MW, which is at 113% of the cumulative current target through Q2 2017, the program shows slower than expected progress on all other benefits metrics which range from 21% to 54% of cumulative current targets through Q2 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	7,444	7,444	14,940	50%	37,440	20%
	MWh Lifetime	-	-	-	74,440	74,440	149,400	50%	374,400	20%
	MW	-	-	-	1	1	1	113%	1	113%
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	3,917	3,917	7,920	49%	19,920	20%
	Lifetime Tons	-	-	-	39,168	39,168	79,200	49%	199,200	20%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$1.08	\$1.08	\$1.99	54%	\$4.99	22%
	Lifetime Dollars	-	-	-	\$10.83	\$10.83	\$19.99	54%	\$49.99	22%
Private Investment (millions)	Dollars	-	-	-	\$8.00	\$8.00	\$39.00	21%	\$99.00	8%
Participants	Participants	-	-	-	2	2	4	50%	10	20%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Anaerobic Digester Resource Acquisition Transition Program has been revised to shift away from standard offer incentives to a competitive selection process. In June 2017, NYSERDA pivoted the format of the program a competitive selection format to strategically source pilot projects that have the potential to yield improved economic value and thereby proceed at reduced incentives from the ratepayers. The initiative will provide support for analysis and coaching regarding cost-reduction and revenue-enhancement strategies, and incentives for competitively-selected projects to pilot installations that demonstrate such features. Following these modifications, the initiative in 2017-2018 will continue to provide financial support to assist typically rural facilities with projects to install on-site renewable distributed generation equipment to help reduce their energy expenses as well as their carbon footprint, but the incentives will now be offered via a competition.

## Small Wind

### Results to Date – Metrics

This program has not achieved targets due to smaller sized projects than anticipated. Whereas participants and MW are on track, MWh is lagging the target due to the lower capacity factors of the smaller projects, which is also impacting carbon emissions and customer bill savings progress. Additional information can be found in NYSEERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	487	168	655	692	1,348	2,000	67%	5,000	27%
	MWh Lifetime	9,744	3,365	13,109	13,841	26,951	34,000	79%	82,000	33%
	MW	0.2	0.1	0.3	0.4	1	1	98%	2	41%
CO2e Emission Reduction (metric tons)	Annual Tons	256	89	345	364	709	1,500	47%	3,000	24%
	Lifetime Tons	5,127	1,771	6,898	7,283	14,181	18,500	77%	44,000	32%
Customer Bill Savings (millions)	Annual Dollars	\$0.06	\$0.02	\$0.08	\$0.08	\$0.17	\$0.30	56%	\$0.72	23%
	Lifetime Dollars	\$1.23	\$0.45	\$1.69	\$1.69	\$3.37	\$6.00	56%	\$14.40	23%
Private Investment (millions)	Dollars	\$0.70	\$0.61	\$1.31	\$2.44	\$3.75	\$3.00	125%	\$7.20	52%
Participants	Participants	7	11	18	38	56	54	104%	129	43%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Small Wind Resource Acquisition Transition Program did not meet its 2016 projected targets. The Small Wind Program was intended to provide the marketplace with support for turbines ranging in size 2 MW and smaller, where the electricity produced would primarily be used behind the customer's meter(s) via net metering or remote net metering. As evidenced in 2016 by the size of turbines matched to customers' loads who have participated in this Program, a very small turbine (size 10 kW) was predominantly chosen, resulting in lower acquired megawatts relative to committed budget, and this trend is expected to continue in 2017 and 2018. The benefit values were updated in June 2017 to reflect 2016 actuals, as well as revising the 2017 and 2018 anticipated performance metrics. Following these modifications, the initiative continued as planned. NYSEERDA has experienced a slowdown in applications to the program, which is driving a continued lag in achieving the metrics. NYSEERDA will monitor the program, and if this trend continues will further revised the targets.

## Solar Thermal

### Results to Date – Metrics

Although the number of eligible installers participating was lower than expected, the program largely tracked with regard to achievement of the rest of its cumulative current targets through Q2 2017, which were updated at the time of program closure in June 2017 to track with expected achievements for the duration of the program. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	123	-	123	707	830	830	100%	830	100%
	MWh Lifetime	1,849	-	1,849	10,604	12,453	12,500	100%	12,500	100%
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	65	-	65	372	437	437	100%	437	100%
	Lifetime Tons	973	-	973	5,580	6,552	6,550	100%	6,550	100%
Customer Bill Savings (millions)	Annual Dollars	\$0.02	-	\$0.02	\$0.09	\$0.11	\$0.11	96%	\$0.11	96%
	Lifetime Dollars	\$0.23	-	\$0.23	\$1.35	\$1.58	\$1.66	95%	\$1.66	95%
Private Investment (millions)	Dollars	\$0.08	-	\$0.08	\$0.74	\$0.82	\$0.82	100%	\$0.82	100%
Participants		8	-	8	34	42	42	100%	42	100%
Eligible Installers	Participants	5	-	-	-	5	20	25%	20	25%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Solar Thermal Resource Acquisition Transition Program did not meet 2016 goals and was subsequently closed in June 2017. The budget and benefit values were updated to reflect 2016 actuals. The remaining unspent budget from this initiative will be repurposed to fund a new solar thermal pilot in the Renewable Heating and Cooling Chapter, in the Heat Pumps and Solar Thermal Initiative.



## Combined Heat and Power

### Results to Date – Metrics

The program is making good progress against its cumulative current targets through Q2 2017, having exceeded its target participant enrollment and showing progress between 87% to 98% for all other targets. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	402	-	402	186,742	187,144	201,000	93%	287,000	65%
	MWh Lifetime	6,031	-	6,031	2,801,134	2,807,165	2,965,000	95%	3,320,500	85%
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	0.1	-	0.1	35	35	36	98%	51	69%
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	82	-	82	39,521	39,603	45,600	87%	64,900	61%
	Lifetime Tons	1,232	-	1,232	592,808	594,040	681,000	87%	972,800	61%
Customer Bill Savings (millions)	Annual Dollars	\$0.06	-	\$0.06	\$17.64	\$17.69	\$20.39	87%	\$29.20	61%
	Lifetime Dollars	\$0.84	-	\$0.84	\$264.54	\$265.38	\$306.65	87%	\$437.70	61%
Private Investment (millions)	Dollars	\$3.20	-	\$3.20	\$177.95	\$181.15	\$192.00	94%	\$230.00	79%
Participants	Participants	7	-	7	75	82	57	144%	86	95%
MT Marketplace		-	-	8	-	8	6	133%	24	133%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Not applicable. Transition programs do not have reporting milestones.

### Plan for Continuation/Modification/Termination

The Combined Heat and Power Resource Acquisition Transition Program was updated in July 2017 to correct an error in the value used to calculate the natural gas required to run CHP systems. The carbon and bill savings metrics were revised to take this updated natural gas value into account. Following these modifications, the initiative will continue as planned.

Matter Number 16-00681, In the Matter of the Clean Energy  
Fund Investment Plan

Clean Energy Fund Investment Plan:  
Market Characterization & Design  
Chapter

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

### 3 Market Characterization & Design

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The Market Characterization & Design Chapter (MCDC) presents NYSERDA's approach to market research and characterization to provide the necessary analytical information to identify and adequately understand target markets, including who the market players are and how they influence each other, barriers and leverage points, value added opportunities, pricing, baseline information, and other potential indicator metrics. As a part of this Chapter, a key focus will be on "Novel Solutions" where NYSERDA will identify and test the effectiveness of different novel intervention types and their potential to inform future investments in New York.

The MCDC Chapter has been modified to update the Intervention Pre-Development activities listed in Table 1. Some of the studies that were indicated in the initial April 16, 2016 filing have been removed as the insights and intelligence targeted have been collected through other methods (e.g. procurement of existing data and research). Table 1 has also been updated to reflect scoping changes to some of the remaining studies and reflect the market intelligence needs more accurately. The timing of the Market Fundamentals and Sector Building Stock work (in Tables 2 and 4 respectively) has also been updated to reflect more accurate timing based on initiative launch dates. The overall timeline laid out in Appendix A has also been updated to reflect these changes. The MCDC Chapter has also been modified to add additional funding for Novel Solutions activities. The additional funding will be leveraged to conduct market concept tests to validate effectiveness and impact potential of a concept, prior to filing a full-scale initiative.. This activity will accelerate the path for successful novel ideas and concepts that can be quickly proven to get to the market.

The objective of market research and characterization is to provide energy use and demographic/firmographic information; economics perspectives on costs and value of energy solutions; and insights on market, provider and customer trends relevant to accelerating the deployment of effective clean energy solutions. This work is designed to be available and useful to all actors engaged in advancing the objectives of the Clean Energy Fund (CEF), including but not limited to utilities, customers, and emergent service providers, and Reforming the Energy Vision (REV) project developers seeking to develop new business opportunity in emerging markets. This work will provide ongoing information to market participants as REV changes the regulatory environment for energy services and as the CEF and utility activities help to advance the market for clean energy services.

Accordingly, the approach recognizes the value of the learning to be extracted in a timely manner from CEF interventions and from the REV demonstration projects, as well from the activities of other parties engaged in relevant and instructive work. The approach commits NYSERDA to effective sharing of insights, resulting both from studies and learnings derived from interventions. Importantly, this market research and characterization approach will also support predevelopment work required to identify, prioritize, and design the future market development interventions for NYSERDA.

This chapter identifies known market characterization and design data needs, which NYSERDA expects will evolve along with the CEF portfolio. As new interventions are planned and introduced,

NYSERDA will revisit needs and update this chapter, at least annually, to reflect material changes.

This Market Characterization & Design Chapter is organized into the following sections:

- Market Characterization & Design Activities
- Information Dissemination
- Additional Resources
- Budgets & Expenditures

### 3.1 Market Characterization & Design Activities

The MCDC identifies five distinct categories of market characterization and design work required to initiate, accelerate, and evaluate interventions under the CEF. Furthermore, this work is expected to have broad applicability and value to other clean energy activities such as utility Energy Efficiency Transition Implementation Plans (ETIPs), REV Demos and other activities.

- **Intervention Pre-Development (Sector Level)** – Improved quantitative/qualitative understanding of energy efficiency decision making, economics, value proposition, segmentation, market trends and opportunities to aid in planning or modifying investments.
- **Novel Solutions** – Research and analysis to identify and measure the effectiveness of novel interventions to inform new investments, including behaviorally-based and performance based interventions, and other pre-investment in-market concept tests appropriate for validation of effectiveness and impact potential, prior to filing a full-scale initiative or launching a larger-scale initiative.
- **Market Fundamentals** – For energy efficiency and renewable/distributed energy resources, NYSERDA requires data on: energy use in various areas of the market; demographic/firmographic information; economic perspectives on costs and value of energy solutions; and insights on market/technology, provider and customer trends relevant to accelerating the deployment of effective clean energy solutions and evaluating the effects of interventions in the market. Work in this area will fulfill such information needs, typically informing multiple NYSERDA interventions.
- **Market Baselines, Potentials and Progress** – This area encompasses: high-level market characterization information needs that are important to optimizing NYSERDA’s strategy in the market on an ongoing basis and to measuring overall market progress across strategies; ongoing updates to energy efficiency potentials by major end use sector to aid in planning; and overarching, ongoing information needs pertaining to buildings, energy equipment and impact of program activities on energy consumption by sector.
- **Macro-Level Analyses** – NYSERDA will explore the viability and utility of conducting top-down econometric, macro-consumption studies to provide a more complete understanding of overall end-use energy reduction outcomes, including those associated with all clean energy strategies in the State. NYSERDA is also exploring the potential use and development of energy intensity indicators.

Although this chapter is organized by these five areas, NYSERDA will optimize its data gathering efforts (e.g., using the same data sets, same primary data collection vehicles, etc.) to meet needs in multiple areas. NYSERDA has competitively selected multiple pools of qualified consultants to perform the market and evaluative research identified herein in order to inform program strategies and assess the effectiveness of strategy results. NYSERDA's evaluation and market research capabilities are transitioning to become increasingly nimble and flexible to meet short turnaround requests and provide actionable insights while supporting accountability goals. The results of this work will allow NYSERDA to improve impact and innovation in deploying clean energy projects and strategies.

In order to achieve these objectives cost-effectively and efficiently, work will be assigned for individual, discrete activities with firm timelines and approaches and tools (including, but not limited to, longitudinal surveys and analysis of secondary data) will be used in conducting analyses, non-traditional research methods such as ethnography, social media and community platforms to offer real-time and continuous feedback on concepts and strategies will also be explored.

### 3.1.1 Interventions Pre-Development (Sector Level)

NYSERDA will leverage a wide range of intelligence gathering and research techniques to hone investment opportunities, identifying and applying actionable insights to interventions to increase their likelihood of success in the market. Activities will largely focus on market discovery methods designed to understand (1) customer and partner attitudes and perceptions, (2) customer decision-making, drivers and barriers affecting market growth, and (3) partner, service provider and end-user economics and business models to ensure the design of interventions and approaches will be economically compelling. Voice of customer and concept testing, in addition to other research methodologies will confirm that strategies and market approaches resonate with target audiences. Activities may also include continuous monitoring of the social, economic, demographic and financial conditions which impact NYSERDA's efforts. Table 1 provides more detail on specific work that is planned.

**Table 1. Interventions Pre-Development Work**

	2016	2017	2018	2019
Energy Efficiency - Commercial			Analysis of small/medium facilities (consideration of employee size of less than 100 = small, 100-500 = medium as proxies; will also consider square footage); assess remote audits and other analytics service options, intelligence for commercial office space and leasing process, including energy efficiency clauses and “rentalization” concept.	Applicability of energy service companies (ESCOs) to smaller facilities; Segment colleges, universities/k-12 for depth of sustainability activity and map values/drivers for faculty, staff and donor engagement.
Energy Efficiency - Industrial			Current state of industrial operations among small to medium facilities (Small = 500kw and below; Medium = 500kw to 1MW).	Evaluate and test tools for measuring productivity of data centers; assess emerging technologies for potential application in industrial process; analysis around small on-site data centers facilities; explore energy information management systems (EMIS) applicability for data centers.
Energy Efficiency - Multifamily			Analysis of building management and investment structures, financing mechanisms and barriers, and tenant preferences including buildings with 4-49 units. Analysis of service provider market, focus on non-NYSERDA service provider participants.	

	2016	2017	2018	2019
Energy Efficiency - Residential		Analysis of realtors, appraisers, lenders markets to integrate efficiency at point of home sale, and validity of home scoring systems.	Assess solutions gaining traction in other jurisdictions to feed pipeline for future NY strategies and investments- including combined EE/PV offering, analyzing pay for performance models in residential sector; business models for heating, ventilation, and air conditioning (HVAC) and other contractors serving the retail market; Identify MLS' including who utilizes energy efficiency information in their listings; Assess viability for a centralized on-line consumer resource to support residential energy systems, performance information, and service offerings	
Energy Efficiency - Products and Digital Solutions			Home energy management systems and advanced roof top units (ARTU) market analyses.	Analyze long-term energy as a service business models potentially using cloud computing to store and use energy data to optimize performance.
Low - to-Moderate Income (LMI) - Energy Efficiency and Distributed Generation (DG)	Inventory of LMI homes previously served and assessment of unmet needs of market.		Analysis on affordable housing builders and developers for potential to build to higher standards.  Analysis on landlords and property owners to understand their investment and capital improvement decisions.	Feasibility study and analyses on potential for scaling market for zero net energy modular homes to increase affordability for LMI residents
Distributed Energy Resources (DER) - Storage				Opportunities for storage as an integrated service offering with non-utility partners such as energy service providers.

	2016	2017	2018	2019
DER- Renewable Heating and Cooling		Customer analysis on decision making, priority segments and value propositions; analysis of contractor business models and potential models for financing.		
Clean Transportation				Assess critical segments (i.e., car dealers, employers, municipalities, etc.) for economics, decision making and value propositions around electric vehicles (EVs). Engage the EV dealer network: understand and evaluate dealer approaches to selling EVs and how potential customers are responding and what barriers are they seeing to purchasing EVs.
Innovation in Renewables Value Improvement and Connectivity			Support market research/analysis that will provide critical input to develop Innovation strategies around renewable value improvement, connected buildings, and smart mobility.	
Workforce Development	Research to isolate the energy impacts and non-energy benefits for buildings.	Analysis of operations and maintenance skills gaps and training needs		



	2016	2017	2018	2019
Financing Solutions			Analysis of potential barriers related to financing that are preventing the acceleration of cost-effective deployment of energy efficiency and renewable energy technologies in the State. Activities are envisioned to include, but not be limited to, sponsoring/ funding studies, pilots and interventions as well as working with market participants and other stakeholders.	
Large Scale Renewables – On Site			Assessment of attitudes and perceptions surrounding large scale solar and land based wind, including issues on siting and transmission development.  Analysis of bottlenecks in citing review process of major electric generating facilities (Article 10 process).	
New Construction				An analysis of demographic/cultural trends that can shape the New Construction market 5-10 years out for future investment planning; analysis/trends in construction practices including BIM (3-D modeling tool), design build and production build.

### 3.1.2 Novel Solutions

NYSERDA will identify and test the effectiveness of different novel intervention types and their potential to inform future investments in New York. Research activities will initially focus on identifying and testing the effectiveness and market impact of interventions supporting: 1) behavior integrated clean energy design and 2) performance-based solutions.

#### ***Behavior Integrated Clean Energy Design***

NYSERDA will evaluate and test integrated behavioral approaches for specific CEF strategies where a behavioral intervention is expected to result in high impact outcomes. Behavioral approaches use insights from social psychology and the decision sciences, like social norms that predict most people will adjust their behavior to be consistent with what is perceived to be the norm or common behavior. Integrated behavior design with a program or strategy could range from minimal to more extensive with in-market field testing using quasi-experimental design and/or random controlled trials. Successful outcomes for this behavioral science research could lead to broad intervention application and investment.

NYSERDA will also work outside of NYSERDA collaboratively with market partners to integrate effective behavioral principles into clean energy design, delivery and market animation activities to test efficacy and impact for potential to scale.

#### ***Performance-Based Solutions***

NYSERDA will identify and evaluate a variety of performance-based solutions and other novel financial mechanisms that have the potential to achieve greater clean energy adoption. Manufacturer warranties, pay as you go (examples include EVs, shared solar, van pools), lease to own (solar, EVs), crowd funding, carbon credits, and collaborative purchasing, hold a largely untapped potential for clean energy in New York State. This work is separate from and will complement the larger scale activities conducted by the New York Green Bank by focusing on new ways to drive projects forward and leverage financial markets without direct use of ratepayer funding.

As part of this work, NYSERDA will establish forums for knowledge sharing among technical and subject area experts to convene and discuss research analyses and other market insights to hone in on areas of opportunity and focus, and provide direction for future investments and intervention/pilot design. Activities and results from this work can also be disseminated through the Clean Energy Advisory Council (CEAC).

#### ***In-Market Testing for Novel Ideas and Concepts***

NYSERDA will develop a mechanism to implement small-scale in-market tests of novel ideas, including behavior and performance based solutions, as well as other concepts that are promising, but in need of further real world market validation prior to proceeding to a full initiative or

investment plan pilot.<sup>1</sup> The in-market testing will accelerate the path to market for successful novel ideas and concepts that can be quickly proven.

The tests are anticipated to last no longer than 18 months to two years, including implementation and evaluation. NYSERDA will allocate \$8,000,000 in total over three years to fund approximately five in-market concept tests per year (up to \$500,000 per in-market test). It is expected that market-driven projects would be solicited through an open enrollment procurement, and via solicitations for targeted NYSERDA driven tests. Market-driven solicitations may be phased to enable NYSERDA to recruit and select the best projects for testing each year. Novel ideas may include but are not limited to the following examples:

Multifamily Comparables Database: Affordable housing agencies are eager to underwrite to projected operational cost savings from energy performance improvements, as part of their first/unsubsidized mortgage lending process. This would allow for larger first mortgages and reduce the amount of subsidized capital needed for each property, which could then be allocated elsewhere. NY State Homes and Community Renewal (HCR) and Housing Preservation and Development (HPD) underwriters currently refer to Management and Operations Standards (“Standards”) when projecting buildings’ operating costs, yet energy models and audits regularly project energy cost numbers that are significantly below the per-unit energy costs prescribed by these Standards. While the will is there to underwrite lower operating costs from energy performance improvements, underwriters and regulators are uncomfortable deviating from these Standards based solely on energy models and audits. Based on meetings with HCR and interviews with underwriters, “comparables” comprised of post-retrofit energy consumption and costs information could serve as reference resources to corroborate energy model projections and allow underwriting to those savings. NYSERDA could develop a database of comparables—using NYSERDA multifamily program data and HCR financial reports for buildings that have received NYSERDA incentives for retrofits—to serve this role for affordable housing underwriters and test this idea on a small- scale to determine its potential impact.

Testing Products, Tools, and Approaches to Improve Energy Affordability and Access to Clean Energy Solutions for LMI Customers and Affordable Housing: Working with the utilities, product manufacturers, developers and CBOs, NYSERDA could help to demonstrate new products, tools, and services that can improve an LMI customer’s ability to better manage their energy consumption and reduce their energy costs. Demonstrations would include understanding barriers to adoption, as well as testing for user acceptance, and affordability impacts. In addition, NYSERDA can explore the development of new approaches for delivering clean energy services for LMI customers, such as testing effective models for integrating energy efficiency and on-site generation for LMI customers or affordable buildings, or piloting alternate models of procuring no-cost energy efficiency services to reduce the overall cost of delivering those services.

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<sup>1</sup> The novel solutions work here differs from the Novel Business Models and Offerings (NBMO) initiative which is more narrowly focused on supporting companies in scaling up novel service offerings.

### 3.1.3 Market Fundamentals

In all areas of energy efficiency and renewable/distributed energy resources, NYSERDA requires data on energy use in various areas of the market; firmographic/demographic information; economic perspectives on costs and value of energy solutions; and insights on market/technology, provider and customer trends relevant to accelerating the deployment of effective clean energy solutions. This data is imperative to understanding current market activity and future changes related to clean energy interventions.

NYSERDA's initiatives define the current market situation, theory of change (including market barriers addressed and outcomes sought) and expected impact of each strategy. Market Evaluation data needs associated with measuring the effectiveness of each specific strategy, over time, are also outlined in the individual initiatives. In conjunction with and in addition to these strategy-specific market evaluation needs, there are several higher-level market characterization data needs that are important to optimizing NYSERDA's strategy in the market on an ongoing basis and to measuring overall market progress across strategies. This layered approach including investment-specific and high-level market data is an important foundational element of NYSERDA's approach to measuring market change and validating program effectiveness.

This section describes higher-level data needs and plans for fulfilling them in each major end use sector. Table 2 provides more detail on specific work that is planned. The original timing for some activities, including the Home Energy Management System Market Assessment and the LMI Key Housing/Energy Assessments and LMI Integration of Key Cross-Agency Information Sets, have shifted to future years due to a change in study timing priority. New to Table 2 is a Large-Scale Wind Balance of System (BOS) Cost Study that will commence in 2018 and will be designed to quantify elements of BOS cost in NYS as a baseline for future progress and to compare BOS cost to other states and regions.

The CEF order called for specific attention to LMI households, ordering both a specific LMI Chapter and a minimum commitment of CEF funds of no less than \$234.5M during the years 2016-2018. In recognition of the need to assure that CEF programs effectively deliver clean energy solutions to these households, NYSERDA has developed approaches to improve its understanding of LMI customers and guide CEF investments. Research has and will include critical and relevant demographic, housing and energy information such as detail on housing tenure, occupancy by building type and configuration (single family, multifamily, public housing), household composition, energy end use characteristics, energy cost, energy burden, and geography. NYSERDA also will coordinate information gathering and integration of data with agencies that maintain relevant data, including the Office of Temporary and Disability Assistance, Department of Environmental Conservation, Department of Health, Department of Public Service, and Homes and Community Renewal. The data collected could then be processed and presented in multiple ways, including in geospatial information system (GIS) mapping to identify trends, gaps, and opportunities that will guide CEF investments.

**Table 2. Market Fundamentals Work<sup>2</sup>**

	2016	2017	2018	2019-2021
Energy Efficiency - Commercial	Key Technology/Market Area Assessments including: HVAC; energy management systems (EMS)/Building management systems (BMS); Energy Service Market; Customer Decisions	Net Zero Energy Commercial Building Market Assessment		Update to Key Technology/Market Area Assessments including: HVAC; EMS/BMS; Energy Service Market; Customer Decisions
Energy Efficiency - Multifamily		Net Zero Energy Multifamily Building Market Assessment		
Energy Efficiency - Residential	Net Zero Energy Homes Market Assessment; Home Energy Management Systems Market Assessment	HVAC Market Assessment	Update to Home Energy Management Systems Market Assessment; Update to Net Zero Energy Homes Market Assessment	Investigate Standardized Approaches to energy efficiency
Low-to-Moderate Income	Key Housing/Energy Assessments;		Key Housing/Energy Assessments; Integration of Key Cross-Agency Information Sets	
DER – Renewable Heating and Cooling	Air Source Ductless Mini- Split Market Assessment			Update to Air Source Ductless Mini-Split Market Assessment
DER - Renewables	Photovoltaic (PV) Balance of System Cost Study		Large-Scale Wind Balance of System Cost Study	Update to PV Balance of System Cost Study

<sup>2</sup> Several studies in Table 2 are supported by legacy Energy Efficiency Portfolio Standard (EEPS) and Technology & Market Development (T&MD) funds. These studies are shown here as part of the longitudinal data collection plan envisioned within the MCDC and because NYSERDA plans to use CEF funds to support updates to the studies as spending for legacy-funded evaluation activity will end February 29, 2020. Also, where NYSERDA programs or interventions are using non-ratepayer funds, market evaluation budgets will also be supplemented with non-ratepayer funds where comprehensive studies are planned.

	2016	2017	2018	2019-2021
Transportation	Transportation Market Assessment			Update to Transportation Market Assessment
Multi-Sector	Impact Study on NYSERDA Technology Innovation Demonstration Projects		Impact Study on NYSERDA Technology Innovation Demonstration Projects	

### 3.1.4 Market Baselines, Potentials and Progress<sup>3</sup>

To support CEF program design and evaluation, as well as assessment of overall progress toward the State Energy Plan and future Clean Energy Standard (CES) goals, NYSERDA will conduct a number of overarching, time series studies on building stock and energy consumption in NY State. These studies are described below.

#### ***Sector Building Stock Data***

Comprehensive sector building stock data will be gathered statewide on existing and new construction buildings across a broad range of customer segments and energy measures. The overall objective of this data collection effort is to understand the current condition of the building stock (residential, multifamily, commercial space) and associated energy use, including the saturations of energy consuming equipment (electric, natural gas, and other fuels) and the penetrations of energy efficient equipment, building characteristics and energy management practices. The studies will also collect demographic and firmographic information along with behavioral and operational information which will be correlated with the energy usage features.

The information gathered from building stock studies is necessary to support intervention design and evaluation, including a critical use in understanding market transformation. Based on the aggregation of data collected through the building stock studies, NYSERDA will be better equipped to design interventions that strategically target high opportunity segments, measures, or behaviors within the different NYS buildings markets. For example, the Residential Statewide Baseline study completed in

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<sup>3</sup> The *Plan for EEPS Statewide Research Studies and Joint Evaluations*, prepared by the Evaluation Advisory Group in February 2012 and updated August 2012, included two rounds of the Statewide Residential/Multifamily Baseline/Potential Study and two rounds of the Statewide Commercial Baseline/Potential Study. The first round of the Residential/Multifamily study was completed in 2015 and the first round of the Commercial study is currently underway; both have been funded with EEPS funds. The next round of the Residential study is included in this plan and will also be allocated EEPS II funds rather than CEF funds. This work activity is important to the CEF and will ultimately be allocated CEF funding for future rounds as NYSERDA updates this Chapter. As spending for legacy-funded evaluation activity ceases on February 29, 2020, the next round of the Commercial study and a new, separate Multifamily study will be funded entirely by CEF. The EEPS Statewide Study Plan can be found at:  
[https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/766a83dce56eca35852576da006d79a7/\\$FILE/2012-08-10\\_Feb\\_2012\\_Statewide\\_Study\\_Plan.pdf](https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/766a83dce56eca35852576da006d79a7/$FILE/2012-08-10_Feb_2012_Statewide_Study_Plan.pdf).

2014 identified that just over one-third of NYS homes do not receive an annual tune/service call for their HVAC systems, indicating a significant intervention opportunity around annual HVAC servicing. Further analysis of the data from these studies can be used to establish the condition of specific building types or segments at a point in time to serve as a standard practice baseline against which evaluation work can more precisely measure the impact of specific interventions. For example, the Residential Statewide Baseline study indicates that roughly a quarter of existing homes use heating oil as their primary heating fuel; this baseline will be used to understand the impact of NYSERDA programs that encourage heat pump technologies and develop fuel-neutral initiatives. Furthermore, these studies will provide valuable data to triangulate with other sources in order to arrive at estimates of the indirect, market transformative effects of NYSERDA and other interventions in the market in terms of key indicators, e.g., market penetration of high efficiency HVAC or other measures. In addition to measuring market transformation effects, the publicized results from these building stock studies will also inform the private market to better understand energy efficiency and renewable energy investment opportunities (see Information Dissemination section for more details).

The process for conducting building stock studies and regularly maintaining the key construction market attributes will require NYSERDA to assess which research elements may be established and/or supplemented by existing data (public or purchased) and which elements will require primary data collection. Furthermore, the elements requiring primary data collection will be organized by the level of effort. For example, some data can be reliably collected through phone or web-based surveys while other data requires on-site verification, based on complexity and level of rigor desired. To date, this assessment work has identified sources like HARDI data from D&R International to be a reliable source to track the penetration of energy efficiency HVAC equipment sales. This data can be purchased on an annual basis to keep building stock information current in the interim years between studies. Where data like the estimated level of private investment in energy efficiency within a construction market would likely require primary data collection, it may be annually updated through web-based surveys. Lastly, data elements like efficiency levels of equipment installed requires on-site verification approximately every five years.

This process and specific data collection plan for each construction market will be identified during the first task of each building stock study.

Research by major end use and operations and behavior elements vary by construction market and are identified in Table 3 below. The building stock studies are designed to collect key characteristics on buildings and equipment including, fuel type, vintage, equipment type, nameplate data, and measure counts. Building stock studies will generally include secondary data aggregation to support primary data collection. Primary data collection may include telephone and web-based surveys for less granular data points (e.g., heating equipment type) and on-site visits to validate phone and web-based data or collect additional granular data (e.g., Furnace annual fuel utilization efficiency (AFUE)) that may not be easily or accurately self-reported by the respondent.

**Table 3. Sector Building Stock Study Elements**

Elements of Research	Residential	Multifamily	Commercial
<b>Major End Uses</b>			
Lighting	X	X	X
Heating and Cooling	X	X	X
Ventilation	X	X	X
Space heating	X	X	X
Process heating/cooling		X	X
Water heating	X	X	X
Motors, fans and pumps		X	X
Compressed air		X	X
Refrigeration		X	X
Plug load/Computing/data/electronics	X	X	X
Segment-specific end-uses	X	X	X
Building shell (insulation and air sealing)	X	X	X
Appliances (e.g., dishwasher, clothes dryer, clothes washer)	X	X	
<b>Operations and Behavior</b>			
Operation days-of-week		X	X
Space hours-of-use		X	X
Equipment hours-of-use	X	X	X
Maintenance and Replacement practices	X	X	X
Awareness of energy efficiency technologies and practices	X	X	X
Control strategy (e.g., lighting: manual, EMS, occ. sensors, dimmers, daylighting, etc.; HVAC: thermostat, EMS, etc.)		X	X
Settings/set points (e.g., thermostat settings, hot water temps; use of energy-saving settings)	X	X	X
Common space attributes		X	X

From a longitudinal perspective, the comprehensive picture of the construction markets at different points in time can be used to understand the trend line within a construction market. These studies require regular updates, currently projected to be conducted every five years with specific elements collected annually through secondary data purchases and targeted primary data collection as described above. In addition, more frequent data collection may be conducted to ensure metrics on key indicators are current. Table 4 below is the schedule for building stock studies.

**Table 4. Timing of Sector Building Stock Studies**

	2016	2017	2018	2019	2020
Residential		Design & Implement Update Study	Measurement Year	Report Out	
Multifamily				Design & Implement	Baseline Year
Commercial	Design & Implement	Design & Implement	Baseline Year	Report Out	



### ***Future Potential***

The building stock studies and associated data will directly feed into NYSERDA's short-term potential studies. NYSERDA will maintain energy efficiency potential models for each of the construction markets that estimate technical, economic and achievable energy efficiency opportunities in NYS over the next three and five years. The models will be maintained through both bottom-up (measure-level) data from building stock studies and top-down (end-use or sector-level) data from secondary or other sources, e.g., technology cost forecasts. The potential studies will also include consideration of the influence of code changes. The potential studies will assist with the identification of energy-related opportunities and, when possible, recommend intervention action or adjustments to pursue opportunities found to be cost-effective. The potential studies will inform intervention targets and the development of strategic initiatives that best align with the State Energy Plan, CEF and REV goals.

NYSERDA will employ a strategy for keeping the potential studies up to date in the interim years between major primary data collection efforts. Inputs envisioned to be updated more frequently, potentially on an annual basis, are avoided costs, market penetration values gathered from secondary data and data purchases, and other such inputs.

#### **3.1.5 Macro Level Analyses<sup>4</sup>**

NYSERDA will explore the viability and utility of conducting top-down analysis, including potentially basic approaches to more sophisticated econometric, macro-consumption studies, to provide a more complete understanding of overall end-use and energy reduction outcomes, including those associated with all clean energy strategies in the State. Macro level analysis is useful to corroborate and correlate observed building and equipment changes with actual changes in energy use, controlling for factors such as energy prices, overall economic health, weather and business cycles. Should the approach prove feasible and effective in New York, wider scale implementation of macro-level analysis every 2-3 years can provide comprehensive information directly related to assessing the State Energy Plan energy, environmental and economic goals. Reduced energy consumption by sector can be translated into energy cost savings and emission reductions.

NYSERDA is also exploring the potential use and development of energy intensity indicators. Energy intensity is measured by the quantity of energy required per unit output or activity and may include energy use per unit of Gross State Product or energy use per square foot of building space in the residential sector, for example. Energy intensity indicators can be used to consistently track changes in energy intensity over time, for the State as a whole as well as for specific end-use sectors.

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<sup>4</sup> The *Plan for EEPS Statewide Research Studies and Joint Evaluations*, prepared by the Evaluation Advisory Group in February 2012 and updated August 2012, included Top-Down Energy Indicator/Econometric Study work consisting of identifying methods and conducting pilot assessments, as well as a full Statewide effort. Thus, the initial work identified in this MCDC will utilize EEPSII Evaluation funds. Future work planned for later years of the CEF will utilize CEF Evaluation funds, following appropriate updates to this MCDC to gain authorization.

## 3.2 Information Dissemination

The approach outlined in this Chapter allows for effective sharing of insights, resulting both from studies and the like and from learnings derived from interventions.

As studies are completed on the time lines identified within this Chapter, NYSERDA will share the data and information gained through this work with the public by publishing studies on its website and in the Department of Public Service's Document and Matter Management (DMM) system<sup>5</sup>, posting data on Open NY and in the context of later filed initiatives that will rely on this information. NYSERDA will also provide an update on information gained through the work outlined in this Chapter, and how the information has influenced activities, in the annual investment plan and progress reports. In addition, NYSERDA will seek out other ways to ensure NY Program Administrators have access to, and can benefit from, this information.

At this time, a nominal amount of funding associated with information dissemination is included within the budgets for activities identified elsewhere in this Chapter. If in the future NYSERDA identifies a more significant need for funding specific to information dissemination, this request will be made in the form of updates to this Chapter. However, NYSERDA is developing a suite of tools to support systematic and ongoing knowledge sharing by engaging with the market on data and information gained through its work, and to collect viewpoints and reactions to concepts during the strategic development process. For example, NYSERDA may leverage its Salesforce CRM platform to create "communities" that enable NYSERDA to opt-in market stakeholders for intelligence seeking or sharing of insights.

## 3.3 Additional Resources

### 3.3.1 Technical Assistance for Reform of the Electric Distribution System and Markets

NYSERDA will competitively select a pool of contractors qualified to assist NYSERDA staff in conducting objective economic and technical analysis and analytical modeling to inform the modernization of the electric distribution system in New York State; this work will complement and enhance the impact of CEF activities and further the objectives outlined in the 2015 New York State Energy Plan. The 2015 Energy Plan coordinates across State policies, agencies, and authorities that touch energy to advance the State's comprehensive energy policy initiative, REV. Central to the REV agenda are initiatives to reform regulatory policy, create new markets, and catalyze technological innovation to integrate clean DER into the core of the State's electric system.<sup>64</sup>

This contractor pool will make available specialized expertise and technical assistance across multiple support areas that reflect NYSERDA's current and anticipated work to advance reform of the State's electric distribution system and markets. Access to the contractor pool will augment

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<sup>5</sup> Final CEF evaluation plans and studies will be posted to DMM under Matter #16-02180.

<sup>6</sup> DER is comprised of a variety of resources, principally located on customer premises, including energy efficiency, demand response and energy management controls that increase demand elasticity, distributed storage, microgrids, and roof-top solar, combined heat and power, and other on-site power generation.

NYSERDA staff capabilities when called upon to undertake distinct, time-sensitive projects. Consistent with NYSERDA's leadership role in developing the State Energy Plan, NYSERDA will continue to provide research and analytic work to inform ongoing deliberations on relevant policy and regulatory proposals. NYSERDA also will use these technical assistance services in developing complementary CEF initiatives, which both account for anticipated regulatory reforms and help to accelerate technology and business model innovations that will make possible greater investment in and integration of clean DER.

### 3.3.2 Data Sets

To aid in securing timely information, NYSERDA will expand on its procurement of secondary data resources for intelligence gathering and analysis across NYSERDA's efforts. Databases will be purchased for both quicker and more qualitative findings, and also to support more foundational, quantitative work. The secondary research will be used both as a precursor to a primary research (i.e., to help clarify what is to be learned) and to answer specific, targeted research questions. In some cases, studies cannot definitively answer the research question but, nonetheless, can contribute to an understanding of the issue.

Data sources that NYSERDA plans or has procured include, but are not limited to the following:

- CoStar: CoStar provides access to research and data on commercial real estate properties throughout New York State, including building stock characteristics, lease turnover, and average tenant space square footage. This provides NYSERDA with key market intelligence to inform program design and continually up-to-date learnings about the market. This will be leveraged to support initiatives targeting commercial real estate tenants and multifamily buildings.

Info Group (formerly Info USA): Both the business and consumer datasets contain confirmed contact information for New York State businesses and individuals that can be used for marketing, program outreach, and sample development for evaluation and market insights. The datasets also contain both verified and modelled data points on firmographics and demographics, information like sales revenue or employee counts that will enable NYSERDA to track market growth related to new interventions. The datasets also include geo-coding for these entities which will be used to develop maps that enable geographic targeting.

- McGraw-Hill (including market sizing, relationship, and Dodge products): Market sizing function uses historic data from the Dodge data to construct forecasts the growth/contraction of construction by major Commercial building type, model is usually within five percent of reality. Relationship and Dodge data provide maps of key market actors relationships, market channels, and key specifications on any new commercial construction occurring in NYS (e.g., sq. ft., building type, value, etc.). This suite of data would provide a comprehensive picture of the commercial construction market that will enable more accurate evaluation, better segment-design program interventions, and a strategic understanding of the market's evolution.

- D&R International: Collects heating and cooling equipment sales by fuel, efficiency, and equipment type from surveys with Heating, Air-conditioning, and Refrigeration Distributors International (HARDI) members. This type of data enables program planning, marketing, and evaluation of the HVAC market in NYS through understanding market size, penetration and saturation of specific HVAC equipment, and identifies areas for potential growth/impact. NYSERDA's 2015 Residential Baseline Study identified and validated the HARDI data by comparing it to two other data sets, and NYSERDA plans to use the HARDI data set to potentially offset the need for more costly primary data collection in the future.
- Navigant: Provides research and analytical support on a variety of topics, including energy storage, residential energy innovations, and distributed generation. This information will provide key market intelligence to inform program design, and continually provide up to date learnings about the market.
- Green Tech Media: Provides research and analytical support on a variety of topics, including solar and grid-tied technologies. Information includes market forecasts, technology hard vs. soft cost breakdowns, and granular data and insights into global grid vendor deployments and projects. This information will provide key market intelligence to inform program design, and continually provide up to date learnings about the market.
- E-Source: A research library and data sets subscription service that provides access to market analysis tools and advisory services for more effective program planning, including knowledge of the best technologies. This work will provide insights to inform investments in the Products area.
- NYSERDA will investigate a data set that captures renovation/gut-rehab information, including the quantification of square foot of renovation activity, amount of energy savings potential (and/or energy efficiency activity), and systems break-out (envelopes, systems, etc.). This insight and data will inform New Construction and Codes strategy and investments.

In addition to the above data sets and resources, NYSERDA will also leverage and procure data from other sources, as appropriate, to support its efforts on an ongoing basis. Some of the initial purchases of data sets will utilize existing EEPS and T&MD funds.

### 3.3.3 Utility Data

The Market Characterization & Design work described herein will require access to utility customer and system data. This Chapter recognizes that the approach for providing this data has not yet been resolved and requires consideration of the value of and usefulness of the data, as well as of feasibility and of privacy and proprietary concerns that arise. The Chapter notes that there is an existing New York State Public Service Commission REV proceeding that includes the consideration of issues related to utility data.<sup>7</sup>

Data needed includes customer-level but anonymized data on certain defined segments/sectors of

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<sup>7</sup> Case 14-M-0101, In the Matter of Reforming the Energy Vision.

customers, including variables such as annual energy use, segmentation by NAICs code, location, and utility program participation, is needed to define the population and to develop sampling plans for sector building stock studies. Similar data is also needed for macro-consumption analysis.

Contact information is needed for a subset of customers selected for sampling within the sector building stock or other studies. These customers will be contacted for agreement to participate in such studies and will be asked to provide authorization for more detailed information, such as their individual energy consumption data, to be released to NYSERDA for use within the study.

### 3.3.4 Professional and Expert Engagement

The CEF will take advantage of national, state and regional entities whose mission is to advance and improve markets for clean energy to collaborate, further inform research, aggregate information from thought leaders and experts, and pool resources across multiple jurisdictions. Support for such organizations allows for the collection of best practices for program formation, as well as ‘next generation’ or innovations in program approaches and market designs that may help with New York’s REV strategy as well as the CEF implementation. Memberships provide forums for NYSERDA to engage with experts in various topic areas, as well as platforms that both inform policy and program directions for New York, and promote New York’s approaches to clean energy market development. Such engagements can also have the effect of eliciting interest in New York’s clean energy market, providing greater opportunities for products and services as well as increasing the level of expertise among stakeholders to foster greater information exchange in public proceedings. Finally, such institutions often provide focused research and/or market data (particularly in regional markets) that help to ensure that CEF strategies can be best structured to have impact in target market audiences.

NYSERDA has found value in membership of national, regional, state organizations in the past. As NYSERDA evolves its focus and activities under the CEF, it will continue to assess which organizations/activities provide the greatest value for engagement in furtherance of the CEF objectives. NYSERDA will engage where the organization furthers its market characterization and design activities, as well as provides market intelligence, information, pooled resources from multiple sources such as various states, or expertise that can inform future initiatives that would not be achieved otherwise.

## 3.4 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 5. The annual expenditure projection is included in Table 6. Budgets and expenditures do not include Administration or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. For transparency, NYSERDA has included in this budget activities planned for the years indicated. It is expected that activities will be added, especially for the later years in these tables, as this Chapter is updated and refiled in the future.

As noted earlier in this Chapter, some activities previously planned to be undertaken within EEPS or T&MD will be supported by NYSERDA’s EEPS or T&MD funding initially. Descriptions of these activities are included in this Chapter nonetheless as they are a critical part of NYSERDA’s CEF

evaluation approach and are planned to be included in future updates to this Chapter requesting allocation of CEF funding for later work. The budget and expenditure schedule below includes only CEF funds needing authorization at this time and is not indicative of the level of future CEF budget/spending that is envisioned for the work described. Furthermore, the budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 5. Evaluation Annual Budget – Based on Expected Schedule of Commitments**

<b>Budget - Commitment Basis</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>	
Market Development Market Research	<i>Market Characterization &amp; Design Activities</i>									
	Intervention Pre-Development	\$50,000	\$625,000	\$2,400,000	\$725,000	-	-	-	-	\$3,800,000
	Novel Solutions	-	\$50,000	\$3,300,000	\$3,300,000	\$2,600,000	-	-	-	\$9,250,000
	<i>Additional Resources</i>									
	Technical Assistance	\$150,000	\$1,750,000	\$1,350,000	\$1,250,000	\$500,000	-	-	-	\$5,000,000
	Data Sets	\$150,000	\$150,000	\$150,000	\$150,000	-	-	-	-	\$600,000
	Professional and Expert Engagement	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	-	-	-	\$2,500,000
<i>Sub-Total</i>	<i>\$850,000</i>	<i>\$3,075,000</i>	<i>\$7,700,000</i>	<i>\$5,925,000</i>	<i>\$3,600,000</i>	-	-	-	<i>\$21,150,000</i>	
Innovation & Research Market Research	<i>Market Characterization &amp; Design Activities</i>									
	Intervention Pre-Development	-	-	-	\$250,000	-	-	-	-	\$250,000
	<i>Sub-Total</i>	-	-	-	<i>\$250,000</i>	-	-	-	-	<i>\$250,000</i>
Evaluation	<i>Market Characterization &amp; Design Activities</i>									
	Market Fundamentals	-	\$977,500	\$690,000	\$4,864,500	\$632,500	\$552,000	-	-	\$7,716,500
	<i>Additional Resources</i>									
	Data Sets	-	-	-	\$100,000	\$125,000	\$25,000	\$25,000	\$25,000	\$300,000
<i>Sub-Total</i>	-	<i>\$977,500</i>	<i>\$690,000</i>	<i>\$4,964,500</i>	<i>\$757,500</i>	<i>\$577,000</i>	<i>\$25,000</i>	<i>\$25,000</i>	<i>\$8,016,500</i>	
<b>Total</b>	<b>\$850,000</b>	<b>\$4,052,500</b>	<b>\$8,390,000</b>	<b>\$11,139,500</b>	<b>\$4,357,500</b>	<b>\$577,000</b>	<b>\$25,000</b>	<b>\$25,000</b>	<b>\$29,416,500</b>	

**Table 6. Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
Market Development Market Research	5%	20%	27%	24%	18%	6%			100%
Innovation & Research Market Research	-	-	-	100%	-	-			100%
Evaluation	-	12%	9%	62%	9%	7%	0.3%	0.3%	100%

## Appendix A – Timeline

Year	Sector	Activity	Status
2016	Commercial	Market Assessments for Commercial: HVAC; EMS/BMS; Energy Service Market; Customer Decisions	In process. Preliminary findings will be complete by early 2018; final deliverables will be informed by and align with the completion of the Commercial Building Stock Study.
		Design and Implement Commercial Building Stock Study	In process. Final deliverables expected 2019.
	Industrial	Current state of industrial operations among small to medium facilities	Shifted activities to 2018.
	Single Family	Investigate Standardized Approaches to energy efficiency in the residential sector	Moved to 2019 due to priority shifts
		Net Zero Energy Homes Market Assessment	Complete. Final study will be posted to NYSERDA's website.
		Assess solutions gaining traction in the residential sector, including delivery mechanisms and key factors for contractor selection	Shifted activities to 2018.
		Analysis of business models for residential HVAC and other contractors	Shifted activities to 2018.
	Multifamily	Analysis of building management and investment structures, financing mechanisms and barriers, and tenant preferences; Analysis of multifamily service provider market	Shifted activities to 2018.
	LMI	Inventory of LMI homes previously served and assessment of unmet needs of market	Completed. through Apprise Market Characterization Study. Final study to be posted on NYSERDA website.
		LMI Key Housing/Energy Assessments	Complete. Final study posted <a href="#">here</a> . <sup>1</sup>
		Integration of Key Cross-Agency Information Sets for LMI	Ongoing activity.
	Products	Home Energy Management Systems Market Assessment	Complete. Final study posted <a href="#">here</a> .
		Air Source Ductless Mini-Split Market Assessment	Complete. Final study will be posted to NYSERDA's website.
		Home energy management systems and ARTU market analyses	Shifted activities to 2018.
	Workforce Development	Analysis of operations and maintenance skills gaps and training needs; research to isolate the energy impacts and non-energy benefits for buildings	In progress. To be completed Q4 2017.
	Transportation	Transportation Market Assessment	Complete. Final study posted <a href="#">here</a> . <sup>2</sup>
On-Site Power	Evaluate market approaches to attract luxury condo/coops and hotels segments to CHP	Activities cancelled due to priority.	
Solar PV	PV Balance of System Cost Study	Complete. Final study posted <a href="#">here</a>	

Year	Sector	Activity	Status
	Cross Sector	Impact Study on NYSERDA Technology Demonstration Projects	Complete. Final study posted <a href="#">here</a> .
		Behavior Research	Ongoing activity.
		Performance Based Solutions Research	Ongoing activity.
		Explore macro consumption modeling and energy intensity indicators	Ongoing activity.
		Information dissemination	Ongoing activity.
2017	Commercial	Analysis of smaller commercial buildings, including applicability of ESCOs	Scoping of project underway. Complete study in 2018.
		Assess remote audits	Activities shifted to 2018.
		Intelligence for commercial office space and leasing process	Scoping of project underway. Complete study in 2018.
		Segment colleges/universities and K-12 for depth of sustainability activity	Activities shifted to 2019.
		Map values/drivers for college faculty, staff and donor engagement.	Activities shifted to 2019
		Net Zero Energy Commercial Building Market Assessment	Study scoping in process.
		Assess baseline year for Commercial Building Stock Study	Move to 2018 given current progress of the study.
	Industrial	Evaluate and test mentoring and internship approaches in the industrial sector	Activities conducted in house.
		Inventory of current industrial M&V protocols	Activities conducted in house
		Testing uptake for new approaches to energy efficiency in the industrial sector	Activities shifted to 2019.
	Single Family	Analysis of realtors, appraisers, lenders and markets to integrate efficiency at point of home sale	Project underway. To be completed in 2017.
		Update to Home Energy Management Systems Market Assessment	Moved to 2018 due to priority shifts.
		HVAC Market Assessment	Study scoping in process.
		Design and implement Residential Building Stock Study	Study scoping in process.
		Assess viability for a centralized on-line consumer resource to support residential energy systems, performance information, and service offerings	New study added to MCDC as part of November 1, 2017 filing.
	Multifamily	Analysis of multifamily building management and investment structures, financing mechanisms, and tenant preferences	Activities shifted to 2018
		Net Zero Energy Multifamily Building Market Assessment	Study scoping in process.
	LMI	Analysis on affordable housing builders and developers for potential to build to higher standards	Scoping of project underway. Complete study in 2018.
		LMI Key Housing/Energy Assessments	Cancelled due to priority and recent completion date of 2016 study.
		Integration of Key Cross-Agency Information Sets for LMI	Ongoing activity.



Year	Sector	Activity	Status
	Energy Storage	Assess best fit sectors for energy storage	Activities conducted in house
		Assess opportunities for storage as an integrated ESCO service offering	Study areas revised. Activities shifted to 2019.
		Assess viability of alternative ownership models for energy storage (shared savings, PPA, etc.)	Study areas revised. Activities shifted to 2019.
	Renewable Heating and Cooling	Customer analysis on decision making and value propositions	Project underway. To be completed in 2018.
		Analysis of contractor business models	Project underway. To be completed in 2018.
	Workforce Development	Analysis of operations and maintenance skills gaps and training needs	New study added to MCDC as part of November 1, 2017 filing.
	Transportation	Assess critical clean transportation segments (i.e. car dealers, employers, municipalities, etc.) for economics, decision making and value propositions around EVs	Activities shifted to 2018.
	On-Site Power	Assess opportunities to increase uptake of small CHP (<50Kw) for restaurants and low rise Multifamily (25 units)	Activities cancelled due to priority.
	Cross Sector	Behavior Research	Ongoing activity.
		Performance Based Solutions Research	Ongoing activity. Project scoping for phase 1 research underway.
Information dissemination		Ongoing activity.	
2018	Commercial	Update to Key Commercial Market Assessments including: HVAC; EMS/BMS; Energy Service Market; Customer Decisions	Study moved to 2019 given planned completion date of 2016 study.
		Report out from Commercial Building Stock Study	Report out moved to 2019 given current progress of the study.
	Industrial	Evaluate and test tools for measuring productivity of data centers	Activities shifted to 2019.
		Assess emerging technologies for potential application in industrial process	Activities shifted to 2019.
	Single Family	Update to Net Zero Energy Homes Market Assessment	No change to original plans.
		Assess baseline year for Residential Building Stock study	No change to original plans.
		Assess solutions in other jurisdictions for potential in New York	New study added to MCDC as part of November, 1, 2017 filing
	LMI	LMI Key Housing/Energy Assessments	No change to original plans.
		Integration of Key Cross-Agency Information Sets for LMI	No change to original plans.
		Analysis of landlords and property owners capital improvements decision making	New study added to MCDC as part of November 1, 2017 filing
	Products	Update to Air Source Ductless Mini-Split Market Assessment	Study moved to 2020 due to priority shifts.

Year	Sector	Activity	Status
	Transportation	Update to Transportation Market Assessment	Study moved to 2020 to align with annual study timing not disaggregated in original filing.
	Solar PV	Update to PV Balance of System Cost Study	Study moved to 2019 to align with annual study timing not disaggregated in original filing.
	Large-Scale Renewables	Large-Scale Wind Balance of System Cost Study	New study added to MCDC as part of November 1, 2017 filing.
		Assessment of attitudes and perceptions surrounding large-scale solar and land-based wind, including issues on siting and transmission development	New study added to MCDC as part of November 1, 2017 filing.
		Analysis of bottlenecks in citing review process of major electric generating facilities (Article 10 process)	New study added to MCDC as part of November 1, 2017 filing.
	Financing Solutions	Understanding of potential barriers and obstacles to accelerate the cost-effective deployment of energy efficiency and renewable energy technologies in the State	New study added to MCDC as part of November 1, 2017 filing.
	Renewables Value improvement and Connectivity	Analysis surrounding the development of innovations for renewables value improvement, connected buildings and smart mobility	New study added to MCDC as part of November 1, 2017 filing.
	Cross Sector	Impact Study on NYSERDA Technology Demonstration Projects	No change to original plans.
		Behavior Research	Ongoing activity
		Performance Based Solutions Research	Ongoing activity
		Information dissemination	Ongoing activity.
		Novel Solutions In Market Testing	New study added to MCDC as part of November 1, 2017 filing.
	2019	Single Family	Report out from Residential Building Stock Study
LMI		Feasibility study and analyses on potential for scaling market for zero net energy modular homes to increase affordability for LMI residents.	New study added to MCDC as part of November 1, 2017 filing.
Multifamily		Design and implement Multifamily Building Stock Study	No change to original plans.
New Construction		Analysis of demo/cultural trends shaping new construction 5-10 years out	New study added to MCDC as part of November 1, 2017 filing.
Notes:			
<ol style="list-style-type: none"> <li>Additional volumes of this study, including the Executive Summary, Special Topic Reports, Methodology Reports, Acronyms and Glossary can be found <a href="#">here</a> under the Low- To Moderate-Income Market Characterization Study heading.</li> <li>Additional volumes of this study, including the Executive Summary, Electric Vehicles and Transportation Demand Management Market Characterization and Baseline Assessments and report appendices can be found here under the Clean Transportation Market Characterization Study heading.</li> </ol>			

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Commercial Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan: Commercial Chapter		
Revision Date	Description of Changes	Revision on Page(s)
April 29, 2016	Original Issue	Original Issue
May 20, 2016	<u>Real Estate Tenant</u> : Clarifying language added to Tables 3 and 5; <u>Real Time Energy Manager</u> : Corrections made to Tables 9 and 10.	9-11 and 21-22
June 23, 2017	<u>Real Estate Tenant</u> : Revised Tables 1, 2, 4, and 5 to reflect revised timing of budget and benefits. <u>Real Time Energy Manager</u> : Revised initiative name to Energy Management to better reflect initiative; increased funding to reflect Remote Energy Metering activities. Revised text and Tables 7, 8, 9, 10, 11 and 12 to reflect these revisions as well as shift in timing of budget and benefits. <u>REV Campus Challenge</u> : Increased funding based on initial market response; Revised Tables 13, 14, 16, and 17 to reflect shift in timing of budget and benefits and benefits associated with additional funding.	Multiple
November 1, 2017	<u>Energy Management</u> : Updated the baseline values in Table 3 to reflect latest data available and adjusted cumulative targets accordingly to incorporate baseline findings. <u>Real Estate Tenant</u> : Updated the baseline values in Table 9 to reflect latest data available. <u>K-12 Schools</u> : New initiative filed.	Multiple

## 4 Commercial

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NYSERDA aims to enable business models in the Commercial sector that can broadly impact a diversity of buildings, owners, tenants and businesses. This work initially will focus on enabling both existing energy service companies and other types of entities that could provide energy efficiency as a combined offering, a service, or energy efficiency as by-product or an embedded offering in another service. NYSERDA will also seek to accelerate the deployment of smarter technology whether it's smart fixtures, equipment or building systems, or a comprehensive approach to a portfolio of buildings – taking advantage of the rapid development of smart devices streaming data to the internet and smarter applications for managing equipment and building services.

The Commercial strategy is anchored by decision-makers being able to more easily determine their options and have confidence in their investment decisions. NYSERDA's efforts in reducing soft costs and time frames and supporting credentialing, matchmaking and quality assurance in the marketplace will support increased investment opportunities and more affirmative investment decisions.

Initial initiatives launched in 2016 include: Commercial Real Estate Tenant which pursues energy efficiency in the commercial tenant segment; Real Time Energy Management (RTEM) which supports smart technology on a building or portfolio basis; and REV Campus Challenge, a segmentation strategy to use peer ratings, sharing, and supports to drive deeper energy efficiency and renewable energy in colleges and universities. Updates to those initiatives are included herein as follows:

- Uptake to the initial Commercial Real Estate offering was slower than anticipated and did not meet its 2016 projected targets. Beginning in October 2016, aggressive outreach and meetings with potential applicants revealed a minimum three-month development cycle between learning about the offering and committing to a project could be the likely cause, though continued market research is being conducted to inform the strategy. It is anticipated the strategy will still achieve its 2025 projected benefits, however the investment plan has been updated to reflect 2016 activity and a shifting of activity in years 2017-2025.
- Real Time Energy Management did not meet its 2016 projected targets. RTEM vendors began applying to the initial offer in October 2016, and NYSERDA has seen a steady increase in applications since. Market feedback indicates the strategy is on target to achieving its overall goals, although NYSERDA anticipates a six-month lag in its original projected 2016 targets. The investment plan has been updated to reflect actual 2016 results and a shifting of projected achievements accordingly. This section of the chapter has also been renamed Energy Management to broaden the scope to explore less sophisticated remote energy management (REM) opportunities and to expand into other sectors, i.e. industrial and multifamily. In addition, market feedback and vendor capabilities have identified untapped potential in RTEM system enhancements and the targeted market segment. As a result, \$7 million is being added to the pool of incentives and services to support the installation of

additional controls components on RTEM systems, as well as projects outside of the commercial sector. These new projects are anticipated to achieve additional benefits at the same \$/CO2 ton as originally projected. Budget and benefits are updated to reflect these adjustments.

- REV Campus Challenge exceeded its 2016 target of 40 colleges, signing 63 members. Workshops held in 2016 confirmed interest and need in additional financial support to obtain technical guidance, intern support and community reaching initiatives. As a result, an additional \$2 million is being added to the pool of incentives and services REV Campus Challenge is offering. The funds are being added in 2017 and 2018 with additional direct benefits at the same \$/CO2 ton as originally projected. Budget and benefits are updated to reflect these additions.

In 2017, a Technical Services initiative was filed and approved in the Multi-Sector Solutions Chapter, which commercial facilities are eligible for. This initiative will engage consultants and customers in exploring approaches to providing and receiving clean energy recommendations through technical analysis. Also included in the Commercial Chapter in 2017 is the K-12 Schools initiative. This effort will provide schools and their service providers a framework for clean energy awareness and adoption that leverages existing capital planning cycles schools are already accustomed to.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 4.1 Real Estate Tenant

### 4.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• New York State has the highest percentage of non-building owner (tenant) occupied space of any state and most of the tenant occupied space is concentrated in New York City.</li> <li>• In an individual commercial office building, somewhere between 40 to 60% percent of energy consumption is controlled by tenants and not the building's owners and managers. While heating, ventilation, and air conditioning (HVAC) and lighting are trending downward in energy use per square foot, tenant plug load is growing.</li> <li>• Energy is most often omitted from lease negotiations and not a priority in the space design process in part due to the split incentive between the tenant and the building owner.</li> <li>• The energy and non-energy benefits of energy efficiency improvements in tenant spaces are not well known and are overshadowed by the high cost of rent and other tenant expenses.</li> <li>• The split incentive issue between tenants and building owners and managers has been an ongoing barrier to incorporating clean energy technologies and practices in to tenant spaces. While the issue is well known, a solution has not been presented by the market.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA will initiate this intervention with an offer to cost-share an energy modeling and package development process for tenant office space within New York State. This would help to drive energy efficiency efforts during the commercial tenant lease and build out process by demonstrating to tenants a cost-effective approach to energy efficient high-performance office space as well as demonstrating to building owners and managers, brokers and architecture and engineering firms a cost- effective and replicable approach to delivering those spaces.</li> <li>• NYSERDA will also offer cost sharing on the development of new tools and resources that allow tenants greater visibility and manageability over their energy consumption, as well as tools that connect tenant level data with base building data.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Commercial Real Estate Tenant Initiative," which can be found in Appendix A.</li> </ul>
<p><b>Goals</b></p>	<ul style="list-style-type: none"> <li>• Build capacity, capability, and interest of architects and engineers to design and deliver above code energy efficiency in the commercial office space market.</li> <li>• Encourage building owners and managers to offer highly efficient office space as a value-added upsell during lease negotiations.</li> <li>• Stimulate demand for and investment in energy efficiency improvements in tenant spaces.</li> </ul>
<p><b>State Energy Plan/Clean Energy Standard Link</b></p>	<ul style="list-style-type: none"> <li>• The State Energy Plan identifies buildings as a major user of energy (~60%) and greenhouse gas (GHG) emissions in the State. Commercial office buildings account for 12% of this energy use. This strategy specifically addresses 7% of the total energy used in New York State.</li> <li>• The State Energy Plan also discusses the need to manage electricity demand to ensure efficient and reliable operation of the grid. This strategy is focused on the buildings which have the biggest impact on peak load and will enhance their ability to manage and reduce peak load.</li> </ul>

#### 4.1.2 Target Market Characterization

<b>Target Market</b>	The target market is commercial tenant space within Class A and B office buildings.
<b>Market Participants</b>	<p>Architecture and Engineering (A&amp;E) firms</p> <ul style="list-style-type: none"> <li>• Present space design options and energy efficiency improvements to tenant</li> <li>• Influence open space layout and perimeter vs interior enclosed space</li> <li>• Influence daylighting, lighting controls, and product selection (lighting design firms)</li> </ul> <p>Building Owners and Managers</p> <ul style="list-style-type: none"> <li>• Have knowledge of inventory of space to be turned over and timing of lease expirations.</li> <li>• Have leverage over the options presented to potential tenants and the associated pricing</li> </ul> <p>Real Estate Brokers</p> <ul style="list-style-type: none"> <li>• Present building and space options</li> <li>• Guide and influence the lease negotiation process</li> <li>• Educate tenants on energy efficient buildings and tenant spaces</li> </ul> <p>Commercial Real Estate (CRE) Tenants and Tenant Representatives</p> <ul style="list-style-type: none"> <li>• Demand energy efficiency improvements to base building systems</li> <li>• Demand high performing office space</li> <li>• Demand control over their energy usage and comfort within their space</li> <li>• Embrace opportunities for energy efficiency improvements</li> </ul> <p>Appraisers</p> <ul style="list-style-type: none"> <li>• Understand and evaluate energy efficiency improvements to base-building and tenant systems</li> <li>• Determine increase in building asset value due to improved tenant spaces</li> </ul> <p>Professional/Industry Associations</p> <ul style="list-style-type: none"> <li>• Advocate for different market participants and their needs</li> <li>• Trusted source of information and best practice sharing</li> </ul> <p>Energy Service Companies</p> <ul style="list-style-type: none"> <li>• Help A&amp;E firms develop efficiency packages</li> <li>• Provide new energy saving technologies, tools, and software</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• Previous national demonstration projects conducted by the Natural Resources Defense Council (NRDC), have shown the economic benefits of high performing tenant spaces and have successfully engaged several industry leaders. Those projects which include some New York City (NYC) buildings, including NYSERDA’s New York City office, have saved an average of 30% more energy than current code and \$19,000 in annual energy bills. In the roll out of NRDC’s work, NYSERDA funded five additional tenant spaces through its Technology &amp; Market Development (T&amp;MD) Funded Emerging Technology &amp; Accelerated Commercialization (ETAC) initiative which will provide NYSERDA with more granular data to inform the overall strategy and approach to building capacity, capability and replicability of energy modeling.</li> <li>• An increasing amount of law firms, technology companies, and banks have corporate sustainability goals and see high performing office space as a necessity to recruit and retain new employees.</li> <li>• Energy-efficient improvements are often viewed as state-of-the art add-ons and as something that tenants use to showcase their space.</li> <li>• TenantStar, the federal initiative to benchmark energy consumption in tenant spaces, is currently under development and expected to launch in 2022. New York City is interested in being an early adopter of TenantStar and in preparation is working to launch a Landlord/Tenant Carbon Challenge in early</li> </ul>



	<p>2017. NYSERDA is working with the City in its efforts to launch the Challenge and will target its members for participation in this strategy.</p>
<p><b>Customer Value</b></p>	<p>Developing tenant-specific efficiency options:</p> <ul style="list-style-type: none"> <li>• The building owner or tenant chooses to model one tenant office space, averaging 50,000 square feet and an 8-year lease.</li> <li>• The cost of an energy model and packaged energy efficiency options specific to one tenant space is approximately \$50,000.</li> <li>• In the initial years of the strategy NYSERDA will provide up to 50% of the cost of modeling without a project cap. These levels will be adjusted based upon market response and reduced if there is strong uptake by the market.</li> </ul> <p>Cost of the extra investment by the tenant:</p> <ul style="list-style-type: none"> <li>• The incremental cost to choose and implement packaged energy efficiency options is approximately \$54,000.</li> <li>• Implementation of packaged energy efficiency options is projected to save an average of \$19,000 in annual energy bills.</li> </ul> <p>Value to the tenant using its tenant-specific package:</p> <ul style="list-style-type: none"> <li>• At \$19,000 in annual energy bill savings, high performing tenant spaces can expect to have a 4.2-year simple payback which fits within the typical 8-year lease term. This payback is 5.5 years without NYSERDA cost-share.</li> <li>• High performing tenant spaces also offer quantifiable gains in image, controllability, productivity and asset value.</li> </ul> <p>Leveraging specific tenant options to other building tenants with a building specific package:</p> <ul style="list-style-type: none"> <li>• The additional cost of creating a building-specific package for any tenant in the previously modeled building is approximately \$6,500.</li> <li>• In the initial years of the strategy NYSERDA will provide up to 100% of the cost of modeling without a project cap. These levels will be adjusted based upon market response and reduced if there is strong uptake by the market.</li> </ul> <p>Value to the tenant when building owners and managers offer tenant specific design based upon a building-specific package and spread costs across multiple tenants:</p> <ul style="list-style-type: none"> <li>• At \$19,000 in annual energy bill savings, high performing tenant spaces can expect to have a 2.9-year simple payback which fits within the typical 8-year lease term. This payback would increase slightly to 3.2 years without NYSERDA cost-share.</li> <li>• High performing tenant spaces also offer tenants quantifiable gains in image, controllability, productivity and asset value</li> </ul> <p>Value to the A&amp;E firms producing the energy models and packages</p> <ul style="list-style-type: none"> <li>• Firms can offer clients an additional service during the design process due to the enhanced skills and experience of their designers.</li> <li>• Allows designers to gain confidence in their ability to model and deliver energy savings.</li> </ul> <p>Value to the Building Owners and Managers</p> <ul style="list-style-type: none"> <li>• Allows building owners and managers to offer new value-added options during the lease negotiation process.</li> <li>• Energy efficient tenant spaces allow base building systems to run more efficiently, lower operating costs, and potentially increase asset value.</li> </ul>

### 4.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• Voice of Customer data collection from one-on-one meetings with tenants, building owners and managers, architecture and engineering firms, and commercial real estate brokers.</li> <li>• NYSERDA will continue to work with stakeholder organizations and the commercial real estate market to inform, optimize and promote the strategy</li> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) to engage with stakeholders, as appropriate. <sup>1</sup></li> <li>• Engage key market partners to gather real-time feedback on the success of the strategy, remaining barriers, and market changes</li> <li>• Outreach: In-person meetings, webinars</li> </ul>
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### 4.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Split incentive issue between building owner and tenant for financing of energy efficiency measures</li> <li>• Rapid lease negotiations and construction timelines limits opportunities to encourage tenant efficiency during the tenant fit-out process</li> <li>• Lack of consideration of energy efficiency during lease negotiations and low prioritization of efficient equipment in designing tenant spaces</li> <li>• Lack of information on the energy and non-energy benefits of energy efficiency improvements in tenant spaces</li> <li>• Comparatively low cost of energy relative to other tenant expenses</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If a tenant is presented with a custom modelled package demonstrating the potential energy savings, incremental project cost, and return on investment, then they will be motivated to choose an energy efficient space design, change behaviors and office culture.</li> <li>• If new tenants are presented with building-specific packages, then they will not need to model their space and will also choose an energy efficient space design, change behaviors and office culture.</li> <li>• If data, case studies, and testimonials from key market actors are developed, then peers will have more confidence in the packages and savings and will replicate energy efficient space design, change behaviors and office culture without NYSERDA cost share.</li> </ul>
<b>Activities</b>	<ul style="list-style-type: none"> <li>• Conduct targeted outreach to key building owners and managers, architecture and engineering firms, and tenant representatives</li> <li>• Encourage increased capacity and capability of energy modeling to architecture and engineering firms             <ul style="list-style-type: none"> <li>○ Development and up to 50% cost-share of tenant specific, energy efficiency packages.</li> <li>○ Development and up to 100% cost-share of building specific, energy efficiency packages</li> <li>○ Target 180 buildings and 200 to 350 tenants</li> </ul> </li> <li>• Augment existing market intelligence to better target and position the offering             <ul style="list-style-type: none"> <li>○ Gain a more precise understanding of the turn-over of leased commercial office space and</li> </ul> </li> </ul>

<sup>1</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

	<ul style="list-style-type: none"> <li>○ Learn how best to introduce energy efficiency to the multiple market actors involved in a transaction</li> <li>○ Learn how best to expand stakeholder relationships beyond building owners and managers and large tenants</li> <li>● Provide training and educational support</li> <li>● Adjust tools/packages to address unique values of different market segments</li> <li>● Analyze tenant space performance and billing data</li> <li>● Analyze building-specific packages for commonalities that could allow for standardization across space and building characteristics</li> <li>● Develop standardized office packages for the market sector</li> <li>● Validate, aggregate, and publish information on energy and non-energy benefits and best practices</li> <li>● Create tenant energy efficiency guidance manual <ul style="list-style-type: none"> <li>○ Identify benefits of energy efficiency</li> <li>○ Provide technical guidance and calculations for energy savings</li> <li>○ Address energy efficiency measures specific to tenant office space</li> </ul> </li> <li>● Create a data warehouse <ul style="list-style-type: none"> <li>○ Collect tenant system level metrics to analyze trends in energy efficiency opportunities and tenant space design</li> <li>○ Share aggregated data with the market place to spur replication of package development, improve existing design and leasing tools, and inspire advancements in tenant level technologies</li> </ul> </li> <li>● Develop supporting tools <ul style="list-style-type: none"> <li>○ A tool that combines tenant level data (sub-meter and tenant system level) with whole building data</li> <li>○ Energy Efficiency add-ins for existing modeling/design software</li> <li>○ Templates for leasing contracts with performance bonus/expectations for energy savings for A&amp;E firms</li> </ul> </li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1: Tenant Modeling Drives Implemented Energy Efficiency Measures (2016-2020)</u></p> <ul style="list-style-type: none"> <li>● Tenants will incorporate energy efficiency measures from tenant-specific packages into their designs. Observed gains from NRDC, were 25-40% of energy saved above 2007 code; NYSERDA is projecting gains of 15-20% against the 2010 and 2012 code. The actual savings will be identified through measurement and verification (M&amp;V).</li> </ul> <p><u>Milestone 2: Building Modeling Drives Initial Wave of Replication (2018-2024)</u></p> <ul style="list-style-type: none"> <li>● Building specific packages demonstrate replicability of tenant-specific model to the whole building for development of building-specific packages</li> <li>● Engagement with stakeholders involves all identified Market Actors</li> <li>● Secure commitments from building owners and managers and brokers to provide building-specific packages to new tenants with leasing materials</li> <li>● New tenants use building-specific energy efficiency packages (actual participation identified from results reported by building owner)</li> <li>● Projects demonstrate that building-specific packages can be used within the normal timeframe of the tenant fit-out process and do not slow-down the process</li> <li>● NYSERDA validates energy models, energy savings, incremental cost, and return on investment for tenant projects</li> <li>● NYSERDA confirms economic savings/value while presenting soft cost (i.e., productivity) opportunities as additional benefits to the market</li> <li>● NYSERDA gathers data on tenant productivity, satisfaction, and wellness through surveys created with each tenant’s Corporate Social Responsibility and Human Resource teams</li> </ul>

	<ul style="list-style-type: none"> <li>For buildings that offer tenant efficiency packages, 30% of new tenants use the package to implement energy efficiency measures that go above code</li> </ul> <p><u>Milestone 3: Market Demand Drives second wave of replication (2020-2025)</u></p> <ul style="list-style-type: none"> <li>Market actors seek to develop tenant and/or building-specific packages for new participating buildings, initially with cost share</li> <li>Tenants and architects and engineers realize the value of energy modeling and packages in the design process (measured by participation in the Intervention and training initiatives)</li> <li>Building owners and managers, architects and engineers, and brokers incorporate package development into their existing business models</li> <li>Tenants inquire about and demand energy efficiency in prospective spaces</li> <li>Standardized packages developed for tenant office spaces, if significant commonalities are identified among building-specific packages</li> </ul> <p><u>Milestone 4: Long Term Benefits to Building Owners and Managers (2020-2025)</u></p> <ul style="list-style-type: none"> <li>Building owners and managers attain lower operating costs and greater asset value</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>Architects and Engineers, and Brokers incorporate packages into existing business models and energy modeling and energy efficiency options are a standard service offering.</li> <li>Class A Building Owners and Managers routinely meet tenant demand for energy efficiency above code and 20% of them, by square footage, present building-specific packages to prospective tenants during lease negotiations.</li> <li>Penetration of methods and energy efficiency offerings into class B and C space will be an indicator that the modeling is efficient and precise and that tenants are acting on the packages.</li> <li>An ever-increasing number of tenants that are presented building-specific or standardized packages adopt energy efficiency measures, generating demand for energy efficiency office space.</li> <li>NYSERDA cost-share for energy modeling and package development decreases as market uptake increases</li> <li>The strategy will progress from offering cost-sharing for energy modelling to enable energy efficiency package development and offerings in the market to providing resources in the form of tools or technologies that help building owners and tenants manage energy resources and optimize the performance of tenant spaces.</li> </ul>

4.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>NYSERDA has shared information and met with each of the investor owned utilities (IOUs) as well as with the Joint Utilities (JU) to discuss commercial initiatives, including CRE Tenant. The primary uptake of the initiative is likely in Con Edison territory. As this initiative gains traction with architecture and engineering firms, building owners and managers and tenants, it is expected to result in energy savings during tenant fit-outs and lease negotiations. Additional coordination is getting underway to provide a clear path for opportunities that are identified to seek out incentive support from IOU energy efficiency programs. Historically, given the nature of tenant fit-outs, projects were eligible for new construction incentives offered through NYSERDA and not the utilities. Therefore, this effort is also being closely coordinated with the evolution of new construction based strategies.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Sub metering efforts and potential tenant level system data are additional points of coordination planned with the IOUs.</li> <li>• NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• While none of the investor owned utilities has a dedicated CRE Tenant initiative now, the target market in 2016-18 overlaps with utility key account initiatives. NYSERDA will coordinate with utilities on key accounts to optimize the overall impact of both NYSERDA and utility offerings and to avoid confusion and multiple outreach efforts. If successful with this initiative, NYSERDA foresees the potential for targeted tenant based efforts to be an integral part of utility offerings in the future and will adjust its initiative accordingly.</li> </ul>

#### 4.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1. Annual Market Development Budget Allocation – Commitment Basis**

Commitment Budget	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Incentives & Services	\$11,000	\$1,217,164	\$2,249,448	\$2,086,567	\$2,434,328	\$1,738,806	\$1,043,284	\$521,642	\$347,761	-	\$11,650,000
Tools, Training, and Replication	-	\$704,167	\$985,833	\$1,126,667	\$1,408,333	\$1,408,333	\$1,408,333	\$845,000	\$563,333	-	\$8,450,000
Implementation Support	\$1,356,700	\$900,000	\$200,000	\$900,000	\$600,000	\$400,000	\$100,000	\$700,000	\$143,300	\$100,000	\$5,400,000
Total	\$1,367,700	\$2,821,331	\$3,435,281	\$4,113,234	\$4,442,662	\$3,547,139	\$2,551,617	\$2,066,642	\$1,054,395	\$100,000	\$25,500,000

**Table 2. Annual Expenditures Projection**

Expenditures	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total
<b>Total</b>	0%	4%	4%	5%	9%	10%	10%	11%	11%	11%	12%	13%	100%

#### 4.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

<b>Indicators<sup>2</sup></b>		<b>Baseline (Before/ Current)<sup>3</sup></b>	<b>2019 (Cumulative)</b>
<b>Activity/Outputs</b>	Number of tenant spaces participating in the modeling and energy efficiency package offer	0	130
	Number of buildings participating in the modeling and energy efficiency package offer	0	110
	Square footage of participating tenant spaces in the modeling and energy efficiency package offer	0	6,500,000
	Percent of energy saved above code (for participants)	0	15 - 20%
	<b>Partner engagement:</b> Number of CRE building owners and managers that offer building-specific packages	0	130
	Number of case studies developed	0	7
	<b>Partner engagement:</b> Number of brokers and A&E firms trained	0	20
	<b>Partner engagement:</b> Number of Brokers and A&E Firms that include in-depth energy models and package development in their standard practice	0	12
<b>Outcomes</b>	<b>Package development</b> costs of building-specific package per square foot (SF)	\$0.13/SF	\$0.06/SF
	<b>Market Engagement</b> Number of Brokers and A&E Firms that include in-depth energy models and package development in their standard practice	6	20
	Percent of the total addressable square footage in NYS that is covered by a building-specific package	0	7%
	Tenant Spaces completed by the market without NYSERDA funding	141	286
	Percentage of Real Estate Broker firms trained on energy efficient space design and including energy in leasing dialogues with tenant	TBD	10%
	Percentage of Architecture and Engineering firms trained to better incorporate energy efficiency options into tenant space designs and providing packages as standard practice	TBD	10%

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

<sup>2</sup> TBD denotes preliminary results have been collected but NYSERDA requires additional analysis to confirm the values. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>3</sup> Revised baseline metrics reflect preliminary research and will be updated upon completion of a market evaluation study still underway. Once finalized, the study will be available publicly on NYSERDA’s website and in the DPS Document and Matter Management system.

**Table 4. Direct Impacts**

Primary Metrics <sup>4</sup>		2016	2017	2018	2019	2020	2021	2022	2023	2024	TOTAL
Energy Efficiency	MWh Annual	121	13,100	24,100	22,400	26,100	18,600	11,200	5,600	3,700	124,900
	MWh Lifetime	968	105,000	193,000	179,000	209,000	149,000	89,600	44,800	29,600	999,200
	MMBtu Annual	128	13,800	25,500	23,600	27,500	19,700	11,800	5,900	3,900	131,800
	MMBtu Lifetime	1,020	110,000	204,000	189,000	220,000	158,000	94,400	47,200	31,200	1,054,000
	MW	-	-	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual	70	7,620	14,000	13,000	15,200	10,800	6,520	3,260	2,150	72,700	
CO2e Emission Reduction (metric tons) Lifetime	564	61,000	112,000	104,000	122,000	86,600	52,100	26,100	17,200	581,600	
Customer Bill Savings Annual (\$ million)	\$0.017	\$1.82	\$3.34	\$3.11	\$3.62	\$2.58	\$1.55	\$0.777	\$0.514	\$17.34	
Customer Bill Savings Lifetime (\$ million)	\$0.134	\$14.5	\$26.7	\$24.9	\$29.0	\$20.7	\$12.4	\$6.22	\$4.11	\$138.7	
Private Investment (\$ million)	\$0.011	\$1.27	\$2.35	\$2.18	\$2.54	\$1.81	\$1.09	\$0.544	\$0.363	\$12.15	

**Table 5. Annual Projected Initiative Participation**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Participants (includes modeling and energy efficiency package offer, training, and tools)	1	141	186	151	168	188	178	168	168	-	1,349

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

<sup>4</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes an 8-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

**Table 6. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	61,600	220,000	411,000
	MMBtu Cumulative Annual	65,000	232,000	433,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		35,900	128,000	239,000

**4.1.8 Fuel Neutrality**

<b>Fuel Neutrality</b>	<p>NYSERDA intends to offer this program in a fuel neutral manner, offering cost-sharing to encourage more efficient use of all fuel types. It is anticipated that most tenant based savings will be electric in nature, however, to properly model the tenant space, all systems regardless of fuel type will need to be included in the model to provide an accurate picture of energy consumption. Additionally, building owners and managers who participate on a building-wide basis will need to assess other fuels as part of the optimization on a building-wide basis. The model is fuel neutral and will provide recommended energy saving measures regardless of fuel type. This will help develop the market at the scale needed to achieve New York State’s clean energy goals.</p> <p>Offering the program on a fuel neutral basis will allow NYSERDA to achieve a ton of carbon savings at a cost of \$350/metric ton, compared to a cost of \$388/metric ton in an electric only scenario. The cost of modeling will not be significantly impacted whether the approach is fuel-neutral or electric only. Therefore, potential electric efficiency reductions will remain the same but valuable potential fuel savings could be lost for the same funding.</p>
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**4.1.9 Performance Monitoring and Evaluation Plans**

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>• Year 1-2: Test assumptions on the cost-effectiveness of converting a single tenant-specific energy model and package to an entire building-specific package. Assess the ability of energy modeling to fit within the tenant space design timeline. Evaluate the ability to extrapolate a single tenant-specific energy model and package to an entire building-specific package and the ability of energy modeling to fit within the tenant space design timeline. Test how building-specific packages can advise design without slowing down the leasing and fit-out process by a survey of current participants. Receive input from projects and Commercial Tenant stakeholders. Adjust program design if warranted.</li> <li>• Year 3: Test willingness of new tenants to use building-specific packages in lieu of custom tenant packages; survey to understand key decision points affecting the offering of tenant energy efficiency packages as a standard offering. Repeat Year 1-2 assessment.</li> <li>• Year 4-5: Aggregate and analyze data from NYSERDA-supported projects to verify realized energy savings above code and persistence of savings. Evaluate</li> </ul>
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	<p>the ability of energy models to accurately predict energy savings for tenant spaces. Repeat Year 1-2 assessment.</p> <ul style="list-style-type: none"> <li>• Annually gather market characterization data from CRE real estate databases</li> </ul> <p><u>CRE Tenant Strategy M&amp;V</u></p> <ul style="list-style-type: none"> <li>• Validate energy model predictions</li> <li>• Validate energy savings through one-year M&amp;V and five-year utility bill analysis.</li> <li>• Compare the CRE Tenant participating tenant spaces energy saving between and across building system types, within portfolios and across Classes</li> </ul> <p><u>Market Evaluation</u></p> <ul style="list-style-type: none"> <li>• Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of programmatic and broader market success</li> <li>• Baseline measurements of key market indicators will occur soon following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. They include: volume and rate of turn-over of leased commercial office space, current use of building-specific above code energy efficiency approaches, real estate broker awareness and practices around incorporating energy efficiency into options into leasing dialogue, awareness and practices of architects and engineers regarding incorporating above code energy efficiency into tenant space designs, etc.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including: usefulness, uptake and outcomes of standardized efficiency packages; replication of commercial real estate building-specific packages into non-NYSERDA funded facilities; the models for replication; and the associated benefits.</li> <li>• Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul> <p><u>Impact Evaluation/Field Verification</u></p> <ul style="list-style-type: none"> <li>• Evaluation M&amp;V will be conducted for a sample of participating spaces/buildings, according to the International Performance Measurement &amp; Verification Protocol (IPMVP) method(s) most appropriate given the improvements made. Evaluation M&amp;V will rely heavily on the CRE data stream and analysis to validate program estimated savings.</li> <li>• Depending on the extent of replication identified in Market Evaluation, impacts will be examined for a sample of replication projects to ascertain the level of savings.</li> <li>• Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</li> </ul>
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## 4.2 Energy Management

### 4.2.1 Overview

<p><b>Present Situation</b></p>	<p>Energy Management (EM) is the common name for the management of building energy consumption from a combination of building data collection systems (e.g. meters, sensors, equipment feeds), analytics, and building data information services. There is a full spectrum of EM sophistication ranging from the basic, Remote Energy Management (REM), to the more advanced Real Time Energy Management (RTEM). The market includes vendors of systems and information services, with many vendors providing both.</p> <p>REM is a virtual building assessment tool that can provide a baseline of whole building performance quickly and cost-effectively, detecting energy savings potential and targeting energy efficiency projects. RTEM can show building management the actual state of building performance at any point in time. RTEM is utilized to capture the discreet data such as set points, power loads, flow rates, temperature and humidity, and feed the information back to building operators with key insights about operations and systems that they then use to fine-tune the building energy system operations and identify capital projects.</p> <p>EM is an enabling technology/service, however, and not the direct source of energy reductions. The site-specific opportunities are a function of the individual building in its current physical condition and the way it is operated. As such, there is wide variability in both the size of the opportunity and the degree to which the building managers needs to change how they operate the building. Since energy consumption is just one of many factors to be considered in operating a building, some opportunities may be discarded due to non-energy impacts, such as staffing, cost or tenant/occupant impact. Some installed systems have been abandoned or are underutilized due to site-specific issues and therefore have failed to produce economic returns. Furthermore, EM related services and technologies are advancing at a rate more rapid than most potential customers can keep up with, which leads to a significant knowledge and confidence gap in the market.</p>
<p><b>Intervention Strategy</b></p>	<p>The market is ripe for leveraging the value of EM and driving scale as the upfront costs are dropping and the potential sites for application of RTEM are growing both from a financial and technical perspective.</p> <p>This EM intervention strategy has four elements that build on NYSERDA's reputation as a source of objective and credible technical advice and information, in addition to catalyzing private investment through NYSERDA investment in focused areas of:</p> <ul style="list-style-type: none"> <li>• Assisting building owners in the identification of EM system and service that meet threshold qualifications.</li> <li>• Providing independent technical advisement to building owners that invest in EM.</li> <li>• Investing in EM systems and services to stimulate the current market and leverage the expected natural growth.</li> <li>• Gathering, analyzing and sharing learning and successes to further stimulate investor confidence and growth.</li> </ul> <p>For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Energy Management (EM)," which can be found in Appendix A.</p>
<p><b>Goals</b></p>	<ul style="list-style-type: none"> <li>• Increase awareness of EM and data analytics capabilities in the market.</li> </ul>

	<ul style="list-style-type: none"> <li>• Reduce customer acquisition costs and project development costs.</li> <li>• Reduce soft-costs for a broad segment of building owners interested in obtaining information about their building energy performance.</li> <li>• Leverage natural market growth by addressing upfront risk and downstream returns through an open enrollment offering and technical support to double the expected year over year growth rate of 16% to 32% for the next five years.</li> <li>• Improve the predictability of returns from RTEM investments by engaging in studies/pilots which provide replicable approaches and assessment tools.</li> <li>• Assist in the development of the capabilities and business models of the RTEM service vendor community through sharing of data, case studies, best practices and identification of qualifications.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The State Energy Plan identifies buildings as a major user of energy (~60%) and GHG emissions in the State. This strategy further reduces energy consumption in buildings by 8-20% as a function of how buildings are operated above and beyond the efficiency of the installed equipment. This approach should apply to buildings accounting for 60% of energy usage. It specifically addresses 4% of the total energy used in New York State.</li> <li>• The State Energy Plan also discusses the need to manage electricity demand to ensure efficient and reliable operation of the grid. This strategy is focused on the buildings which have the biggest impact on peak load and will enhance their ability to manage and reduce peak load.</li> </ul>

4.2.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<p>EM techniques are applicable to all building types and organizational structures. Existing and new construction commercial, industrial, and multifamily buildings can benefit. The initial targeted sector will be existing commercial buildings, with likely higher uptake in sub-sectors with significant existing penetration of Building Management Systems– Commercial Office, Retail, University/College, and Healthcare. These sectors also have large buildings or portfolios being centrally managed and therefore are more likely to have the human resources necessary to capitalize on the potential of EM.</p> <p>Multifamily and Industrial buildings are also eligible to participate in this initiative. As the costs of EM systems drop and the technology supplants the need for an existing Building Management System, NYSERDA expects interest from non-commercial buildings to increase, and will adjust activities to meet demand. For customers with less sophisticated monitoring aptitude, REM efforts will be explored and offered as well. While sector uptake might overlap, it is expected small-medium businesses will gravitate to REM.</p>
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• EM system providers</li> <li>• EM service providers</li> <li>• ESCOs</li> <li>• Building owners/management firms</li> <li>• Building operators</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• Many end users currently employing EM have indicated that EM is ready for broader deployment.</li> <li>• EM system and service providers see specific opportunity in the target market segments that have been identified above.</li> <li>• Potential end users in the target market segments are receptive to the technology and its potential impact on energy consumption. Both end users and</li> </ul>

	<p>RTEM system and service providers have expressed interest in partnering with NYSERDA to help demonstrate and “de-risk” EM investments.</p> <ul style="list-style-type: none"> <li>• Both EM system and service providers have interested potential customers that are reluctant to invest due to the lack of independent technical advice to better understand their site-specific risks and opportunities. The risk includes both system design and post-installation application of the information to change building operations.</li> <li>• Current EM system and service providers have expressed an ability to meet increased market demand.</li> <li>• EM platforms and service delivery models are maturing at a rate more rapid than customer awareness can keep up with, making it more difficult for customers to understand the various options available.</li> <li>• New York utilities are looking for new business models that leverage their customer relationships as part of REV. Utility early adopters (both in-state and out-of-state) have initiated REM pilots to demonstrate remote audit platforms’ ability to engage and inform customers. Results from these pilots will inform the overall strategy and approach to engaging remaining utilities.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Installing EM will provide the end-user with annual energy bill savings ranging from 5 to 25% across all fuels.</li> <li>• EM will help reduce operations and maintenance costs, in addition to energy bill savings by identifying the relationships between equipment settings and actual conditions as well as indicating when equipment performance is degrading.</li> <li>• Building owners/management firms can leverage the benefits of installing EM systems by applying the knowledge and operating methodologies learned across their portfolios.</li> <li>• NYSERDA’s identification of qualifications and companies that meet those qualifications as well as provision of independent technical advice will reduce customer procurement time and costs.</li> <li>• Provision of post installation advice and training for building operators will accelerate the application of information obtained from EM and maximize the value obtained from the investment.</li> <li>• NYSERDA’s investments in specific projects will decrease the payback period and increase the persistence of projects (e.g., decrease the risk of projects being abandoned or EM being under-utilized). This will help to build a library of learnings and successful case studies to further stimulate confidence and growth in the EM market.</li> </ul>

4.2.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<p>Engagement To-Date:</p> <ul style="list-style-type: none"> <li>• Consulted with the New York Power Authority’s (NYPA’s) NY Energy Management Team, which is assisting state buildings in adopting Executive Order (EO) 88 guidelines through the deployment of RTEM, to capitalize on their expertise and incorporate lessons learned into this strategy.</li> <li>• U.S. Department of Energy (DOE) Better Buildings Team have launched the Energy Management Information Systems (EMIS) campaign of which EM is a component. NYSERDA has participated in this effort and utilized materials and data obtained from this effort to inform this strategy.</li> <li>• Consulted with NRDC, which has run a national RTEM pilot with buildings like NY buildings, in developing requirements for vendors and strategy.</li> <li>• Market Interviews with EM vendors and customers have informed this strategy.</li> </ul>
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	<p>Further Engagement:</p> <ul style="list-style-type: none"> <li>• Launch of EM Qualified Vendors List in coordination and consultation with NYPA.</li> <li>• Continue engagement with industry experts and New York stakeholders to review progress and help guide evolution of EM strategy to maximize impact</li> <li>• Establish Peer-to-Peer Exchanges between and among current users of EM.</li> <li>• Periodically solicit the EM system and service providers for identification of both issues and new opportunities to improve results and expand the EM market.</li> <li>• Conduct regular on-site visits to buildings investing in EM to maintain an understanding of their experiences, needs, and challenges. Solicit suggestions for improving results and NYSERDA’s role.</li> <li>• Conduct webinars for potential customers and the EM system and service providers to understand both supports available and learnings from installed EM projects and studies.</li> <li>• NYSERDA will also utilize the CEAC to engage with stakeholders, as appropriate.</li> </ul>
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4.2.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Customers uncertain of necessary vendor qualifications or best approach to procure:</b> Potential customers are often interested in the concept of EM and the potential benefits it could provide, but are unsure of how to identify a qualified vendor and select either the system or service provider that best meets their needs.</li> <li>• <b>Lack of unbiased information on qualifications and performance:</b> Lack of centralized third party independent information with regards to either qualifications or system performance compounds the issue and most customers ultimately do not invest in EM due to the lack of readily available and reliable information to assist them.</li> <li>• <b>Difficulty in assessing site-specific design requirements and associated cost:</b> Site-specific design often leads to the need to work through many options during the initial installation of meters and information technology (IT) equipment</li> <li>• <b>Difficulty in assessing site-specific return on investment:</b> Investment does not guarantee a return; the return comes from changing the method of operating the building and is impacted by the condition of the building and its operating characteristics prior to installation.</li> <li>• <b>Lack of persistence due to learning curve between receiving information and how best to apply it:</b> EM systems can provide a large volume of new information and point to many potential issues. Building owners without proper support or understanding have limited the use of the information and in extreme cases some have abandoned their systems.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA provides incentives for RTEM systems and information services, it will accelerate the growth of the RTEM market in NYS, helping it to mature faster than currently forecasted.</li> <li>• If there is easy access to qualified vendors, a simplified implementation process, proof of energy savings, and demonstrated O&amp;M benefits of EM then commercial customers will incorporate EM into their building operations without need for further NYSERDA incentives.</li> </ul>

	<ul style="list-style-type: none"> <li>• If NYSERDA provides education and focused vendor support for operators, the depth and persistence of energy savings will improve and EM will better inform future capital investments.</li> </ul>
<b>Activities</b>	<p><u>Stimulate the market to invest in EM and enhance the success rate of these installations:</u></p> <ul style="list-style-type: none"> <li>• Create a qualified vendor list for both systems and services.</li> <li>• Provide open enrollment incentives for EM systems/installation</li> <li>• Provide open enrollment incentives for EM service subscriptions/analytics</li> <li>• Provide independent expert EM advisory services and training.</li> </ul> <p><u>Apply the knowledge and experience gained from initial installations to replicate success and build market confidence in EM investment:</u></p> <ul style="list-style-type: none"> <li>• Create EM technical guidance documents of best practices</li> <li>• Incentivize pilot and demonstration projects that provide greater insight in to EM benefits by: <ul style="list-style-type: none"> <li>○ targeting sectors that traditionally have not utilized EM</li> <li>○ monitoring data points not regularly trended to find deeper energy savings</li> <li>○ exploring EM applicability to load management on top of energy efficiency</li> <li>○ working more closely with service providers to learn about successful business models that could be replicated</li> </ul> </li> <li>• Publish case studies</li> <li>• Establish peer-to-peer exchanges</li> </ul> <p><u>Improve the effectiveness of this strategy and build assets to support its effectiveness:</u></p> <ul style="list-style-type: none"> <li>• Enable the creation of an EM analytics training platform</li> <li>• Solicit ongoing market feedback from stakeholders, service providers and end users to confirm usefulness of intervention efforts</li> <li>• Establish data warehousing to collect project and system level EM performance metrics. Analyze trends in identified energy efficiency opportunities, persistence and common practices to share with the market place to spur replication.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1: RTEM Program Designed and Offered to the Market (2016)</u></p> <ul style="list-style-type: none"> <li>• Secure RTEM Advisor and begin development of market standards</li> <li>• Create and grow a list of qualified RTEM vendors</li> <li>• Stimulate interest and market activity with an open enrollment incentive offering</li> <li>• The program’s criteria for qualification of vendors, hardware, and software is introduced to the market and used as a road map for new vendors with the goal of becoming the industry standard</li> </ul> <p><u>Milestone 2: EM Market Growth through Incentives and Standardization (2017-2020)</u></p> <ul style="list-style-type: none"> <li>• Incentives, Qualified Vendor Listing and Independent RTEM advisor services help convert prospective customers into committed and installed RTEM projects</li> <li>• NYSERDA market support and approach attract new RTEM vendors to the New York State market and increase business development investment of all RTEM vendors</li> <li>• Secure REM Advisor and begin development of market standards</li> <li>• Create and grow a list of qualified REM vendors</li> <li>• Stimulate interest and market activity with an open enrollment incentive offering for REM</li> </ul>

	<ul style="list-style-type: none"> <li>• EM Advisors support gaps in market confidence and identifies market approaches to eliminating gaps</li> <li>• Peer to peer exchanges and EM Advisors transfer learnings across the projects supported by NYSERDA and enhance success</li> <li>• RTEM Technical Guidance Document is drafted and tested</li> <li>• RTEM Technical Guidance Document is published</li> <li>• NYSERDA in coordination with industry partners standardizes methodologies for calculating/analyzing costs and savings data</li> </ul> <p><u>Milestone 3: EM Market Transformation (2018-2021)</u></p> <ul style="list-style-type: none"> <li>• NYSERDA direct supports are ratcheted downward as industry standardization is adopted and results of pilots/studies are shared broadly increasing customer confidence in the benefits and returns of RTEM.</li> <li>• Methods for capturing the potential benefits of RTEM for operations and maintenance of buildings are standardized and widely available.</li> <li>• Aggregated data sets and applications of RTEM data are robust enough to enable quick and proper evaluation of energy savings projects, thus removing the need for detailed, building specific energy audits to identify potential energy savings, thereby reducing customer acquisition and project costs</li> <li>• NYSERDA explores the utilization of its RTEM data set to advance efforts at demand reduction and peak load shaping as well as its use in predicting and optimizing investments in energy efficiency.</li> <li>• Training platform for facility owners/operators is designed</li> <li>• Training platform is available and used by facility owners/operators</li> <li>• Market penetration of REM insights increases as commercial customers gain awareness of and confidence in remote audit technology for energy efficiency projects and the usage becomes more widespread. Regularly engage with REM vendors to understand changing technology and market landscape.</li> </ul> <p><u>Milestone 4: End of Efforts and Post Intervention (2022 and beyond)</u></p> <ul style="list-style-type: none"> <li>• RTEM is the standard for quality energy metrics, efficient building operations, and accessing behind-the-meter data</li> <li>• Qualified list and NYSERDA’s continued support is rendered obsolete due to market standardization and acceptance</li> <li>• RTEM is integrated into standard Building Management Systems (BMS) offerings and widely applied in buildings without BMS.</li> </ul>
<p><b>Goals Prior to Exit</b></p>	<ul style="list-style-type: none"> <li>• REM is recognized as a reliable means to monitor facility’s energy usage patterns and identify opportunities for energy and cost savings.</li> <li>• The termination of this intervention will be based upon a significant reduction in both the upfront costs of RTEM design/installation and Return on Investment uncertainty associated with implementing RTEM in a specific vertical. NYSERDA will survey the market periodically to measure progress in these areas. NYSERDA plans to invest equal amounts in systems and information services for five years. If system costs drop faster than anticipated, NYSERDA will reduce or eliminate its incentives for system costs earlier than planned.</li> <li>• A market penetration rate of 30 - 40% in the 2,000 largest buildings in the target market sectors (Commercial Office, Retail, University/College, and Healthcare) should be significant enough to address the aims of this incentive investment and initial offerings. NYSERDA expects significant gains in the development of this technology and as both performance and per application cost reductions are achieved, NYSERDA will shift to exploring methods for driving its adoption in the next 8,000 largest buildings through the non-incentive supports in this strategy.</li> <li>• The strategy will progress from offering incentives through an open enrollment program to targeted pilots/studies to address knowledge gaps and</li> </ul>

	standardization of methods to optimize returns, with continued support for qualified vendors, training, and guidance, eventually leading to replication of uptake without incentives.
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4.2.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• NYSERDA has shared information and met with each of the IOUs as well as with the JU to discuss commercial initiatives, including EM. The likelihood of EM market activity in New York City and other dense urban environments led to additional discussions with Consolidated Edison and National Grid. As this new initiative gains traction with contractors and building operators, it is expected to result in energy savings based on building management and operational savings and to help identify energy efficiency retrofit and infrastructure opportunities. Additional coordination is getting underway to provide a clear path for opportunities that are identified to seek out incentive support from IOU energy efficiency programs.</li> <li>• NYSERDA has held discussions and information sharing with NYPA regarding their efforts with NY Energy Manager, NYSERDA’s planned approach to EM, supporting the EM market, and coordination in serving state buildings that may be eligible to participate in the Clean Energy Fund.</li> <li>• In addition to helping to identify energy efficiency retrofit and infrastructure opportunities, EM develops building specific load profiles. These profiles can serve as a basis for better informed and more flexible building operations that act as grid assets under Reforming the Energy Vision (REV) Pilots and innovative rates. The launch of REV pilots and rates benefits by customers who have the data and information to understand their load shape, and its potential for flexible response to price signals.</li> <li>• Continued collaboration will also be imperative as refinements and changes are made to related utility offerings under energy efficiency transition implementation plans (ETIPs) and REV.</li> <li>• NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• NYPA’s New York Energy Manager is promoting and installing EM across New York State buildings under EO 88 compliance. Some of those buildings pay into the System Benefits Charge (SBC) and are therefore eligible to participate in Clean Energy Fund initiatives. NYSERDA is carefully coordinating how the Open Enrollment incentive offering is handled to eliminate duplicative incentives and optimize the benefit to rate-payers.</li> <li>• While none of the investor owned utilities currently has an RTEM initiative, the target market in 2016-18 overlaps with utility key account initiatives. As mentioned above, NYSERDA will coordinate with utilities on key accounts to optimize the overall impact of both NYSERDA and utility offerings and to avoid confusion and multiple outreach efforts. If successful with this initiative, NYSERDA foresees the potential for RTEM to be an integral part of utility offerings in the future and will adjust its initiative accordingly.</li> <li>• Con Edison recently launched a Building Efficiency Marketplace REV Demonstration project. Participants in the demonstration program are comprised of large commercial customers who have interval meter data. The project will provide the participants with access to analysis driven by REM data and insights, and later link that information to a wider platform that will allow energy service providers to subscribe to and get access to the analysis.</li> </ul>



	NYSERDA will monitor the results of this demonstration project, and adjust this initiative as needed in coordinated with Con Edison.
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4.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 7. The annual expenditure projection is included in Table 8. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 7. Annual Market Development Budget Allocation – Commitment Basis**

Commitment Budget	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Direct Incentives and Services	\$731,462	\$5,790,000	\$8,310,000	\$10,600,000	\$10,600,000	\$8,598,346	\$2,438,942	\$618,750	\$412,500	\$48,100,000
Tools, Training and Replication	\$0	\$800,000	\$729,167	\$858,333	\$1,087,500	\$900,167	\$1,145,833	\$1,375,000	\$1,304,000	\$8,200,000
Implementation Support	\$303,750	\$650,000	\$670,500	\$783,000	\$501,500	\$296,250	\$100,000	\$100,000	\$100,000	\$3,505,000
Total	\$1,035,212	\$7,240,000	\$9,709,667	\$12,241,333	\$12,189,000	\$9,794,763	\$3,684,776	\$2,093,750	\$1,816,500	\$59,805,000

**Table 8. Annual Expenditures Projection**

Expenditures	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Total	0%	8%	13%	17%	18%	15%	10%	5%	4%	3%	3%	3%	2%	100%

4.2.7 Progress and Performance Metrics

Table 9 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 9. Initiative Specific Metrics**

Indicators <sup>5</sup>		Baseline	2019
		(Before/Current) <sup>6</sup>	(Cumulative)
<b>Activity/ Outputs</b>	Number of buildings participating in incentive program	0	711
	Number of pilots	0	15
	Number of qualified providers on NYSERDA list	0	50
	Extent of use of qualified provider list by the market (% increase in NY EM revenue by listed vendors)	0	65%
	Participation of building owners/managers in peer-to-peer exchanges (from incentive program).	0	40
	Number of comprehensive building specific data sets submitted to NYSERDA	0	40
	Number of downloads of EM technical guidance document	0	100
	Percent of EM providers using programmatic criteria & technical guidance document (as reported through annual survey)	0	75%
<b>Outcomes</b>	Awareness of EM among building owners/managers	18%	58%
	Percent of EM projects that are a part of a larger building management portfolio	0	40%
	Persistence of EM service contracts (i.e., how many customers extend their subscription with an RTEM provider beyond 5 years)	TBD <sup>7</sup>	60%
	Percent reduction in RTEM soft costs & operational costs	TBD <sup>8</sup>	15%
	Percentage of EM projects that institute an energy efficiency goal	TBD <sup>9</sup>	35%
	Size of market as indicated by vendor sales	\$10 M	\$20M
	Percent of decision-makers using EM data to assess operational risk (as reported through annual survey)	0%	35%
	Number of BMS offerings with integrated RTEM	TBD	30%
	Percent of EM projects that use services for non-energy benefits (e.g., long-term asset management, capital investment strategies, risk mitigation analyses)	TBD <sup>10</sup>	10%

<sup>5</sup> Except where indicated otherwise, TBD denotes preliminary results have been collected but NYSERDA requires additional analysis to confirm the values A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>6</sup> Revised baseline metrics reflect preliminary research and will be updated upon completion of a market evaluation study still underway. Once finalized, this study will be available publicly on NYSERDA’s website and in the DPS Document and Matter Management system.

<sup>7</sup> Baseline values for post-pilot performance will be measured when pilot projects are completed.

<sup>8</sup> Ibid.

<sup>9</sup> Ibid.

<sup>10</sup> Baseline values for post-pilot performance will be measured when pilot projects are completed.

Benefits shown in Table 10 and Table 11 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 10. Direct Impacts**

Primary Metrics <sup>11</sup>		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Energy Efficiency	MWh Annual	2,450	56,100	106,000	119,000	112,000	33,700	10,200	3,410	945	242	444,300
	MWh Lifetime	19,600	449,000	851,000	950,000	896,000	269,000	81,500	27,300	7,560	1,940	3,554,000
	MMBtu Annual	2,100	24,800	44,600	47,100	44,100	15,000	4,530	1,520	420	108	184,200
	MMBTU Lifetime	16,800	198,000	357,000	377,000	353,000	120,000	36,200	12,100	3,360	860	1,474,000
	MW	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual	1,400	30,900	58,400	64,900	61,200	18,500	5,600	1,880	519	133	243,400	
CO2e Emission Reduction (metric tons) Lifetime	11,200	246,000	467,000	520,000	490,000	148,000	44,800	15,000	4,160	1,060	1,948,000	
Customer Bill Savings Annual (\$ million)	\$0.34	\$7.6	\$14.4	\$16	\$15.1	\$4.56	\$1.38	\$0.46	\$0.13	\$0.03	\$60.11	
Customer Bill Savings Lifetime (\$ million)	\$2.7	\$60.8	\$115	\$129	\$122	\$36.5	\$11	\$3.7	\$1.02	\$0.26	\$480.9	
Private Investment (\$ million)	\$3.34	\$19.3	\$33.9	\$44.2	\$51.3	\$78.7	\$92.0	\$9.58	\$11.2	\$14.4	\$357.8	

**Table 11. Annual Projected Initiative Participants**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Participants (Number of RTEM buildings)	17	65	110	135	135	110	90	80	80	-	822
Participants (Number of REM buildings)	-	7	121	256	256	-	-	-	-	-	640
Total	17	72	231	391	391	110	90	80	80	-	1,462

<sup>11</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes an 8-year measure life. Benefits are rounded to three significant figures. Totals may not sum. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

Benefits shown in Table 12 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 12. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	416,000	1,720,000	1,970,000
	MMBtu Cumulative Annual	150,000	640,000	706,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		227,000	937,000	1,070,000

#### 4.2.8 Fuel Neutrality

<b>Fuel Neutrality</b>	NYSERDA intends to offer this commercial program in a fuel neutral manner, offering incentives on EM systems and services that identify energy efficiency reduction opportunities for all applicable fuel sources that a customer may utilize (electric, natural gas, oil). Offering the program on a fuel neutral basis will allow NYSERDA to achieve a ton of carbon savings at a cost of \$246, compared to a cost of \$267 in an electric only scenario <sup>12</sup> .
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#### 4.2.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>• Year 1: Reassess market requirements for Qualified Vendors List. Receive input from projects, industry experts, and other stakeholders</li> <li>• Year 2: Receive input from projects, industry experts, and other stakeholders</li> <li>• Year 3: Review market response to open enrollment incentives and execute scheduled incentive ramp-down. Analyze aggregated data from NYSERDA-supported projects to understand performance and market capabilities. Review training effectiveness. Repeat Year 1 Course Corrections.</li> </ul>
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<sup>12</sup> If the Program were to operate on a fuel neutral basis, program funds would identify both electric and natural gas efficiency opportunities. If the Program were only to support electric efficiency the magnitude of savings would increase with the budget (i.e. all the program funds could be used to identify electric efficiency opportunities)

	<ul style="list-style-type: none"> <li>• Year 4: Assess the success of EM pilots/demonstrations and adjust as needed to achieve market transformation and emerging REV objectives. Repeat Year 1 Course Corrections.</li> <li>• Year 5: Review market response to open enrollment incentives and execute scheduled incentive ramp-down. Analyze aggregated data from NYSERDA-supported projects to understand performance and market capabilities. Review training effectiveness. Repeat Year 1 Course Corrections.</li> </ul> <p><u>EM M&amp;V Strategy</u></p> <p>M&amp;V will provide the following:</p> <ul style="list-style-type: none"> <li>○ Validate data quality of meters, sensors and systems</li> <li>○ Validate energy savings and determine independent variables that can identify correlation for predicted saving models</li> <li>○ Compare the EM-related energy savings between and across building types, within large building portfolios and across market sectors</li> </ul> <p><u>Market Evaluation</u></p> <ul style="list-style-type: none"> <li>• Market Evaluation will be aligned with the logic model and will include baseline and longitudinal measurement of key indicators of programmatic and broader market success.</li> <li>• Baseline measurements of key performance indicators will occur soon following initiative approval and will address indicators including: awareness of EM among owners, operators and providers, size of the current EM market, use of EM by decision makers to assess operational risk, use of EM to support broader energy efficiency goals, etc.</li> <li>• Regular (e.g., annual or biennial) and measurement of market change will occur once the program is underway.</li> <li>• Sources of data for market evaluation include the open enrollment program, pilot data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul> <p><u>Impact Evaluation/Field Verification</u></p> <ul style="list-style-type: none"> <li>• Measurement and verification at a sample of pilot facilities, according to the IPMVP method(s) most appropriate given the improvements made. It is anticipated that operational, maintenance and capital improvement projects will occur. M&amp;V for pilot facilities will rely heavily on the EM data stream to validate program estimated savings.</li> <li>• Depending on the extent of replication identified in Market Evaluation, field verification with a sample of replication projects will potentially occur to ascertain the level of savings and compare it to potential identified, if feasible.</li> <li>• Data from Field Verification/Impact Evaluation will be used to help lend confidence in the market, especially among other end users.</li> </ul>
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## 4.3 REV Campus Challenge

### 4.3.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"> <li>• Some colleges and universities in New York State have demonstrated leadership in adopting clean energy practices and technologies while others have not advanced as far.</li> <li>• Various clean energy initiatives, challenges, peer groups, conferences and events to increase and encourage participation in energy initiatives exist in the current higher education market, but with only moderate to minimal uptake and resulting impacts.</li> </ul>
<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• Drive the implementation of additional clean energy projects and strategies at institutions of higher education and their surrounding communities in the state of New York by leveraging existing national and local Clean Energy Challenges and peer based sustainability scorecards. NYSERDA will identify and acknowledge achievement of leaders and support and track the progress of all institutions.</li> <li>• Of the approximately 250 higher education institutions in New York State some have made substantial progress in energy efficiency gains and others are struggling to begin. For colleges and universities that have acted there is often little public recognition given for their adoption of clean energy projects, progress, and results. Recognition that does occur is limited in its distribution. Alternatively, colleges and universities embarking on their path to clean energy adoption would benefit from the lessons learned and knowledge transfer available from their peers. Increased recognition and a platform for peer exchange will stimulate knowledge of and implementation of clean energy projects in this sector.</li> <li>• In addition to recognizing accomplishments in clean energy, NYSERDA will work with the sector to identify gaps in available resources and provide solutions in the form of technical assistance, how to guides, competitions, or peer mentorship. This support will increase the rate at which clean energy technologies are adopted in the sector.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: REV Campus Challenge,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• To establish the value of and increase implementation of clean energy projects and strategies on campuses and within their surrounding communities in the State of New York.</li> <li>• Utilize higher education’s capacity to conduct research and demonstrations, develop curricula and provide education and training to spur adoption and replication of innovative and successful clean energy projects both within and outside of institutions of higher education.</li> <li>• Engage students, faculty, and staff through the exchange of information within and among peer institutions</li> <li>• To generate an environment where campuses engage with surrounding communities to foster clean energy initiatives, and prospective students are more aware of an institution’s commitment to clean energy/sustainability.</li> </ul> <p>This initiative called the REV Campus Challenge was launched in 2015 in conjunction with NYPA. Funding for the initiative to date has come from sources other than the CEF.</p>
<b>State Energy Plan/Clean Energy Standard Link</b>	<p>The REV Campus Challenge is part of the Sustainable and Resilient Communities efforts mentioned in the NYS Energy Plan. It is a joint NYSERDA-NYPA initiative and some participating institutions will receive funding directly from NYPA or other non-CEF sources such as Regional Greenhouse Gas Initiative (RGGI) proceeds.</p>

### 4.3.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<p>The target market is all New York State higher education institutions, at all levels of clean energy progress. This strategy will challenge institutions that are committed to clean energy goals to make progress toward those goals, and engage and support institutions that have not yet set goals to take the necessary steps. REV Campus Challenge Member institutions will select one of three membership levels (Participant, Achiever, or Leader) illustrating their current progress toward clean energy goals. These membership levels will enable NYSERDA to more clearly identify and react to barriers to clean energy implementation, and encourage peer-to-peer exchange of best practices and lessons learned. Additional sources of funding such as NYPA and RGGI will provide direct support to institutions that are not eligible for CEF funds. The most effective strategy for driving impact is to have an open initiative in the market itself.</p>
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• Institutional decision-makers will be targeted, with focused efforts on engaging: facility/energy managers, sustainability directors/coordinators, deans/faculty engaged in curriculum development, workforce training, and community outreach, as well as finance and other high-level executives as appropriate.</li> <li>• Several other key stakeholders will be engaged and leveraged to assist in driving REV Campus Challenge Membership, scaling clean energy implementation and incorporation into classroom and community activities, and sharing project validation data to recognize Member institutions, such as:             <ul style="list-style-type: none"> <li>○ Second Nature (supporting organization for the Climate Commitments)</li> <li>○ Association for the Advancement of Sustainability in Higher Education (AASHE)</li> <li>○ Commission on Independent Colleges and Universities (CICU)</li> <li>○ State University of New York (SUNY) Administration</li> <li>○ NYPA</li> </ul> </li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• The market currently offers a number of clean energy commitment opportunities and resources targeting institutions that enable tracking and reporting of energy and GHG reduction:             <ul style="list-style-type: none"> <li>○ The Climate Commitments (Formerly the American College and University Presidents' Climate Commitment)</li> <li>○ NYC Carbon Challenge</li> <li>○ AASHE's Sustainability Tracking, Assessment &amp; Rating System (STARS)</li> <li>○ NYPA Build Smart (EO 88)</li> <li>○ DOE EnergyStar Portfolio Manager</li> <li>○ University of New Hampshire's Campus Climate Calculator</li> </ul> </li> <li>• Research by NYSERDA indicates that:             <ul style="list-style-type: none"> <li>○ &lt;30% of NYS private institutions have completed a climate action plan</li> <li>○ 52 NYS institutions have committed to the Carbon Commitment (formerly the American College &amp; University Presidents Climate Commitment or ACUPCC) as of December 2015, but over half of them have not updated their climate action plans since 2010 or earlier</li> </ul> </li> <li>• Institution-based peer groups have begun to emerge to create a space for sharing knowledge, best practices, and lessons learned such as those below. Research by NYSERDA indicates that only about 30% of NYS institutions take advantage of New York Coalition for Sustainability in Higher Education (NYCSHE) membership and its benefits. The REV Campus Challenge will partner with these groups to find ways to increase membership and enhance discussions and resource opportunities:             <ul style="list-style-type: none"> <li>○ NYCSHE</li> <li>○ New York Presidents for Climate Action (NYPCA)</li> </ul> </li> </ul>
<b>Customer Value</b>	<p>Recognition for the implementation of clean energy projects and strategies increases understanding and demonstrates the direct value (energy savings, GHG reduction) and indirect value (student recruitment, improved community relations) of these projects, which in turn results in the scale-up of the adoption of clean energy projects and</p>

	<p>initiatives as a means of recruiting students, managing energy costs, and improving public relations.</p> <p>Projected Benefit to Customer include:</p> <ul style="list-style-type: none"> <li>• Direct benefits to institutions will be realized as energy savings from the implementation of clean energy projects, which will result in cost savings for the institution.</li> <li>• The implementation of clean energy projects will also result in the reduction or mitigation of GHG emissions, a critical value-add to those institutions with GHG reduction goals.</li> <li>• As many prospective students look for institutions actively engaged in sustainability and clean energy initiatives on campus, participation in the REV Campus Challenge and other available market opportunities will increase the institution’s visibility with regards to clean energy initiatives and will help recruit prospective students.</li> <li>• The REV Campus Challenge expands on current market clean energy opportunities to include community engagement in clean energy initiatives as a strategic goal for member institutions. Greater engagement of the community will improve public relations and increase visibility of positive actions within the institution.</li> </ul>
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4.3.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement</b></p>	<ul style="list-style-type: none"> <li>• June 2015 workshop to obtain feedback on REV Campus Challenge concept <ul style="list-style-type: none"> <li>○ Approximately 70 representatives of Colleges and Universities attended</li> <li>○ Survey results indicated: <ul style="list-style-type: none"> <li>▪ 76% of workshop attendees would recommend participation in the REV Campus Challenge to their institution. This included campuses that were already involved in national or local challenges.</li> <li>▪ 80% were interested in learning more about the REV Campus Challenge as it continued to develop</li> </ul> </li> </ul> </li> <li>• NYSERDA will continue to work with stakeholder organizations and the College and University market to inform, optimize and promote the strategy</li> <li>• NYSERDA will also utilize the CEAC to engage with stakeholders, as appropriate.</li> </ul>
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4.3.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• Lack of state-level recognition for clean energy projects and strategies</li> <li>• Lack of knowledge and resources needed to develop an initial college and university specific roadmap/energy master plan for improving energy efficiency and reducing GHG emissions</li> <li>• Lack of knowledge sharing and lessons learned among New York State institutions</li> <li>• Lack of coordination between campuses and communities in implementing clean energy projects</li> <li>• Lack of funding for clean energy projects and strategies</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA recognizes progress toward and achievement of NYS institutions’ clean energy goals, then the adoption of clean energy projects and strategies on NYS campuses will increase.</li> <li>• If NYSERDA drives participation in existing clean energy commitment opportunities, resources and peer groups, then clean energy implementation on NYS campuses will</li> </ul>



	<p>accelerate because of improving knowledge sharing and demonstrating the value of clean energy projects and strategies.</p> <ul style="list-style-type: none"> <li>• If NYSERDA identifies gaps in the availability of needed resources and works with the market to fill the gap then institutions will have greater confidence in and improved understanding of the value of clean energy projects leading to a greater number of projects being implementation and accelerated progress toward achieving clean energy goals.</li> </ul>
<b>Activities</b>	<ul style="list-style-type: none"> <li>• <b>Market Segmentation and Identifying Barriers:</b> Obtain an understanding of how institutions view their peers and how this relates to needs associated with clean energy implementation through market segmentation as well as identifying barriers and gaps to clean energy implementation.</li> <li>• <b>Steering Committee:</b> A steering committee of key market partners to provide insights and feedback during strategy development and implementation was created to launch the REV Campus Challenge in 2015. This committee continues to be a valuable resource.</li> <li>• <b>REV Campus Challenge Membership:</b> Targeted outreach and communication to drive REV Campus Challenge membership and ascertain needs.</li> <li>• <b>REV Campus Challenge Website:</b> Utilize a REV Campus Challenge website to provide access to membership, as well as information on resources, case studies, and links to encourage knowledge building and sharing of best practices.</li> <li>• <b>Leverage Existing Events:</b> NYSERDA will leverage existing events such as conferences and sustainability working groups.</li> <li>• <b>Leverage Existing Funding:</b> NYSERDA will leverage existing funding available from NYSERDA and utilities.</li> <li>• <b>Funding Support and Competitions:</b> Provide targeted and limited funding support for exceptional college and university based clean energy and sustainability projects.</li> <li>• <b>Knowledge Transfer:</b> Encourage knowledge transfer and the sharing of ideas, best practices, and lessons learned; provide targeted resources and professional connections.</li> <li>• <b>Leverage Existing Market Resources:</b> Encourage participation in other local, regional, or national sustainability initiatives to leverage existing market resources.</li> <li>• <b>Recognition:</b> Provide recognition of progress toward and achievement of clean energy goals by REV Campus Challenge Members, setting these institutions apart from their peers while demonstrating the value of clean energy projects. Recognition will take the form of website updates, press releases, and other college and university identified valuable practices.</li> <li>• <b>REV Campus Challenge Member Impact:</b> Gather information on member GHG emission reductions and energy savings to demonstrate REV Campus Challenge Member impact.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1: Launch and Leverage Existing Campus Leadership (2016-2019)</u></p> <ul style="list-style-type: none"> <li>• 120 out of 250 institutions sign up to be REV Campus Challenge Members</li> <li>• Members make progress and receive recognition as demonstrated by new and revised planning, new commitments to sustainability goals and clean energy projects started and completed.</li> </ul> <p><u>Milestone 2: Utilize Peer Recognition and Successes to Engage Additional Campuses (2020-2022)</u></p> <ul style="list-style-type: none"> <li>• 140 out of 250 institutions sign up to be REV Campus Challenge Members</li> <li>• Members continue to make progress and receive recognition as demonstrated by new and revised planning, new commitments to sustainability goals and clean energy projects started and completed.</li> <li>• 15% more NYS institutions participate in clean energy commitment opportunities, conferences/events, peer groups, etc., building a strong support network</li> </ul>

	<ul style="list-style-type: none"> <li>Annual/Semi-annual survey of Member institutions provides feedback on clean energy progress and changes in overall campus, student, and community mindset</li> </ul> <p><u>Milestone 3: Utilize Peer Recognition and Successes to Drive Results beyond Participants (2022-2025)</u></p> <ul style="list-style-type: none"> <li>Members continue to make progress and receive recognition as demonstrated by new and revised planning, new commitments to sustainability goals and clean energy projects started and completed.</li> <li>25% more NYS institutions participate in clean energy commitment opportunities, conferences/events, peer groups, etc., building a strong support network</li> <li>Annual/Semi-annual survey of all institutions state-wide provides feedback on clean energy progress and changes in overall campus, student, and community mindset</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>60% of NYS institutions of higher education are REV Campus Challenge Members</li> <li>80% of all REV Campus Challenge Members have actualized road map/energy master plan for reducing GHG emissions.</li> <li>Increase participation in peer groups (i.e. NYCSHE) by 30%</li> </ul>

4.3.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>The REV Campus Challenge will be operated in close collaboration with NYPA, who has a vested interest in the clean energy commitments and progress of its energy users and of public institutions in general. Representatives from Con Edison, National Grid, and NYPA are on the REV Campus Challenge Steering Committee. REV Campus Challenge Members will be encouraged to look to NYSERDA, NYPA, and other utility programs for funding and support opportunities as they move to implement projects. NYSERDA will coordinate closely with utilities to ensure institutions are aware of programs and offerings that may be relevant to their clean energy goals.</li> <li>To operate a statewide effort within the CEF order language, direct support for institutions not eligible to receive CEF funds will come from other sources such as NYPA and RGGI. NYSERDA will also utilize outside funding support to leverage the investment of rate payer funds.</li> <li>NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	Utility prescriptive and custom incentive programs currently exist in and are available to the NYS College and University market.

4.3.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 13. The annual expenditure projection is included in Table 14. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 13. Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Direct Incentives &amp; Services</b>	\$-	\$3,000,000	\$3,000,000	\$1,500,000	\$1,500,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$14,000,000
<b>Tools, Training, and Replication</b>	\$-	\$330,435	\$357,971	\$357,971	\$275,362	\$495,652	\$495,652	\$495,652	\$495,652	\$495,652	\$3,800,000
<b>Program Implementation</b>	\$409,269	\$256,667	\$256,667	\$256,667	\$256,667	\$513,333	\$513,333	\$513,333	\$513,333	\$360,731	\$3,850,000
<b>Total</b>	\$409,269	\$3,587,102	\$3,614,637	\$2,114,637	\$2,032,029	\$2,008,986	\$2,008,986	\$2,008,986	\$2,008,986	\$1,856,384	\$21,650,000

**Table 14. Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>Total</b>
<b>Total</b>	0%	6%	10%	14%	12%	9%	9%	9%	9%	9%	5%	5%	3%	100%

#### 4.3.7 Progress and Performance Metrics

Table 15 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 15. Initiative Specific Metrics**

<b>Indicators<sup>13</sup></b>		<b>Baseline (Before/ Current)</b>	<b>2019 (Cumulative)</b>
<b>Activity/ Outputs</b>	Number of REV Campus Challenge Members	0	120
	Number of NYS institutions participating in AASHE STARS	44 (21 with STARS rating)	60
	Percent increase in NYS institution attendance at existing clean energy events/conferences	TBD	20%
	Percent of all NYS institutions participating in REV Campus Challenge initiatives/competitions	0	25%
	Percent of REV Campus Challenge Members collecting and reporting energy usage (as reported through annual survey)	0	25%
	Percent of REV Campus Challenge Members reporting new clean energy projects on campus (as reported through annual survey)	0	60%
	Percent of REV Campus Challenge Members reporting new clean energy curricula or curriculum integration (as reported through annual survey)	0	30%
	Percent of REV Campus Challenge Members reporting new or improved community partnerships to expand clean energy goals (as reported through annual survey)	0	25%
	Percent of REV Campus Challenge Members receiving recognition	0	30%
	<b>Outcomes</b>	Percent of REV Campus Challenge Members with new or updated climate action plans, energy master plans, or GHG inventories	0
Percent of REV Campus Challenge Members with staff assigned to manage sustainability/clean energy goals (as reported through annual survey)		TBD	35%
Percent of REV Campus Challenge Members reporting a greater understanding of clean energy opportunities on their campus (as reported through annual survey)		0	50%
Percent of REV Campus Challenge Members reporting greater student engagement with clean energy initiatives (as reported through annual survey)		0	40%
Percent of REV Campus Challenge Members reporting greater buy-in and support from management for clean energy projects and initiatives (as reported through annual survey)		0	50%
Percent of REV Campus Challenge Members reporting improved community relations because of clean energy strategies (as reported through annual survey)		0	30%

<sup>13</sup> TBD denotes that NYSERDA requires more data in order to quantify baseline/market metrics to the degree needed to measure against in the future. Baseline measurements of key market indicators are anticipated to occur soon following initiative approval and NYSERDA will update the information in this table as the information becomes available, which is anticipated within 9-12 months of initiative approval. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

Benefits shown in Table 16 and Table 17 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 16. Direct Impacts**

Primary Metrics <sup>14</sup>		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Energy Efficiency	MWh Annual	-	23,200	23,200	11,600	11,600	7,720	7,720	7,720	7,720	7,720	108,100
	MWh Lifetime	-	347,000	347,000	174,000	174,000	116,000	116,000	116,000	116,000	116,000	1,621,000
	MMBtu Annual	-	144,000	144,000	71,800	71,800	47,900	47,900	47,900	47,900	47,900	670,000
	MMBtu Lifetime	-	2,150,000	2,150,000	1,080,000	1,080,000	718,000	718,000	718,000	718,000	718,000	10,050,000
	MW	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	1,470	1,470	1,100	1,100	734	734	734	734	734	8,804
	MWh Lifetime	-	22,000	22,000	16,500	16,500	11,000	11,000	11,000	11,000	11,000	132,100
	MW	-	1	1	1	1	1	1	1	1	1	8
CO2e Emission Reduction (metric tons) Annual		-	20,600	20,600	10,500	10,500	6,990	6,990	6,990	6,990	6,990	97,030
CO2e Emission Reduction (metric tons) Lifetime		-	309,000	309,000	157,000	157,000	105,000	105,000	105,000	105,000	105,000	1,455,000
Customer Bill Savings Annual (\$ million)		-	\$3.87	\$3.87	\$1.94	\$1.94	\$1.29	\$1.29	\$1.29	\$1.29	\$1.29	\$18.07
Customer Bill Savings Lifetime (\$ million)		-	\$58.1	\$58.1	\$29.0	\$29.0	\$19.4	\$19.4	\$19.4	\$19.4	\$19.4	\$271.1
Private Investment (\$ million)		-	\$13.3	\$13.4	\$7.43	\$7.10	\$5.98	\$5.98	\$5.98	\$5.98	\$5.98	\$71.2

**Table 17. Annual Projected Initiative Participation**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Participants	63	20	20	17	10	5	5	5	3	2	150

Benefits shown in Table 18 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect

<sup>14</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 18. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	11,700	41,000	58,800
	MMBtu Cumulative Annual	72,500	254,000	365,000
Renewable Energy	MWh Cumulative Annual	1,170	3,870	3,870
	MW	1	3	3
CO2e Emission Reduction (metric tons) Cumulative Annual		10,600	37,100	52,300

#### 4.3.8 Fuel Neutrality

<b>Fuel Neutrality</b>	NYSERDA intends to offer this strategy to engage NYS colleges and universities in a fuel neutral manner. This will help develop the market at the scale needed to achieve New York State’s clean energy goals. Offering the strategy on a fuel neutral basis will allow NYSERDA to achieve a ton of carbon savings at a cost of \$223, compared to a cost of \$381 in an electric only scenario. <sup>15</sup>
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#### 4.3.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b>Test-Measure-Adjust Strategy</b></p> <p>The REV Campus Challenge will roll out a number of resources, competitions, and initiatives to address C&amp;U market barriers to implementation and to accelerate adoption of clean energy projects on NYS campuses.</p> <p>Validate energy savings resulting from competitions and initiatives through project specific reporting and M&amp;V tailored to the clean energy project.</p> <p>Energy baseline and progress data is publicly available on those colleges and universities that are enrolled in AASHE STARS, the NYC Carbon Challenge or subject to EO 88. Data from these resources will be utilized to assist in documenting trends and validating energy consumption reduction.</p> <p>In addition, progress associated with this initiative will primarily be measured through a periodic (e.g., annual or semi-annual) survey of REV Campus Challenge Members. Data to be collected will include:</p> <p>“Has your institution –”</p> <ul style="list-style-type: none"> <li>Reached any clean energy milestones or achieved any clean energy goals?</li> </ul>
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<sup>15</sup> Fuel neutral and electric only scenarios differ only in the assumed rates of implementation for electric and gas clean energy projects. The fuel neutral scenario assumes that, for active institutions, 65% of electric and gas clean energy projects will be implemented as a direct result of this strategy. The electric-only scenario assumes a higher implementation rate for electric projects (75%), but no gas projects resulting from this strategy.

	<ul style="list-style-type: none"> <li>• Hired new staff whose primary objective is to make sustainability/clean energy progress on campus?</li> <li>• Joined a clean energy initiative/commitment (i.e. the Carbon Commitment, AASHE STARS, etc.)?</li> <li>• Completed an energy master plan, climate action plan, GHG inventory?</li> <li>• Updated an energy master plan, climate action plan, GHG inventory?</li> <li>• Implemented a clean energy project with the goal of obtaining recognition through the REV Campus Challenge?</li> <li>• Leveraged NYSERDA or utility energy programs?</li> <li>• Installed a renewable energy on campus?</li> <li>• Implemented a clean energy project with the intent of improving campus resiliency?</li> </ul> <p>Responses to the survey will indicate general market shifts toward clean energy and sustainability and changes to the status quo and will be used by NYSERDA to ascertain the effectiveness of the initiative and adjust activities accordingly. Should an institution respond that they have implemented a project with the intent of obtaining recognition through the REV Campus Challenge, NYSERDA will reach out directly to get more information on the impact of that project.</p> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation consist of the activities described above under Test-Measure-Adjust. Evaluators will work closely with program staff to collect this data routinely and assess the effectiveness of the initiative.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>• Evaluation M&amp;V will be conducted for a sample of participating spaces/buildings, according to the IPMVP method(s) most appropriate given the improvements made. It is expected that Evaluation M&amp;V will rely heavily on pre- and post- project energy usage data to validate program estimated savings.</li> <li>• Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</li> </ul>
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## 4.4 K-12 Schools

### 4.4.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• There are over 6,000 public and private schools in New York State that are estimated to spend approximately \$1 billion on energy costs annually.</li> <li>• Schools are tolerant of longer paybacks (up to 18-years) as compared to other sectors, many of which prefer a payback of three years or less.</li> <li>• The Commissioner of Education requires schools to create five-year capital facilities plans and submit the executive summary to the New York State Education Department (SED) Facilities Planning Office when they plan to implement projects. Deeper retrofits and comprehensive projects are more common in schools as compared to other sectors due to these mandated capital planning financial cycles.</li> <li>• The average age of school buildings is over 60 years, and schools manage their assets with the expectation that they will always be there and own the structure. However, competition for resources and funding can limit or deprioritize investment in energy efficiency projects.</li> <li>• Schools have a history of use and trust of performance contracting and are interested in further assessing their clean energy opportunities.</li> <li>• Some schools in NYS have demonstrated leadership in adopting clean energy practices and technologies, while others have not advanced as far. Decision makers frequently lack sufficient information and the necessary staff time to execute clean energy investments.</li> <li>• The New York Public Authorities Law was amended to create the School Energy Efficiency Collaborative Act of 2016, naming NYSERDA as the lead agency in developing a collaborative program to reduce redundancy, raise awareness and promote the efficient implementation of public school energy projects across New York State.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA will engage the K-12 sector in pursuing carbon savings and clean energy projects. This strategy will build on NYSERDA’s reputation to provide independent and accurate information, by offering the following activities:             <ul style="list-style-type: none"> <li>○ Coordinate a benchmarking program to encourage schools to measure, track, assess and compare their clean energy impacts across NYS.</li> <li>○ Identify, leverage and promote existing market resources including funding programs, recognition programs<sup>16</sup> and clean energy events.</li> <li>○ Provide direct financial incentives to schools for projects that the investor owned (IOU) utilities and other assistance programs do not cover, which will accelerate clean energy planning, analysis and installations.</li> <li>○ Identify, publish and distribute clean energy case studies, as well as templates and guidance documents to facilitate replication of successful strategies as a matter of course during capital planning cycles.</li> <li>○ Utilize guidance documents to provide a process for schools and their service providers to follow, starting at benchmarking and carrying through to implementation and maintenance of clean energy activities.</li> </ul> </li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: K-12,” which can be found in Appendix A.</li> </ul>

<sup>16</sup> Existing recognition programs have low participation rates from New York limiting the positive benefits such as sharing lessons learned and exposure of success stories that could occur. Two specific recognition programs this effort will target include the NYS Green Ribbon Schools Program and the NYS Environmental Excellence Awards.



<b>Goals</b>	<ul style="list-style-type: none"> <li>• Stimulate demand and investment in clean energy across the K-12 sector.</li> <li>• Increase awareness of the value of energy efficiency and efficient operations and maintenance practices, for infrastructure that is almost entirely existing buildings.</li> <li>• 40% of school districts in NYS utilize clean energy benchmarking tool by 2025.</li> <li>• Service providers utilize the guidance documents as reference guides and have increased opportunities to facilitate clean energy investments in schools.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The State Energy Plan identifies buildings as a major user of energy (60%) and greenhouse gas (GHG) emissions in the State. It further identifies NYSEERDA to seek to address market gaps with new strategies that “unlock the potential of energy efficiency to reduce operating costs, spur private investment, and create jobs throughout the state”, specifically naming benchmarking, expanding access to financing tools, serving as a credible information source, and helping to demonstrate value propositions as mechanisms to do so.</li> <li>• Through an increase in the use of benchmarking and providing targeted incentives, this initiative will help reduce commercial sector consumption, which is 30% of New York State’s primary energy use.<sup>17</sup></li> <li>• This initiative also supports achievement of the Clean Energy Standard goal for renewable resource electric generation (50% renewable electric generation by 2030 – “50 by 30”) by reducing the overall electric load, and therefore the amount of renewables necessary to meet the 50 by 30 goal.</li> </ul>

4.4.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market is K-12 public and private schools in New York State, the engineering consultants and contractors who serve them, and stakeholder groups with vested interest such as the New York State Education Department (NYSEED) and the School Business Officials.
<b>Market Participants</b>	<p>There are several market participants in the K-12 sector and many different stakeholder groups interested in impacting energy usage, student performance, and health in schools. The larger stakeholder groups and some of the major participants include:</p> <ul style="list-style-type: none"> <li>• New York Power Authority</li> <li>• NYS Office of General Services</li> <li>• State Education Department</li> <li>• BOCES</li> <li>• Superintendents of Schools (including NYS Council of School Superintendents)</li> <li>• Facilities Staff (including the NYS School Facilities Association)</li> <li>• School Business Officials (including NYS Association of School Business Officials)</li> <li>• The NYS School Boards Association</li> <li>• Energy Service Companies</li> <li>• Architects and Engineers</li> <li>• School Health Advocacy Organizations</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• The K-12 Schools sector is prepared to take on new initiatives and capital improvement projects relating to energy efficiency and renewable energy, particularly with the development and launch of the School Energy Efficiency Collaboration Program in 2017.</li> </ul>

<sup>17</sup> Commercial sector produces 24 million tons of CO2 equivalent per the State Energy Plan.

	<ul style="list-style-type: none"> <li>• Aging school infrastructure needs upgrades, which presents an opportunity to upgrade with high performance, energy efficient and energy mindful technologies.</li> <li>• Schools across the state regularly create capital facilities plans and the building stock and usage is consistent, which provides an opportunity to leverage guidance documents to standardize energy planning processes.</li> <li>• Schools are also currently motivated to make improvements that increase student performance and health, in addition to supporting initiatives that reduce their carbon footprint, making it an opportune time for clean energy projects.<sup>18</sup></li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• School districts are consistently operating within tight budgets due to tax caps and local economic factors. Providing schools with utility benchmarking information in a timely manner, pathways to reduce the costs of implementing energy upgrades, and a means to track and share results will increase the adoption of the energy efficiency improvements, renewables and performance contracting. This will provide educational, environmental and economic value to the customers, including: <ul style="list-style-type: none"> <li>○ Allowing schools to reduce their energy costs.</li> <li>○ Enabling schools to operate at high energy efficiency levels, which have been shown to improve student performance and health, especially in the areas of lighting, building envelope, thermal comfort, and ventilation.</li> </ul> </li> <li>• Recognition of schools for the implementation of clean energy increases understanding and demonstrates the value of the energy improvements to other schools who may be considering similar projects. This can, in turn, result in the scale-up of the adoption of clean energy in the K-12 school sector as a means of managing energy costs and positive public perception.</li> </ul>

4.4.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• To date, NYSERDA has engaged with the New York Power Authority, the New York State Education Department, the New York Association of School Business Officials, the New York State School Facilities Association, the NYS School Boards Association, 20 K-12 school districts, energy service companies, and utilities to gain feedback on the K-12 strategy. The groups provided input on the barriers schools face when implementing clean energy projects, the funding process for capital projects and the clean energy project priorities for the K-12 sector. The stakeholders will continue to be a source of insight going forward.</li> <li>• NYSERDA will also seek to participate in relevant stakeholder associations in the K-12 sector such as the New York State Education Department’s Green Ribbon Schools Committee. This committee reviews the US Department of Education’s Green Ribbon Schools award program applications for New York State. The New York State Education Department is permitted to nominate up to four schools and one district each year.</li> </ul>
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<sup>18</sup> It is not anticipated that health benefits will be quantified in this strategy. However, recent studies are showing a connection between energy efficiency and health (i.e., Harvard Study, Foundations for Student Success – How School Buildings Influence Student Health, Thinking and Performance).

#### 4.4.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Limited school staff time.</b> School staff time is a finite resource, and time constraints present a challenge to staff in terms of acquiring and receiving approval for energy performance contracts (EPC) and capital improvement projects. This will be addressed through providing third party oversight on EPC contracts, leveraging operations and maintenance operational efficiency guidance documents and promoting energy efficient equipment by offering technical assistance.</li> <li>• <b>Limited funding.</b> School districts are consistently operating within tight budgets due to tax caps and local economic factors. Providing schools with funding to execute benchmarking and gap assistance projects will increase the implementation of clean energy initiatives.</li> <li>• <b>Schools do not fully understand the full benefits of clean energy initiatives.</b> Making the business case for clean energy initiatives can be challenging in the current environment of low energy prices, lack of confidence in clean energy investments, and limited debt load of schools. Providing assistance to create energy master plans that show return on investment to the schools as well as multi-year planning will reduce time to identify optimal measures and increase the implementation of clean energy initiatives. The more schools are recognized for their efforts, the more their peers will become aware of successes and be encouraged to implement clean energy projects. Also, to the extent these efforts can improve student performance and health (non-energy benefits) the schools will be provided with mission driven insights.</li> <li>• <b>Limited insight into the energy management performance of the schools.</b> The majority of NYS schools do not benchmark their facility energy usage, and current capital plans contain limited energy use information. Without this insight, schools do not know where, when or if they could reduce energy usage, or if previous projects have resulted in energy reduction. This will be addressed through providing funding to utilize existing benchmarking software either directly or with assistance from NYSERDA consultants.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA promotes the use of benchmarking, schools can measure, track, assess and compare their clean energy impacts across NYS, leading to the identification of operational improvements, resulting in reduced energy use.</li> <li>• If NYSERDA works with the schools to fulfill and follow their existing capital facilities planning cycles by filling knowledge gaps through conducting energy master plans and assessments,<sup>19</sup> publishing market research and case studies, and leveraging existing market resources, the value proposition for clean energy will be demonstrated, increasing the likelihood that clean energy technologies will be implemented.</li> <li>• If NYSERDA assists schools with increasing efficiency in replicable ways, including through funding assistance from both NYSERDA and the utilities, and by working with the schools and their existing required procurement and planning policies, and showcases those successes, it will lead to increased clean energy adoption amongst peers.</li> <li>• If NYSERDA supports recognition programs, such as the State Education Departments Green Ribbon Schools award program, it will lead to increased awareness of the benefits of clean energy, in turn increasing clean energy adoption.</li> <li>• If NYSERDA provides templates and guidance documents that identify ways to replicate successful strategies in schools, that target schools, service providers and applicable financing mechanisms available, it will lead to increased clean energy adoption.</li> </ul>

<sup>19</sup> Energy master plans and assessments will be conducted through the FlexTech Program approved in the Resource Acquisition Transition Chapter and included in the Tech Services initiative in the Multi-Sector Solutions Chapter.

<p><b>Activities</b></p>	<p><b>Clean Energy Benchmarking</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will provide funding to school districts to collect data on energy consumption and costs. The funding will be provided through an open enrollment solicitation for a specified amount of time. NYSERDA intends to use initial benchmarking as a stepping off point to engage the schools in the use of this resource, with the intention of it leading to greater understanding of their energy use, patterns and opportunities for improvement.</li> <li>• An existing benchmarking tool will be selected via a competitive procurement for use by the schools wishing to participate in this program. Schools will receive multiple benchmarks and have the option to be trained on use of the tool as well as receive an operational assessment report based on the benchmarking findings. In coordination with the State Education Department and School Business Officials, this information may then be: <ul style="list-style-type: none"> <li>○ Used to benchmark energy and sustainability metrics between schools</li> <li>○ Displayed to encourage a sense of competition between schools</li> <li>○ Used as a method of tracking success in the K-12 market</li> </ul> </li> <li>• NYSERDA will use the benchmarking results to further streamline the process for schools to engage in deeper clean energy analysis to support capital plans created every 5 years and updated annually. NYSERDA will deliver the deeper clean energy analysis under its Technical Services initiative, outlined in the Multi-Sector Solutions Chapter, but efforts to minimize hard and soft costs for performing this work will be analyzed in this initiative. The projects that can be served by Technical Services are listed in the Dissemination of Resources activity below.</li> </ul> <p><b>Dissemination of Resources</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will develop a centralized website to encourage and direct K-12 schools to participate in and leverage existing market resources and complimentary programs including but not limited to: <ul style="list-style-type: none"> <li>○ Existing state-supported strategies and funding programs such as NYSERDA's Energy Management program, NY-Sun, the New York Truck-Voucher Incentive Program and Renewable Heat NY</li> <li>○ Investor Owned Utility prescriptive and custom incentive programs that are available to K-12 schools</li> <li>○ CEF Technical assistance programs in the Commercial section of the Resource Acquisition Transition Chapter and the Technical Services initiative in the Multi-Sector Solutions Chapter, which can provide funding for the following projects: <ul style="list-style-type: none"> <li>▪ Develop energy master plans</li> <li>▪ Provide on-site energy manager assistance</li> <li>▪ Assess and analyze energy performance contracts to confirm anticipated savings</li> <li>▪ Assist in investigating rate analysis and power purchase agreements</li> <li>▪ Provide information and support regarding the development and execution of clean energy-focused operations and maintenance plans</li> </ul> </li> <li>○ NYPA's K-Solar Program</li> <li>○ Recognition programs such as the State Education Departments Green Ribbon Schools award program and the NYS Department of Environmental Conservation's Environmental Excellence awards program</li> <li>○ Events such as clean energy conferences and working groups to connect with their peers and share success stories</li> </ul> </li> </ul> <p><b>Gap Assistance</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will provide targeted and limited funding for identified gaps in the market. The gaps include funding for projects that utilities and other assistance programs do not cover, as well as opportunities learned through the execution of the</li> </ul>
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	<p>benchmarking effort and marketplace input. The funding will be provided through a competitive solicitation. Projects could include:</p> <ul style="list-style-type: none"> <li>○ Incentives for comprehensive, deep energy retrofits of school districts</li> <li>○ Coordinated clean energy competitions among schools</li> <li>○ Incentives for boiler replacement projects, which are not incentivized by local utilities</li> <li>○ Assistance in applying to existing recognition or funding programs</li> </ul> <p><b>Publish and Promote Guidance Documents and Project Results</b></p> <ul style="list-style-type: none"> <li>● NYSERDA will publish case studies and promote green design documents for various project types. NYSERDA will: <ul style="list-style-type: none"> <li>○ Promote the utilization of green building guidance documents during the design process for new construction or renovation projects (e.g. Northeast Collaborative for High Performance Schools- NE CHPS and/or Leadership in Energy and Environmental Design Schools).</li> <li>○ Publish clean energy case studies and encourage sharing of project results funded under this initiative.</li> <li>○ Create guidance documents that will serve as a template for schools and their service providers to replicate successful projects and efforts to adopt clean energy. The documents will also show successful financing mechanisms that may increase the rate of replicability.</li> </ul> </li> <li>● These documents will be presented to schools and service providers at existing school conferences, during NYSERDA webinars, through the NYSERDA website and through K-12 association list serves and corresponding websites.</li> </ul>
<p><b>Key Milestones</b></p>	<p><b><u>Milestone 1 (2017)</u></b></p> <ul style="list-style-type: none"> <li>● Develop a list of K-12 clean energy resources and update the K-12 website. Use the website to disseminate resources across schools in NYS.</li> </ul> <p><b><u>Milestone 2 (2017)</u></b></p> <ul style="list-style-type: none"> <li>● Promote the utilization of FlexTech and fund energy master planning and performance contracting assistance oversight for schools.</li> </ul> <p><b><u>Milestone 3 (2018)</u></b></p> <ul style="list-style-type: none"> <li>● Develop and launch a competitive solicitation to select an existing benchmarking tool for the benchmarking program.</li> </ul> <p><b><u>Milestone 4 (2018)</u></b></p> <ul style="list-style-type: none"> <li>● Launch a clean energy benchmarking open enrollment program.</li> </ul> <p><b><u>Milestone 5 (2018)</u></b></p> <ul style="list-style-type: none"> <li>● Begin examining efforts to minimize hard and soft costs associated with delivering technical analysis for schools such as energy master plan development.</li> </ul> <p><b><u>Milestone 6 (2018)</u></b></p> <ul style="list-style-type: none"> <li>● Launch a competitive solicitation to provide gap assistance.</li> </ul> <p><b><u>Milestone 7 (2020)</u></b></p> <ul style="list-style-type: none"> <li>● Assess participation and seek feedback on gap assistance funding program; identify any needed changes.</li> </ul> <p><b><u>Milestone 8 (2020)</u></b></p> <ul style="list-style-type: none"> <li>● Distribute first annual survey for schools to provide feedback on clean energy progress specific to energy use intensity and greenhouse gas emissions data, projects and recognition.</li> </ul>

	<p><b><u>Milestone 9 (2021)</u></b></p> <ul style="list-style-type: none"> <li>Assess school progress in the launched initiatives and assist them in receiving recognition as demonstrated by new and revised clean energy planning and implementation projects.</li> </ul> <p><b><u>Milestone 10 (2021)</u></b></p> <ul style="list-style-type: none"> <li>Deploy clean energy case studies and guidance documents based on successful efforts above.</li> </ul> <p><b><u>Milestone 11 (2022)</u></b></p> <ul style="list-style-type: none"> <li>Launch second gap assistance funding program.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>40% of school districts participate in the NYSERDA benchmarking effort and 30% of school districts utilize tools to make decisions about their energy usage. Tools include case studies and benchmarking data to make informed decisions towards future clean energy projects.</li> <li>NYSERDA transfers the benchmarking efforts to a K-12 Association to promote continuous utility benchmarking across NYS.</li> </ul>

4.4.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>The K-12 Program will work in close collaboration with NYPA and other utilities. K-12 schools will be encouraged to look to NYSERDA, NYPA, and other utility programs for funding and support opportunities as they move to implement projects. NYSERDA will coordinate closely with utilities to ensure K-12 schools are aware of programs and offerings that may be relevant to their clean energy goals. In addition to the programs listed in the activities section such as NYPA’s K-12 solar initiative, the IOUs offer prescriptive and custom incentives that schools are eligible for. NYSERDA will make schools aware of these offerings and connect them with appropriate utility contacts.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>Utility prescriptive and custom incentive programs currently exist in and are available to the K-12 schools sector. This K-12 Schools initiative will complement those programs by providing direct financial incentives to schools for projects and measures that other assistance programs, including those of the utilities, do not cover.</li> </ul>

4.4.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 19. The annual expenditure projection is included in Table 20. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only. NYSERDA’s commitment of funds in this case is to competitively selected contractors who will distribute the benchmarking funding or assistance to customers on NYSERDA’s behalf over a longer period of time that is evident from the committed budget and benefits shown here. NYSERDA will monitor performance and report actual progress.

**Table 79: Annual Market Development Budget Allocation – Commitment Basis**

<b>Budget</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
Direct Incentives and Services	\$1,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$3,000,000	\$2,000,000	\$2,000,000	\$1,500,000	\$15,500,000
Tools, Training, and Replication	\$285,000	\$385,000	\$355,000	\$505,000	\$405,000	\$305,000	\$305,000	\$105,000	\$2,650,000
Implementation Support	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$300,000	\$150,000	\$3,450,000
<b>Total</b>	<b>\$1,785,000</b>	<b>\$2,885,000</b>	<b>\$2,855,000</b>	<b>\$3,005,000</b>	<b>\$3,905,000</b>	<b>\$2,805,000</b>	<b>\$2,605,000</b>	<b>\$1,755,000</b>	<b>\$21,600,000</b>

**Table 80: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>Total</b>
<b>Total</b>	3%	5%	5%	5%	8%	10%	11%	11%	10%	15%	17%	100%

#### 4.4.7 Progress and Performance Metrics

Table 21 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 21. Initiative Specific Metrics**

Indicators <sup>20</sup>		Baseline (Before/Current)	2021 (Cumulative)
Activity/ Outputs	Number of schools engaging with NYSERDA to conduct clean energy benchmarking	0	310
	Number of NYS K-12 schools that receive NYSERDA funding <sup>21</sup>	0	45
	Number of schools that receive energy efficiency funding from IOUs.	0	500
	Number of projects implemented as a result of Gap Assistance offered	0	4
	Number of information downloads from website	0	1000
	Number of case studies developed and disseminated	0	20
Outcomes	Number of NYS K-12 schools utilizing clean energy case studies to make informed decisions towards future clean energy projects	0	150
	Number of NYS K-12 schools utilizing benchmarking data and energy master plans to make informed decisions towards future clean energy projects	0	75
	Number of NYS K-12 schools reporting a greater understanding of benefits of clean energy at their school	0	800
	Number of NYS K-12 schools receiving recognition	0	3

*Note: There are approximately 6,000 schools in New York State of which roughly 4,000 contribute to the SBC fund and will be eligible to receive NYSERDA and IOU funding.*

Benefits shown in Table 22 and Table 23 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

<sup>20</sup> A 0 (zero) is set for the majority of the baseline/market metrics to reflect that these indicators will be tracked and reported from the time the effort begins and are not reporting activities prior to its launch.

<sup>21</sup> This metric represents funding that is delivered to schools from other relevant NYSERDA Programs such as those listed in the Dissemination of Resources activity (i.e. technical services, energy management, renewable heating and cooling).



**Table 22. Direct Impacts**

Primary Metrics		2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Energy Efficiency	MWh Annual	5,800	11,600	11,700	11,700	17,500	11,700	11,700	8,770	90,480
	MWh Lifetime	87,000	174,000	175,000	175,000	263,000	175,000	175,000	132,000	1,357,000
	MMBTu Annual	32,300	64,500	64,500	64,500	96,800	64,500	64,500	48,400	500,000
	MMBTU Lifetime	484,000	968,000	968,000	968,000	1,450,000	968,000	968,000	726,000	7,500,000
	MW	-	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		4,890	9,790	9,830	9,840	14,800	9,840	9,840	7,380	76,000
CO2e Emission Reduction (metric tons) Lifetime		73,400	147,000	147,000	148,000	221,000	148,000	148,000	111,000	1,143,000
Customer Bill Savings Annual (\$ million)		\$1.07	\$2.14	\$2.15	\$2.16	\$3.24	\$2.16	\$2.16	\$1.62	\$16.69
Customer Bill Savings Lifetime (\$ million)		\$16.1	\$32.2	\$32.3	\$32.4	\$48.5	\$32.4	\$32.4	\$24.3	\$250.4
Private Investment (\$ million)		\$7.14	\$11.5	\$11.4	\$12.0	\$15.6	\$11.2	\$10.4	\$7.02	\$86.40

**Table 23. Annual Projected Initiative Participation**

Additional Performance Tracking Metrics	2018	2019	2020	2021	2022	2023	2024	2025	Total
Participants <sup>22</sup>	200	360	360	360	560	360	360	240	2800

Benefits shown in Table 24 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation studies may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSEDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSEDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 24. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	10,000	40,000	50,000
	MMBTu Cumulative Annual	40,000	200,000	320,000
Renewable Energy	MWh Cumulative Annual	2,000	4,000	10,000
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		8,600	34,600	49,900

<sup>22</sup> Participants are defined as schools.

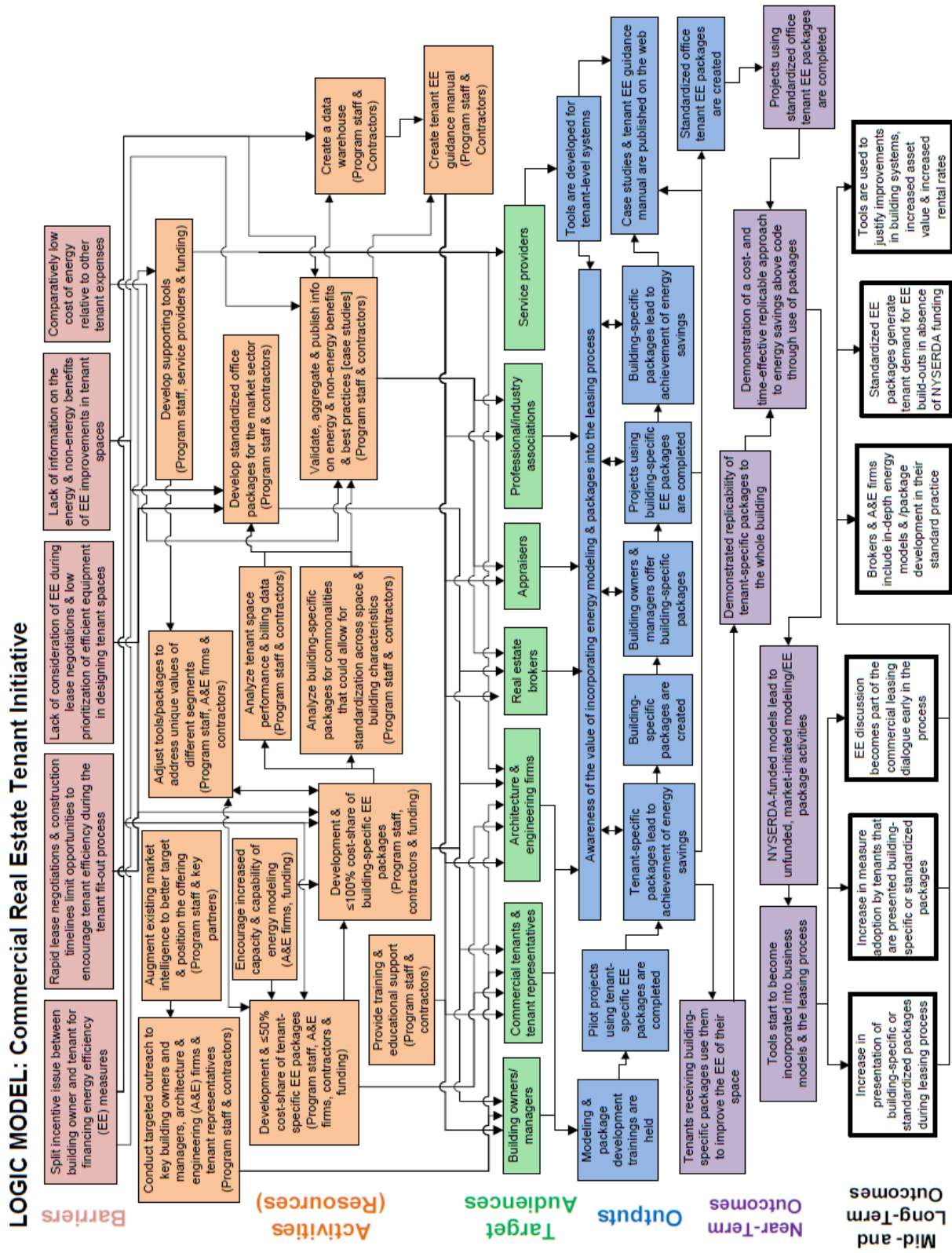
#### 4.4.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• NYSERDA intends to offer this strategy to engage K-12 schools in a fuel neutral manner. This will help develop the market at the scale needed to achieve New York State’s clean energy goals. Offering the strategy on a fuel neutral basis will allow NYSERDA to achieve a ton of carbon savings at a cost of \$287, compared to a cost of \$392 in an electric only scenario.</li> </ul>
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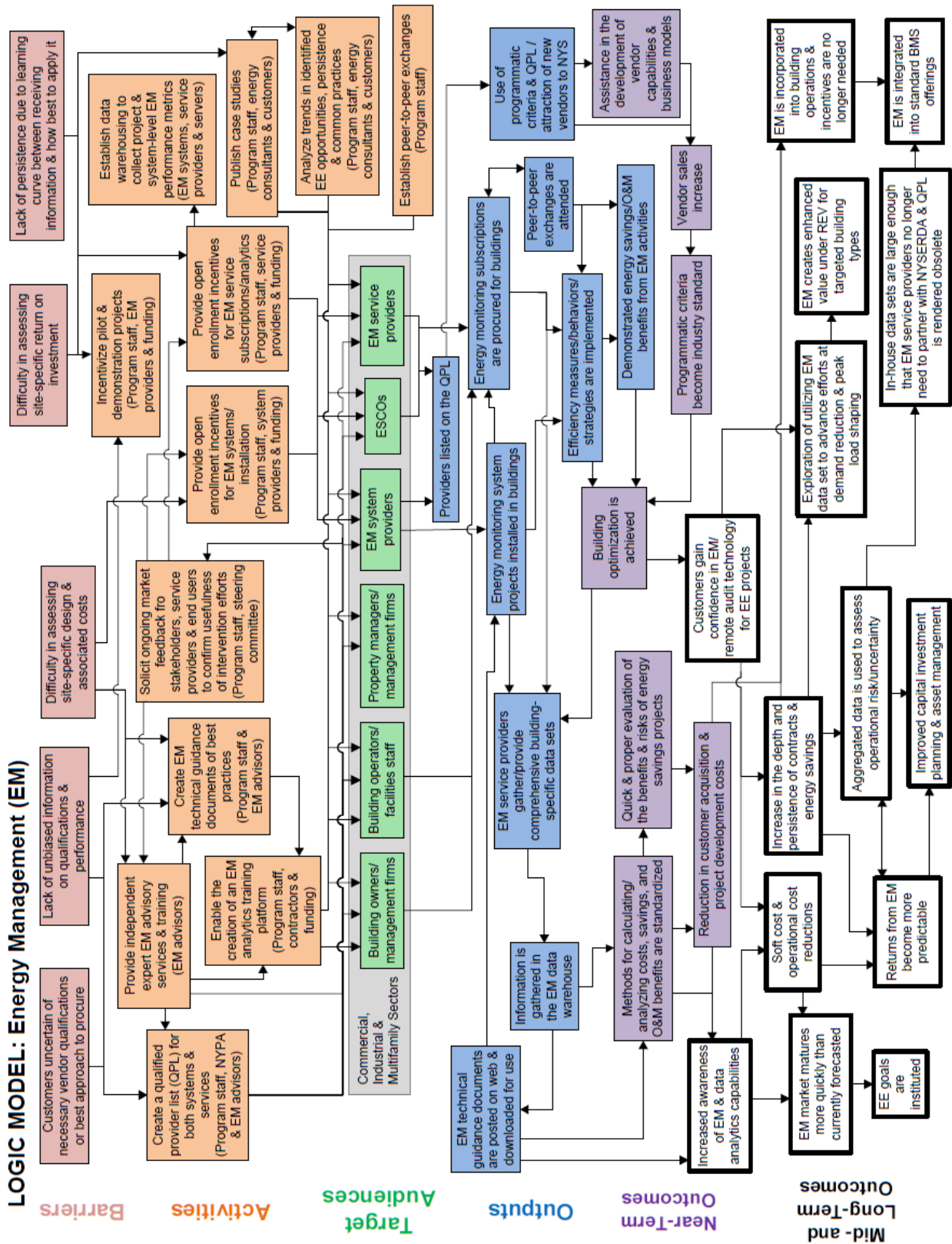
#### 4.4.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>• Collect, analyze and report on progress of the initiative by comparing progress against identified goals on a regular basis (i.e., quarterly, bi-annually).</li> <li>• The strategy design will be tested to gauge the target population’s reaction to the strategy. This information will be used to help inform decisions about how to allocate time and resources.</li> <li>• Insights as to how the initiative can be optimized will be gathered and applied to future initiative design to ensure greatest market impacts within the identified market sectors.</li> <li>• Aggregate and analyze data from NYSERDA-supported gap assistance projects to verify realized energy savings and persistence of savings.</li> </ul> <p><u>Market Evaluation</u></p> <ul style="list-style-type: none"> <li>• Market evaluation will draw on the logic model and will include baseline measurements of key market indicators. Regular longitudinal measurements (e.g., annual or biennial) will include updates of the baseline metrics as well as additional measurements to assess market change resulting from the initiative.</li> <li>• Key market indicators will include, but not be limited to, the number of benchmark reports, awareness and utilization of utility programs and NYSERDA for measure installation, number of schools receiving recognition for clean energy activities, and the number of schools with understanding of the benefits of clean energy and efficient operations.</li> <li>• As appropriate, the market evaluation will leverage sector-level market studies as well as publicly and commercially available data to inform the tracking of key market indicators.</li> </ul> <p><u>Impact Evaluation/Field Verification</u></p> <ul style="list-style-type: none"> <li>• Evaluation M&amp;V will be conducted according to the International Performance Measurement and Verification Protocol (IPMVP) method(s) most appropriate given the measures promoted by this initiative. Data from the impact evaluation can be used to help lend confidence in the market, especially among other end users.</li> <li>• Evaluation M&amp;V of direct savings will focus on areas of greatest impact and will draw upon project-level data collected by the program.</li> <li>• Depending on the extent of replication identified in market evaluation activities, impact evaluation may be conducted on a sample of replication projects to assess outcomes.</li> </ul>
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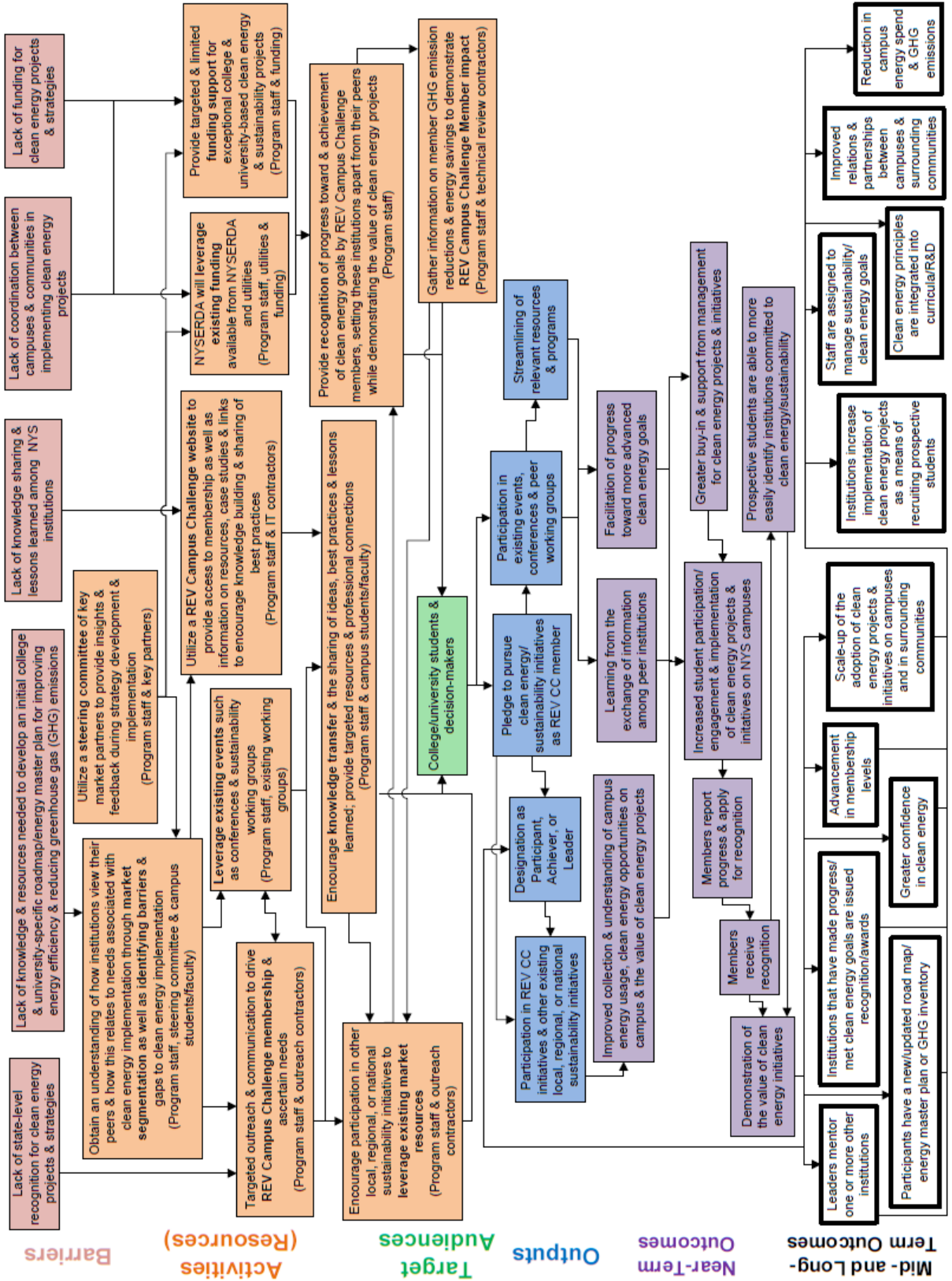
# Appendix A – Logic Models



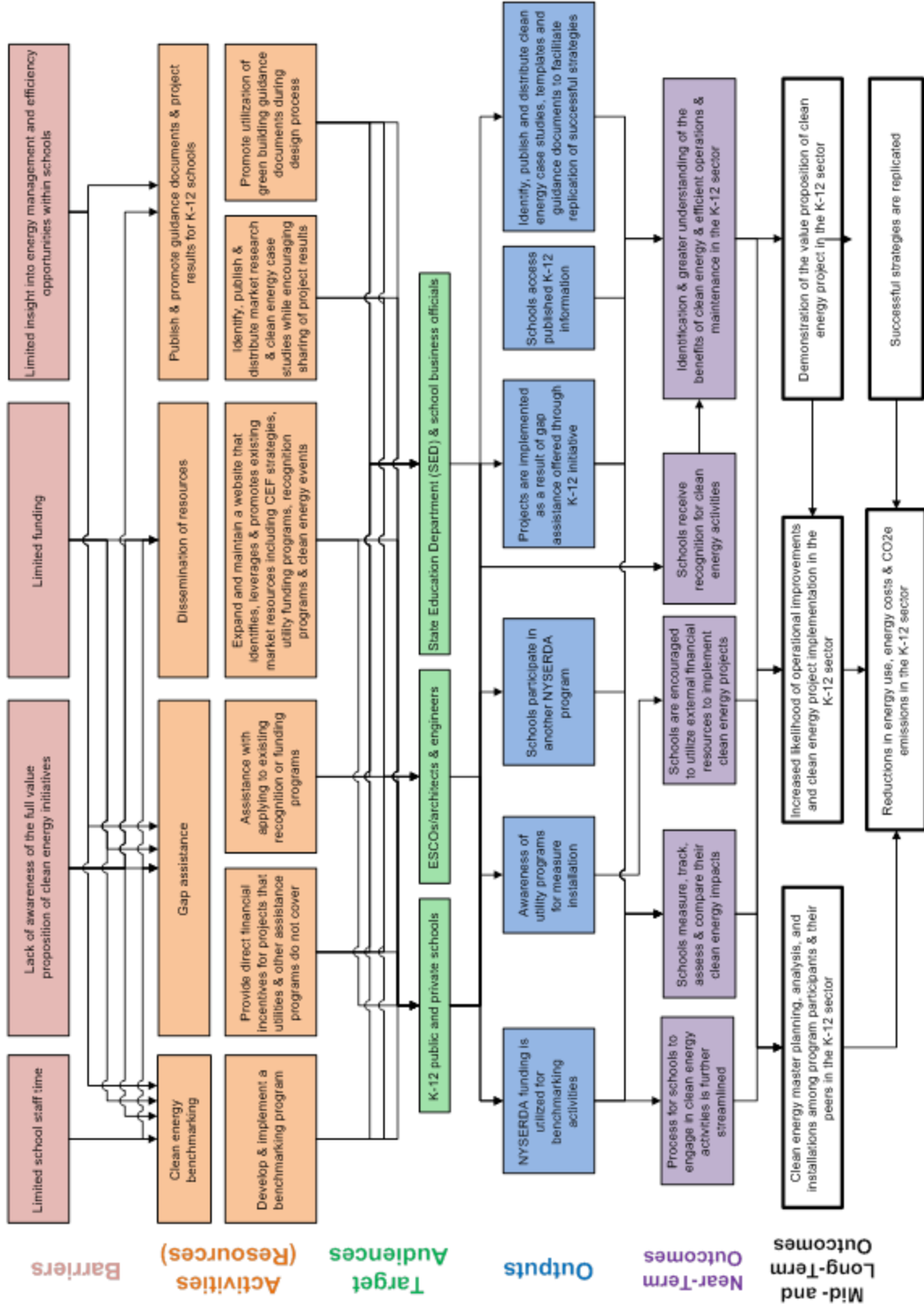
# LOGIC MODEL: Energy Management (EM)



# LOGIC MODEL: REV Campus Challenge



# LOGIC MODEL: K-12 Schools



# Appendix B – Investment Plan Review Supplement<sup>1</sup>

## Real Estate Tenant

### Results to Date – Metrics

The Real Estate Tenant Program was lagging behind expectations across all benefit metrics, with progress ranging from 8% to 17% of cumulative current targets through Q2 2017. Program modifications took effect August 1, 2017, and the initiative is now expected to meet its targets by the end of 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2024)	% of Total Target through Initiative Completion (2024)
Energy Efficiency	MWh Annual	-	-	-	873	873	6,671	13%	124,900	1%
	MWh Lifetime	-	-	-	6,986	6,986	53,468	13%	999,200	1%
	MMBtu Annual	-	-	-	924	924	7,028	13%	131,800	1%
	MMBtu Lifetime	-	-	-	7,392	7,392	56,020	13%	1,054,000	1%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	509	509	3,880	13%	72,700	1%
	Lifetime Tons	-	-	-	4,074	4,074	31,064	13%	581,600	1%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$0.15	\$0.15	\$0.93	17%	\$17.34	1%
	Lifetime Dollars	-	-	-	\$1.22	\$1.22	\$7.38	17%	\$138.70	1%
Private Investment (millions)	Dollars	-	-	-	\$0.06	\$0.06	\$0.65	10%	\$12.15	1%
Participants	Participants	-	-	-	6	6	72	8%	1,349	0.4%

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	June 2017 Actual <sup>2</sup>
			(Cumulative)	(Cumulative)
Activity/ Outputs	Number of tenant spaces participating in the modeling and energy efficiency package offer	0	130	6
	Number of buildings participating in the modeling and energy efficiency package offer	0	110	6
	Square footage of participating tenant spaces in the modeling and energy efficiency package offer	0	6,500,000	688,000

<sup>1</sup> As this report includes performance through Q2 2017 and the K-12 Schools Initiative was filed in Q4 2017, that initiative is not included herein.

<sup>2</sup> Outputs with actuals that are “TBD” have not yet been measured and will have progress included in future reporting.

	Percent of energy saved above code (for participants)	0	15 - 20%	TBD
	<b>Partner engagement:</b> Number of CRE building owners and managers that offer building-specific packages	0	130	1
	Number of case studies developed	0	7	0
	Number of brokers and A&E firms trained	0	20	0
	<b>Partner engagement:</b> Number of Brokers and A&E Firms that include in-depth energy models and package development in their standard practice	0	12	TBD

Performance Against Key Milestones

The Real Estate Tenant Program is early in its development but is making progress toward its current milestones. Current milestones that are not yet complete are or will soon be in progress. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete ✓	Time Frame	Milestone
	2016–2020	Tenants will incorporate energy efficiency measures from tenant-specific packages into their designs. Observed gains from the National Resource Defense Council (NRDC), were 25–40% of energy saved above the 2007 code; NYSERDA is projecting gains of 15–20% against the 2010 and 2012 code. The actual savings will be identified through measurement and verification (M&V).

Plan for Continuation/Modification/Termination

Uptake to the initial Real Estate Tenant offering was slower than anticipated and did not meet its 2016 projected targets. Beginning in October 2016, aggressive outreach and meetings with potential applicants revealed a minimum three-month development cycle between learning about the offering and committing to a project could be the likely cause, though continued market research is being conducted to inform the strategy. It is anticipated the strategy will still achieve its 2025 projected benefits, however the investment plan was updated in July 2017 to reflect 2016 actual activity and to revise the timing of budget and benefit commitments in years 2017-2025. Following these modifications, the initiative will continue as planned.



## Energy Management

### Results to Date – Metrics

The Energy Management benefit metrics currently lag behind annual targets, ranging from 14% to 72% being attained, but are expected to reach congruence with targets by the end of 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2024)	% of Total Target through Initiative Completion (2024)
Energy Efficiency	MWh Annual	-	-	-	7,227	7,227	30,500	24%	444,300	2%
	MWh Lifetime	-	-	-	57,814	57,814	244,600	24%	3,554,000	2%
	MMBtu Annual	-	-	-	6,194	6,194	14,500	43%	184,200	3%
	MMBtu Lifetime	-	-	-	49,555	49,555	115,800	43%	1,474,000	3%
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	4,132	4,132	16,850	25%	243,400	2%
	Lifetime Tons	-	-	-	33,055	33,055	134,200	25%	1,948,000	2%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$1.20	\$1.20	\$4.14	29%	\$60.11	2%
	Lifetime Dollars	-	-	-	\$9.62	\$9.62	\$33.10	29%	\$480.90	2%
Private Investment (millions)	Dollars	-	-	-	\$1.79	\$1.79	\$12.99	14%	\$357.80	1%
Participants	Participants	-	-	-	38	38	53	72%	1,462	3%

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	June 2017 Actual <sup>3</sup>
			(Cumulative)	(Cumulative)
Activity/ Outputs	Number of buildings participating in incentive program	0	711	43
	Number of pilots	0	15	0
	Number of qualified providers on NYSERDA list	0	50	45
	Extent of use of qualified provider list by the market (% increase in NY EM revenue by listed vendors)	0	65%	TBD
	Participation of building owners/managers in peer-to-peer exchanges (from incentive program).	0	40	10
	Number of comprehensive building specific data sets submitted to NYSERDA	0	40	10
	Number of downloads of EM technical guidance document	0	100	TBD

<sup>3</sup> Outputs with “TBD” in the June 2017 Actual column were not yet measured as of the end of June but will have progress included in future reporting.

	Percent of EM providers using programmatic criteria & technical guidance document (as reported through annual survey)	0	75%	TBD
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### Performance Against Key Milestones

The Energy Management Initiative is working toward several current milestones that are not yet complete. After consulting with market providers, customers, and industry experts, it was recommended that development of a technical guidance document and training for operators be postponed until project-level data has been obtained. As such, these milestones that were originally planned for 2016 has been postponed to 2018. All other milestones are on track. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

Complete ✓	Time Frame	Milestone
✓	2016	Secure RTEM Advisor and begin development of market standards.
✓	2016	Create and grow a list of qualified RTEM vendors.
✓	2016	Stimulate interest and market activity with an open enrollment incentive offering.
✓	2016	The program's criteria for qualification of vendors, hardware, and software is introduced to the market and used as a road map for new vendors with the goal of becoming the industry standard.
	2017–2020	Incentives, Qualified Vendor Listing, and Independent RTEM advisor services help convert prospective customers into committed and installed RTEM projects.
	2017–2020	NYSERDA market support and approach attract new RTEM vendors to the New York State market and increase business development investment of all RTEM vendors.
	2017–2020	Secure REM Advisor and begin development of market standards.
	2017–2020	Create and grow a list of qualified REM vendors.
	2017–2020	Stimulate interest and market activity with an open enrollment incentive offering for REM
	2017–2020	EM Advisors support gaps in market confidence and identifies market approaches to eliminating gaps
	2017–2020	Peer to peer exchanges and EM Advisors transfer learnings across the projects supported by NYSERDA and enhance success
	2017–2020	RTEM Technical Guidance Document is drafted and tested
	2017–2020	RTEM Technical Guidance Document is published
	2017–2020	NYSERDA in coordination with industry partners standardizes methodologies for calculating/analyzing costs and savings data

### Plan for Continuation/Modification/Termination

The Energy Management initiative did not meet its 2016 projected targets. Energy Management vendors began applying to the initial offer in October 2016, and NYSERDA has seen a steady increase in applications since. Market feedback indicates the strategy is on target to achieving its overall goals, although NYSERDA anticipates lag in its original projected targets. The investment plan was updated in July 2017 to reflect actual 2016 results and a shifting of projected achievements accordingly. The initiative has been renamed Energy Management (from the original Real Time Energy Management) to broaden the scope to explore less sophisticated remote energy management (REM) opportunities and to expand into other sectors, i.e., industrial and multifamily. In addition, market feedback and vendor capabilities have identified untapped potential in energy management system enhancements and the targeted market segment. As a result, \$7 million was added to the pool of incentives and services to support the installation of additional controls components on energy management systems, as well as projects outside of the commercial sector. These new projects are anticipated to achieve additional benefits at the same \$/CO2 ton as originally projected. Budget and benefits were updated to reflect these adjustments. Following these modifications, the initiative will continue as planned.

## REV Campus Challenge

### Results to Date – Metrics

Benefits metrics for REV Campus Challenge are generally lagging behind targets, with most benefits currently between 60-65% of cumulative current targets through Q2 2017. Participant enrollment is the only metric exceeding its target at 111%. MWh renewable energy is significantly under target at less than 1%. Additional information can be found in NYSEDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2025)	% of Total Target through Initiative Completion (2025)
Energy Efficiency	MWh Annual	-	-	-	7,367	7,367	11,600	64%	108,100	7%
	MWh Lifetime	-	-	-	110,499	110,499	173,500	64%	1,621,000	7%
	MMBtu Annual	-	-	-	45,378	45,378	72,000	63%	670,000	7%
	MMBtu Lifetime	-	-	-	680,676	680,676	1,075,000	63%	10,050,000	7%
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	1	1	735	0.1%	8,804	0.01%
	MWh Lifetime	-	-	-	-	-	11,000	-	132,100	-
	MW	-	-	-	-	-	1	-	8	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	6,288	6,288	10,300	61%	97,030	6%
	Lifetime Tons	-	-	-	94,327	94,327	154,500	61%	1,455,000	6%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$1.23	\$1.23	\$1.94	64%	\$18.07	7%
	Lifetime Dollars	-	-	-	\$18.44	\$18.44	\$29.05	63%	\$271.10	7%
Private Investment (millions)	Dollars	-	-	-	-	-	\$6.65	-	\$71.20	-
Participants	Participants	-	-	-	81	81	73	111%	150	54%

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSEDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	June 2017 Actual <sup>4</sup>
			(Cumulative)	(Cumulative)
Activity/ Outputs	Number of REV Campus Challenge Members	0	120	81
	Number of NYS institutions participating in AASHE STARS	44 (21 with STARS rating)	60	60
	Percent increase in NYS institution attendance at existing clean energy events/conferences	TBD	20%	TBD
	Percent of all NYS institutions participating in REV Campus Challenge initiatives/competitions	0	25%	24%

<sup>4</sup> Outputs with “TBD” in the June 2017 Actual column were not yet measured as of the end of June but will have progress included in future reporting.

Percent of REV Campus Challenge Members collecting and reporting energy usage (as reported through annual survey)	0	25%	TBD
Percent of REV Campus Challenge Members reporting new clean energy projects on campus (as reported through annual survey)	0	60%	TBD
Percent of REV Campus Challenge Members reporting new clean energy curricula or curriculum integration (as reported through annual survey)	0	30%	TBD
Percent of REV Campus Challenge Members reporting new or improved community partnerships to expand clean energy goals (as reported through annual survey)	0	25%	TBD
Percent of REV Campus Challenge Members receiving recognition	0	30%	TBD

### Performance Against Key Milestones

REV Campus Challenge is early in its development but is making progress toward its current milestones. REV Campus Challenge had a growing membership of 81 participants as of June 2017, and was developing an annual member survey on member progress and opportunities for recognition that will be completed in Q4 2017. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓		
	2016–2019	120 out of 250 institutions sign up to be REV Campus Challenge Members.
	2016–2019	Members make progress and receive recognition as demonstrated by new and revised planning, new commitments to sustainability goals and clean energy projects started and completed.

### Plan for Continuation/Modification/Termination

The REV Campus Challenge initiative exceeded its 2016 target of 40 colleges, signing 63 members. Workshops held in 2016 confirmed interest and need for additional financial support to obtain technical guidance, intern support and community reaching initiatives. As a result, in July 2017 an additional \$2 million was added to the pool of incentives and services REV Campus Challenge is offering. The funds were added for 2017 and 2018, with additional direct benefits at the same \$/CO2 ton as originally projected. Budget and benefits were updated to reflect these additions. Following these modifications, the initiative will continue as planned. NYSERDA will monitor progress against the increased targets for 2017 and 2018 to determine if any modifications to the targets are needed, and will reflect any updates in the next annual review.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Industrial Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan: Industrial Chapter		
Revision Date	Description of Changes	Revision on Page(s)
April 29, 2016	Original Issue	Original Issue
December 30, 2016	Revised Table 3 to correct an error in the Direct Cumulative Annual Energy Savings for participants and revised Table 5 to correct an error in the Total CO2e Emissions Reductions (metric tons) Annual.	Multiple
June 23, 2017	Increased funding to support an additional Strategic Energy Management pilot cohort, include a broader pool of industrial facilities, and add an Energy Management Information System (EMIS) offering, with a corresponding increase in benefits. Removed outputs from Table 3 that were duplicative to energy savings information in Table 4. Tables 1-6 have been updated to reflect these revisions, 2016 actual values, and a shift in budget and benefit timing.	Multiple
November 1, 2017	Updated the baseline values in Table 3 to reflect latest data available. In addition, updated 2019 values to show cumulative targets rather than incremental targets as previously filed.	14

## 5 Industrial

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NYSERDA aims to address energy efficiency opportunities in the industrial sector that focus on process efficiency improvements. Acceleration of activity in the Industrial sector requires decision-makers to be able to more easily determine their options and have confidence in their investment decisions. Initiatives will aim to overcome barriers impeding progress including: risk aversion by facility managers and decision makers that energy efficiency could disrupt industrial processes, lack of in-house expertise in energy management, lack of trust in the energy efficiency technology to deliver the intended benefits for the company, and a lack of attractive service offerings to say “yes” to as suppliers often lack scale and a ready market for which to develop more compelling offerings and cost and finance sensitivity.

The first initiative described in this Chapter is Continuous Energy Improvement, which aims to integrate the adoption of energy efficiency and clean energy into companies’ core business processes. Programming and resources provided will focus on identifying areas for improvement, driving managerial and corporate behavioral changes with respect to energy, developing the mechanisms to track energy optimization efforts versus other business investment opportunities, and allowing companies to become accustomed to energy management with minimal risk. Modifications to the Continuous Energy Improvement initiative include, moving the anticipated budget and benefit commitments for both the On-Site Energy Manager and Strategic Energy Management components out one year (from 2016-2018 to 2017-2019) to reflect a later than anticipated program launch, adding \$1 million of funding to the Strategic Energy Management component to support an additional pilot cohort (with a corresponding increase in benefits) to include a broader pool of industrial facilities, and updating the lifetime benefits to reflect a ten year measure life, to correct an error in the previously filed version.

An Energy Management Information System (EMIS) offering has also been added to Continuous Energy Improvement. EMISs are software tools utilized to gather and analyze energy and production data streams in real-time. Like Strategic Energy Management and On-Site Energy Manager, EMIS is an enabling technology to support the long-term realization of continuous energy efficiency improvements through organizational awareness and change. EMIS provides visualization and analysis of energy consumption in parallel with production data, information that that can enable the industrial entities to take action on capital projects or operational and behavioral changes, and to track the effects of the changes. This technical solution is positioned as a stand-alone tool for energy monitoring and analysis, or can be used to enhance a customer’s Strategic Energy Management (SEM) engagement by providing an analytical tool to assist in achieving SEM’s goals.

Projected additional initiatives under development include: a Green Data Center Consortium to provide a platform to educate both information technology and facilities staff on how to apply energy efficiency best practices to their data centers while achieving reliability; a Best Practices initiative to educate industrial and data center facilities in the best approaches for process and energy improvements, and how to implement these at their sites; an Emerging Technologies Forum



to facilitate the introduction of new and emerging technologies and practices; and Capital Projects Support to drive the implementation of process and energy efficiency.

Program investments and activities will also be informed via engagement with stakeholders and subject matter experts.

## 5.1 Continuous Energy Improvement

### 5.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Industrial energy use represents 7.4%<sup>1</sup> of total energy use (across all sectors) in the state and 4% of electric economic energy efficiency potential, 11% of natural gas economic energy efficiency potential, and 2% of petroleum fuels economic energy efficiency potential.</li> <li>• Energy is one of the largest operational costs for industrial and manufacturing facilities, sometimes exceeded only by raw material and labor costs. Investing in process and energy efficiency projects can help lower those energy costs, and improve a company’s bottom line and overall competitiveness. Addressing the industrial sector’s energy management requires a range of solutions designed to help manufacturers of various levels of sophistication improve their energy efficiency.</li> <li>• While a full-time On-site Energy Manager would afford a manufacturer with the dedicated focus and expertise to pursue and implement energy efficiency projects, many industrial organizations lack awareness of the costs and benefits of dedicating a fulltime energy manager staff member relative to other business investment opportunities.</li> <li>• Strategic Energy Management (SEM) – a continuous improvement approach to reducing energy intensity over time, characterized by demonstrated customer commitment, planning and implementation, and systematic measurement – provides the opportunity to achieve systematic energy savings. Yet currently in New York there are limited resources, both internal to industrial facilities and in the external market, that can support this approach, despite the growing interest in pursuing it.</li> <li>• The number of SEM programs offered by program administrators across the United States and Canada grew rapidly from 7 in 2011 to 21 in 2014, demonstrating interest by the industrial sector. Currently, there are three strategic energy management programs in the Northeast region. Discussions with market actors have indicated that New York State’s involvement in offering SEM could push adoption of this strategy within industrial facilities in the state and expand the market in the region for service providers.</li> <li>• SEM program success can be enhanced through the installation of an Energy Management Information System (EMIS) which can store, analyze, and display energy consumption data collected from sensors, equipment feeds, and meters. EMIS offers industrial entities the means to monitor consumption and production data in near real-time and to identify operational changes and capital projects that increase efficiency.</li> <li>• EMIS are viable stand-alone solutions with a number of recognized benefits including identification of energy efficiency opportunities, tracking, trending and</li> </ul>
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<sup>1</sup> NYSERDA Patterns & Trends 2013 report (published Oct 2015).

	<p>comparing performance, measurement and verification of project specific energy, and detection of equipment or process faults.</p> <ul style="list-style-type: none"> <li>• The North American market for EMIS is estimated at \$4.5 billion and expected to grow by approximately 11% over the next decade. Currently, ten energy management information system programs have been identified across North America, however only two programs are in the Northeast region. Discussions with market actors have indicated that New York State’s involvement in offering an EMIS program could push adoption of this strategy within NYS industrial facilities and expand the market in the region for service providers.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• This Continuous Energy Improvement initiative will look to address the interest in On-site Energy Managers, the availability of Strategic Energy Management resources and the uptake in Energy Management Information Systems. Sponsoring On-site Energy Managers who support project identification, implementation, and clearly demonstrate the value proposition of process and energy efficiency projects, encouraging the installation of EMIS to track and monitor energy data, and implementing SEM which promotes operational, organizational and behavioral changes resulting in energy efficiency gains on a continuing basis, would allow industrial facilities to better manage their energy.</li> <li>• The On-site Energy Manager component of this initiative will also promote the development of a pool of experts needed to support SEM and achieve continuous energy efficiency. Having On-site Energy Manager resources, whether contracted or permanent staff, will be critical not only to the broader adoption of SEM but also to support the Self Direct utility programs.</li> <li>• Through this initiative, NYSERDA intends to prove the business case for integrating energy efficiency as a core business practice and applying the principles of continuous improvement to energy management, fostering substantial, long-term savings.</li> <li>• Industrial customers may opt to accomplish this with the support of a dedicated On-site Energy Manager or through a structured series of ‘learn by doing’ Strategic Energy Management cohort training or by integrating an EMIS to enhance facility outcomes</li> <li>• Over the next few years, NYSERDA will conduct multiple pilots to guide industrial sites through the process of establishing and implementing an SEM system or to match facilities with a cost-shared On-site Energy Manager to prove the business case for this dedicated resource; and will provide support to increase the number of successful EMIS installations.</li> <li>• The data from these pilots will be disseminated to the market along with training and developed tools to support integration of continuous energy improvement and increased adoption of an energy culture within industrial facilities.</li> </ul> <p>For a visual representation of this strategy, please reference the flow charts entitled “Logic Model: On-site Energy Manager”, “Logic Model: Industrial Strategic Energy Management,” and “Logic Model: Energy Management Information System (EMIS)” which can be found in Appendix A.</p>
<p><b>Goals</b></p>	<ul style="list-style-type: none"> <li>• The value of an On-site Energy Manager role in industrial facilities will become standardized, fostering the emergence of an on-site energy manager provider market which will gain traction and become self-sustaining.</li> <li>• Build the market demand for SEM through pilot cohorts and follow up information illustrating the value of SEM.</li> <li>• Build the market demand for EMIS by demonstrating the benefits of improved access to energy, production, and system data</li> <li>• Provide training to and develop partnerships with consulting firms and other relevant market actors to grow the market supply of industrial SEM trainers and EMIS vendors and service providers.</li> </ul>

	<ul style="list-style-type: none"> <li>Ultimately, SEM combined with an EMIS will be a key factor for staying competitive in the industrial sector due to the volume of energy and cost savings achievable by facilities.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	This strategy contributes to NYS Energy Plan goals for energy efficiency and emission reductions through program participants implementing energy efficiency and productivity projects as well as behavioral and operational changes.

5.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<ul style="list-style-type: none"> <li>In New York there are approximately 820 large and 1910 medium industrial facilities.</li> <li>Large industrial firms’ annual energy expenditures exceed \$1M, medium industrial customers’ annual energy expenditures between \$500,000 to \$1M, small industrial customers’ annual energy expenditures \$500,000 and below.</li> <li>The target market is industrial facilities in NYS with high energy intensity (i.e., high energy associated with a process relative to the output of the process) and high energy costs relative to other business costs.</li> <li>Likely pilot participants are industrial sites whose organization and management are poised to support a structured, long-term management plan to influence operational, organizational, and behavioral changes resulting in continual improvements in energy performance.</li> </ul>
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>Critical Staff: facility and process engineers, production and plant managers, operations and maintenance managers, energy managers, and C-suite executives</li> <li>Multiple industrial decision-makers: facility, production, managerial, On-site Energy Managers</li> <li>Energy-focused Process consultants</li> <li>EMIS system and service providers</li> <li>Utility Companies</li> <li>Manufacturing and Sector Association Groups</li> </ul>
<b>Market Readiness</b>	<p><u>On-Site Energy Manager</u></p> <ul style="list-style-type: none"> <li>Early adopters include the largest manufacturers in New York which often have dedicated energy managers, or manufacturers which are provided similar resources through corporate energy teams. Other companies may have employees who address energy or sustainability as part of a larger role.</li> <li>Service providers are ready and willing to provide on-site services and have capabilities that can be leveraged.</li> </ul> <p><u>Strategic Energy Management</u></p> <ul style="list-style-type: none"> <li>National industrial market leaders and large corporations with aggressive energy goals have begun to implement SEM in various forms, including EPA’s Energy Star for Energy Management, ISO 50001, and DOE’s Superior Energy Performance.</li> <li>Interest for further growth of SEM is evidenced by the 2015 American Council for an Energy-Efficient Economy (ACEEE) Summer Study on Energy Efficiency in Industry conference where over 200 papers focusing on SEM topics were submitted, and an entire track was devoted to SEM.</li> <li>SEM is scalable and applicable to a broad range of industrial and manufacturing facilities regardless of size or industry because it is a management system and is not limited to any piece of equipment or process.</li> <li>Information obtained from SEM working groups and the Consortium for Energy Efficiency’s 2014 SEM Program Case Studies Report indicate that service</li> </ul>

	<p>providers assist in the delivery of SEM programs across the United States and Canada. These companies have gained experience leading and managing strategic energy management programs and are able to provide support to this strategy in New York. Voice of Customer discussions also indicate that once the state of New York provides an SEM offering to the marketplace, it will develop and bolster the service provider network for strategic energy management on the east coast.</p> <ul style="list-style-type: none"> <li>• There are existing tools in the market that can assist and guide this strategy that include: <ul style="list-style-type: none"> <li>○ DOE eGuide</li> <li>○ DOE Energy Management Guidelines</li> <li>○ The US EPA's ENERGY STAR Guidelines for Energy</li> <li>○ EPA: Small and Medium Sized Manufacturer Energy Guide</li> <li>○ DOE - EnergyPlus</li> <li>○ Energy Star Portfolio Manager</li> <li>○ EPA's Energy Use Assessment Tool</li> <li>○ CEE: SEM Minimum Elements guide</li> </ul> </li> </ul> <p><u>Energy Management Information Systems</u></p> <ul style="list-style-type: none"> <li>• EMIS has been successfully integrated into other existing SEM programs, including Energy Trust of Oregon, BPA ESI, and Efficiency Vermont.</li> <li>• Case studies and testimonials from EMIS vendors indicate that results from EMIS implementation among large industrial customers have shown immediate, high-impact benefits.</li> <li>• EMIS vendors and service providers estimated market penetration to be in the single digits, offering much room for growth.</li> <li>• Customer interviews have revealed a desire for assistance with high-frequency energy use analysis as well as cost support for metering hardware.</li> </ul>
<p><b>Customer Value</b></p>	<p>Industrial facilities operate in a highly competitive environment with tight margins. Particularly in energy-intensive industrial sectors, effective management of energy expenditures is crucial to remaining profitable and competitive.</p> <p>Projected benefits to the customer of a dedicated On-site Energy Manager resource include:</p> <ul style="list-style-type: none"> <li>• Estimated annual cost of fully burdened, full time On-site Energy Manager to hire permanently or contract is approximately \$250,000</li> <li>• Under this risk reduction pilot NYSERDA would provide a cost share of up to 75% of one-year's cost of an energy manager or \$187,500 for a net \$62,500 cost to customer</li> <li>• Pilot annual energy savings range minimally from \$80,000 to \$210,000 for medium and large sites, respectively, based upon average EEPS2 Industrial and Process Efficiency electric and natural gas project savings. This yields payback of less than 2 years without NYSERDA pilot cost-share and less than 1 year with NYSERDA pilot cost-share. Lifetime savings are \$1,200,000 to \$3,150,000, medium and large respectively.</li> <li>• Other non-energy benefits from production improvements (scrap reduction, process time improvements, sustainability measures like water savings, etc.) may be substantial for industrial facilities and further improve the cost justification/value proposition of these initiatives.</li> </ul> <p>Projected benefits to the customer of implementing a Strategic Energy Management system include:</p> <ul style="list-style-type: none"> <li>• Participants, on average, will reduce their overall electric energy consumption by 4 percent during the first year of SEM implementation.</li> </ul>

	<ul style="list-style-type: none"> <li>• Estimated cost of an individual industrial facility hiring a consultant to provide training, guidance, and support for SEM is approximately \$55,000 per year. Assumed costs for one year of SEM guidance and project implementation, without NYSERDA’s involvement is estimated to be \$485,000 (\$55,000 consultant cost plus an estimated \$430,000 to implement energy-related capital and operational &amp; maintenance projects). Based on a 4% energy reduction, the average large customer would realize roughly \$100,000 in energy savings, resulting in a simple payback of 4.9 years. Facilities participating in NYSERDA’s SEM cohorts, where NYSERDA provides the consultant, would have a simple payback of 4.3 years.</li> <li>• Other benefits resulting from production improvements (scrap reduction, process time improvements, etc.) improve cost justification</li> <li>• Additional benefits include peer to peer exchange of best practices, and building and sustaining a culture of energy efficiency within organizations</li> </ul> <p>Projected benefits to the customer of implementing an Energy Management Information System include:</p> <ul style="list-style-type: none"> <li>• Facilities that apply the rigor of an EMIS, through energy and production data monitoring and reporting, realize a greater visibility into the energy impact of SEM activities.</li> <li>• Participants, on average, will realize an annual energy savings estimated at 4% through reduced operations and maintenance costs, and energy bill savings through energy efficiency savings and peak saving optimizations.</li> <li>• EMIS will improve verification of financial impacts of capital projects and operational augmentations through pre- and post-intervention data comparison and benchmarking.</li> </ul>
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5.1.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA’s strategic assessment work confirmed both On-site Energy Manager and Strategic Energy Management as intervention opportunities. The effort found that to have the maximum impact on the Industrial Sector, industrial decision makers need to be educated on the value of energy management as part of their core mission; energy management is as fundamental as any other aspect of cost and operations management. It also suggested that NYSERDA could subsidize a temporary energy-manager-for-hire program for customers that lack sufficient internal resources (time or expertise) to support the identification and implementation of potential efficiency or process improvement projects and to help develop long-term energy plans for the facility.</li> <li>• American Council for an Energy Efficient Economy (ACEEE) 2013 white paper entitled, <i>Onsite Energy Manager Pilot Programs: A Survey of Practices and Lessons Learned</i>, informed this strategy.</li> <li>• Voice of customer from Industrial Stakeholder meetings, Best Practice Forums, and one-on-one meetings with industrial customers, vendors and stakeholder organizations informed this strategy.</li> <li>• NYSERDA hosted a Best Practice event focusing on SEM concepts called Industrial Continuous Energy Management Conference on 11/12/15. A total of 43 external individuals, representing 30 different organizations, attended this event</li> <li>• NYSERDA continues to work with stakeholder organizations and the Industrial market to promote and inform these strategies. NYSERDA participates in the Consortium for Energy Efficiency’s Industrial SEM Committee and the Northeast Regional Continuous Energy Improvement Discussion Group. These groups contain regional and national program administrators, government agencies,</li> </ul>
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	<p>utility companies, and trade associations. Discussions within these groups include program design, new ideas, emerging technologies and trends, establishing common SEM and EMIS definitions and components, and sharing lessons learned. These forums allow NYSERDA to integrate learnings from other market actors into this strategy and subsequent market transfer.</p> <ul style="list-style-type: none"> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) to engage with stakeholders, as appropriate.<sup>2</sup></li> </ul>
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#### 5.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<p><u>On Site Energy Manager</u></p> <ul style="list-style-type: none"> <li>• Lack of awareness of the benefits of an On-site Energy Manager</li> <li>• Limited access to internal capital and resources necessary to fund a dedicated On-site Energy Manager position</li> <li>• Facilities lack manpower or technical expertise to address energy efficiency projects or the energy aspect of process improvement projects</li> <li>• Lack of educated on-site resources with expertise in energy efficiency as it relates to process efficiency</li> <li>• Risk aversion related to facility down time</li> <li>• Limited number of qualified service providers</li> <li>• Staffing and operating cost constraints</li> <li>• Limited understanding of the energy embedded in the manufacturing process</li> </ul> <p><u>Strategic Energy Management</u></p> <ul style="list-style-type: none"> <li>• Lack of standardization in SEM</li> <li>• Difficulty in obtaining executive support due to lack of awareness of SEM benefits</li> <li>• Lack of expertise within facilities</li> <li>• Staffing and operating cost constraints</li> <li>• Limited understanding of the energy embedded in the manufacturing process</li> <li>• Limited number of SEM qualified service providers</li> </ul> <p><u>Energy Management Information System</u></p> <ul style="list-style-type: none"> <li>• Limited understanding of EMIS impact in maximizing the benefits of SEM</li> <li>• Lack of sophistication with energy metering and tracking</li> </ul>
<b>Testable Hypotheses</b>	<p><u>On-Site Energy Manager</u></p> <p>If a dedicated, on-site resource/expert, focused on process efficiency and energy optimization, is put into place at a facility through NYSERDA’s support, then:</p> <ul style="list-style-type: none"> <li>• Cost savings (because of process and energy efficiency initiatives) will justify the long-term funding of this function within the organization.</li> <li>• An On-site Energy Manager can influence corporate behavior to continually identify and implement process efficiency and energy optimization measures that are attractive investments to industrial facilities.</li> <li>• Adoption of an energy culture is accelerated by transferring knowledge and increasing confidence that energy improvements will not disrupt process and are aligned with the organization’s core mission.</li> </ul>

<sup>2</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

	<p><u>Strategic Energy Management</u></p> <ul style="list-style-type: none"> <li>• Customers that implement SEM frameworks are able to build strong energy cultures and sustain significant energy reductions over the long term. If an energy champion can influence corporate behavior through the transfer of knowledge to the energy team, then facilities will be able to continually identify and implement process efficiency and energy optimization measures that are attractive investments for their facility.</li> <li>• If data, case studies, and testimonials from industrial pilot cohorts are developed and disseminated through Best Practice Workshops and other outlets, and more consulting firms offer strategic energy management and energy manager services, then facilities will trust and adopt strategic energy management.</li> <li>• If facilities adopt a strategic energy management system, then they will be able to comprehensively and systematically improve their energy performance and achieve greater savings than through an ad hoc project approach.</li> </ul> <p><u>Energy Management Information System</u></p> <p>If NYS industrial facilities adopt EMIS as a means of tracking and managing their energy, then:</p> <ul style="list-style-type: none"> <li>• Facilities will become more proficient at visualizing and interpreting energy performance and trending data.</li> <li>• Confidence in energy efficiency implementations will increase due to EMIS measurement and verification functionality.</li> <li>• Qualified EMIS vendors will experience an increase in demand for their services.</li> </ul>
<b>Activities</b>	<p><u>On-Site Energy Manager pilots:</u></p> <ul style="list-style-type: none"> <li>• Conduct outreach to educate industrials on the value of On-site Energy Manager and promote program participation</li> <li>• Conduct energy assessments of existing conditions, determine baseline and performance score card</li> <li>• Establish an energy team: includes staff from various business units</li> <li>• Energy accounting and analysis: Develop performance metrics for energy and productivity initiatives</li> <li>• Integrate energy conservation and productivity initiatives into company business model</li> <li>• Review progress reports on energy and productivity projects</li> <li>• Develop case studies and value propositions for replication through Best Practice Workshops and other outlets</li> <li>• Develop a road map for decision makers and facility staff for on-boarding the role</li> <li>• Creation of a list of qualified energy-focused process consultants from which on-site energy management expertise can be sought or matched with facilities</li> </ul> <p><u>Strategic Energy Management pilots:</u></p> <ul style="list-style-type: none"> <li>• Conduct outreach to educate on the value of SEM and promote program participation</li> <li>• Organize cohort training sessions and develop materials</li> <li>• Organize cohort network to promote peer or peer exchange</li> <li>• Lead cohort through SEM training and implementation of SEM activities</li> <li>• Review deliverables from SEM key milestone activities to ensure SEM adoption and energy savings</li> <li>• Review progress reports on energy and productivity projects</li> <li>• Develop case studies and value propositions for replication through Best Practice Workshops and other outlets</li> <li>• Develop and disseminate templates and resources for SEM</li> <li>• Establish and coordinate qualified consultant pool with participants</li> </ul>

	<ul style="list-style-type: none"> <li>• Develop SEM training programs</li> </ul> <p><u>Energy Management Information System:</u></p> <ul style="list-style-type: none"> <li>• Conduct outreach to educate industrial facilities to promote program participation</li> <li>• Develop and disseminate a list of qualified EMIS vendors</li> <li>• Fund readiness assessment and recommendation prior to EMIS implementation</li> <li>• Provide cost-share for EMIS hardware, installation, and ongoing support services</li> <li>• Demonstrate the value proposition of EMIS through case studies, webinars, knowledge transfer sessions in a variety of media and forums.</li> </ul>
<b>Key Milestones</b>	<p><u>On-Site Energy Manager pilots:</u></p> <p><u>Milestone 1 (2016 and 2017)</u></p> <ul style="list-style-type: none"> <li>• List of qualified energy-focused process consultants from which On-site Energy Management expertise can be sought and/or matched with industrial facilities</li> <li>• C-suite executive buy-in and engagement which provides momentum for energy planning and management activities at industrial sites</li> </ul> <p><u>Milestone 2 (2016 and 2017)</u></p> <ul style="list-style-type: none"> <li>• Industrial end user commitment to energy goal creation and realization is key to successful On-site Energy Manager engagements</li> <li>• Robust tracking and reporting of energy and non-energy benefits of the On-site Energy manager role</li> </ul> <p><u>Milestone 3 (2017 and 2018)</u></p> <ul style="list-style-type: none"> <li>• A credible business case that proves the benefits of on-site energy management in industrial facilities <ul style="list-style-type: none"> <li>○ Large sites will save at least 1,200 MWh and 15,000 MMBtu annually</li> <li>○ Medium sites will save at least 500 MWh and 5,000 MMBtu annually</li> </ul> </li> <li>• Business case content for consultant marketing plans which address this need in the industrial market</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• Long-term energy resource(s) dedicated to energy management, without NYSERDA support (e.g., manufacturer hires energy manager function in-house; continues contracting with On-Site Energy Manager consultant; or contracts with a new consultant)</li> <li>• Transition of knowledge and tools from pilot On-site Energy Managers to long-term energy resource</li> <li>• Successful dissemination of training, road maps, case studies, and vetted consultant lists creates both supply for On-site Energy Manager by qualified technical consultants and demand for the role at industrial sites.</li> </ul> <p><u>Strategic Energy Management pilots:</u></p> <p><u>Milestone 1 (2016 and 2017)</u></p> <ul style="list-style-type: none"> <li>• Facilities understand how energy intensity is embedded in their process and have integrated energy management into their organizational culture. <ul style="list-style-type: none"> <li>○ Facilities possess knowledge of SEM (have an energy map, identified goals and metrics, and have developed a project register identifying projects and an action plan for project implementation) and have a system for monitoring, tracking, and making decisions based on their energy use.</li> </ul> </li> </ul>



	<p><u>Milestone 2 (2017 and beyond)</u></p> <ul style="list-style-type: none"> <li>• Facility executives value and adopt SEM due to organizational change and systematic energy management that enables them to identify attractive investments for their facility. <ul style="list-style-type: none"> <li>○ Continuation of energy champion and team beyond the cohort (for participating facilities)</li> <li>○ Executive support to implement energy-related projects.</li> </ul> </li> </ul> <p><u>Milestone 3 (2018 and beyond)</u></p> <ul style="list-style-type: none"> <li>• Industrial facilities seek out developed information and standardized tools as well as contractor support to implement and adopt SEM. <ul style="list-style-type: none"> <li>○ Tracked inquiries and dissemination of case studies, training, SEM resources, and vetted consultant list.</li> </ul> </li> </ul> <p><u>Milestone 4 (2018 and beyond)</u></p> <ul style="list-style-type: none"> <li>• SEM replaces the ad-hoc energy project approach resulting in deeper and continuous energy savings and energy decision-making at industrial facilities <ul style="list-style-type: none"> <li>○ Critical staff can express how the energy measures they've implemented have affected their bottom line.</li> <li>○ Facilities realize 1-2% reductions in their energy consumption annually <ul style="list-style-type: none"> <li>▪ For large industrial facilities, this equates to approximately 150-300 MWh, 1,100-2,500 MMBtu Natural Gas, 75-160 MMBtu Oil, and \$100,000 in energy savings per participant in the first year</li> </ul> </li> </ul> </li> </ul> <p><u>Energy Management Information System:</u></p> <p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Develop and release RFP for qualified EMIS vendors</li> <li>• Solicit and contract with EMIS assessment provider(s)</li> <li>• Develop solicitation for participants</li> <li>• Develop and disseminate a matrix or list of qualified EMIS vendors</li> </ul> <p><u>Milestone 2 (2019)</u></p> <ul style="list-style-type: none"> <li>• Distribute list of qualified EMIS vendors</li> <li>• Initiate development and dissemination of EMIS case studies, webinars; knowledge transfer sessions in a variety of media/forums</li> </ul> <p><u>Milestone 3 (2021)</u></p> <ul style="list-style-type: none"> <li>• Refine and continue the dissemination of EMIS case studies, webinars; knowledge transfer sessions in a variety of media/forums</li> </ul>
<p><b>Goals Prior to Exit</b></p>	<ul style="list-style-type: none"> <li>• Cost savings (energy combined with other benefits) because of On-site Energy Manager activities are greater than the cost of on-site manager or services, thereby justifying the hiring or contracting of an energy manager.</li> <li>• Each year, an additional 10-15 new on-site energy managers or services begin in industrial facilities, without direct NYSERDA support, resulting in an increase of 0.5% market penetration of large and medium industrial facilities each year.</li> <li>• 90% of participants in the SEM pilot have demonstrated adoption of the training and activities resulting in cost and energy savings from capital improvement projects, operations and maintenance measures, behavioral changes, and employee engagement.</li> <li>• Each year an additional 5-10 new facilities undergo SEM as a result of the information and tools disseminated into the marketplace.</li> </ul>

	<ul style="list-style-type: none"> <li>• Greater than 80% of EMIS customers renew their software subscriptions at the culmination of Year 1 of their respective implementation due the demonstrated value of the system</li> <li>• EMIS is recognized by 5-10% of customers in the energy intensive sectors as an essential resource</li> <li>• Resources to support On-site Energy Manager, SEM and EMIS, including case studies, trainings, a consultant list, and supporting documents which will be updated and maintained as needed, are fit to use and available to the public. Replication tools are fit for use and available to the market through Best Practice Workshops and other outlets.</li> </ul>
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### 5.1.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>• As industrial customers establish a better understanding of how energy is an integral component of their manufacturing process through efforts such as dedicating an On-site Energy Manager resource and/or incorporating SEM activities at their facility, they can improve the ability to control a facilities energy usage. Through new innovative rates in REV, facilities may be able to embark on greater energy efficiency and process improvements, establish plans for demand response activities to reduce peak without effecting production, and expand to implement distributed energy generation.</li> <li>• Utilities have established relationships with key accounts who may serve to be ideal candidates for pilot participation. NYSERDA has and will continue to collaborate with utilities on industrial initiatives on how to maximize information exchange. By sharing pilot case studies, tools available and results On-site Energy Manager and SEM with utilities, utilities can be an avenue to help disseminate information leading their customers to achieve deeper energy savings and control costs.</li> <li>• NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• NYSERDA will coordinate with utilities as industrial customers may take advantage of investor owned utility prescriptive or custom incentive programs for energy efficiency improvements.</li> <li>• On-site energy manager and SEM pilots will support the utility self-direct programs. Larger industrial customers will have the option of participating in the self-direct program. If they elect to do so, facilities will need to commit to a level of savings along with an estimated portfolio savings plan. This commitment by the facility will require an energy manager/team to manage the effort.</li> </ul>

### 5.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1. Annual Market Development Budget Allocation – Commitment Basis**

Budget		2016	2017	2018	2019	2020	2021	2022	Total
<b>On-Site Energy Manager (OsEM)</b>	Direct Incentives and Services	\$-	\$2,930,000	\$2,930,000	\$-	\$-	\$-	\$-	\$5,860,000
	Implementation Support	\$-	\$212,000	\$212,000	\$47,000	\$-	\$-	\$-	\$471,000
	Tools, Training, and Replication	\$-	\$118,000	\$118,000	\$568,000	\$-	\$-	\$-	\$804,000
	Sub-Total	\$-	\$3,260,000	\$3,260,000	\$615,000	\$-	\$-	\$-	<b>\$7,135,000</b>
<b>Strategic Energy Management (SEM)<sup>3</sup></b>	Direct Incentives and Services	\$-	\$1,770,000	\$-	\$-	\$-	\$-	\$-	\$1,770,000
	Implementation Support	\$-	\$721,000	\$-	\$-	\$-	\$-	\$-	\$721,000
	Tools, Training, and Replication	\$-	\$1,350,000	\$-	\$-	\$-	\$-	\$-	\$1,350,000
	Sub-Total	\$-	\$3,841,000	\$-	\$-	\$-	\$-	\$-	<b>\$3,841,000</b>
<b>Energy Management Information Systems (EMIS)</b>	Direct Incentives and Services	\$-	\$-	\$584,000	\$953,000	\$1,720,000	\$1,410,000	\$1,100,000	\$5,767,000
	Implementation Support	\$-	\$-	\$23,000	\$38,000	\$69,000	\$56,000	\$42,000	\$228,000
	Tools, Training, and Replication	\$-	\$-	\$162,000	\$406,000	\$-	\$-	\$-	\$568,000
	Sub-Total	\$-	\$-	\$769,000	\$1,397,000	\$1,789,000	\$1,466,000	\$1,142,000	<b>\$6,563,000</b>
<b>Total</b>	\$-	\$7,101,000	\$4,029,000	\$2,012,000	\$1,789,000	\$1,466,000	\$1,142,000	<b>\$17,539,000</b>	

**Table 2. Annual Expenditures Projection**

Expenditures (OsEM, SEM, & EMIS)	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
<b>Total</b>	0%	15%	34%	18%	14%	8%	7%	1%	1%	100%

### 5.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

<sup>3</sup> NYSERDA’s commitment of funds in this case is to an implementer who will distribute funding or assistance to customers on NYSERDA’s behalf over a longer period than is evident from the committed budget and benefits shown in this plan. NYSERDA will monitor performance and report actual progress.

**Table 3. Initiative Specific Metrics**

Indicators <sup>4</sup>		Baseline <sup>5</sup> (Before/ Current)	2019 (Cumulative)
<b>On-site Energy Manager</b>			
<b>Activity/ Outputs</b>	Number of energy management plans with energy reduction target developed	0	30
	Number of energy efficiency projects identified and completed during pilot engagement (likely starts with low/no cost and Operations & Maintenance type measures)	0	30
	Number of case studies/testimonials developed	0	30
<b>Outcomes</b>	Number of energy managers hired/retained within pilot facilities	0	20
	Market penetration of on-site Energy Managers: % of the addressable market participating in this strategy; nonparticipant industrial sites hiring an OsEM	15%	16.5%
	Number of projects implemented involving more complex CapEx and process improvements as a result of this strategy	0	40
	Number of industrial plants (beyond pilot participants) adopting on-site Energy Manager role	0 <sup>6</sup>	30-45 (10 – 15 per yr.)
<b>SEM</b>			
<b>Activity/ Outputs</b>	Number of qualified SEM providers	0	5
	Number of C-suite executives who engage in SEM	0	27
	Number of facilities providing internal SEM staff trainings	0	27
	Number of facilities evaluating projects using an SEM energy intensity metric	0	27
	Number of requests for standardized SEM resources	0	9
<b>Outcomes</b>	Number of energy teams maintained beyond the cohort (indicating executive support for SEM)	0 <sup>7</sup>	27
	Number of facilities that have adopted a system for monitoring, tracking, and making decisions based on their energy use to assist with their SEM activities as a result of this strategy	1,886 facilities <sup>8</sup>	1,913
	Number of industrial facilities (beyond pilot participants) that have adopted SEM	0 <sup>9</sup>	11
<b>EMIS</b>			
<b>Activity/ Outputs</b>	Number of qualified EMIS providers	6	10
	Number of EMISs deployed in NYS as a result of this initiative	0	50
	EMIS subscription renewal rate	75%	85%
	Number of EMIS assessments/audits as a result of this initiative	0	60
<b>Outcomes</b>	Number of facility-wide EMIS deployments as a result of this initiative	0	45
	Number of enterprise-wide EMIS deployments as a result of this initiative	0	4

<sup>4</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>5</sup> Revised baseline metrics reflect the recently-completed Continuous Energy Improvement market baseline evaluation. This study will be available publicly on NYSERDA’s website and in the DPS Document and Matter Management system in the near future.

<sup>6</sup> Baseline values for post-pilot performance will be measured after the first round of pilot offerings are complete.

<sup>7</sup> Ibid.

<sup>8</sup> A total of 1,886 facilities, representing 27% of the addressable market, reported having adopted SEM, indicating there is still a large market potential to capture for SEM. The additional 27 facilities adopting a system for monitoring reflect the direct results of the initiative, and does not include anticipated indirect impacts.

<sup>9</sup> Baseline values for post-pilot performance will be measured after the first round of pilot offerings are complete.

Qualified EMISs with industrial operational control	0	3-5
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Benefits shown in shown in Tables 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 4: Direct Impacts**

<b>Primary Metrics: On-site Energy Manager (OsEM)</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	-	15,000	15,000	12,000	-	-	-	42,000
	MWh Lifetime	-	225,000	225,000	180,000	-	-	-	630,000
	MMBTU Annual	-	175,000	175,000	150,000	-	-	-	500,000
	MMBTU Lifetime	-	2,630,000	2,630,000	2,250,000	-	-	-	7,510,000
	MW	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	17,800	17,800	14,800	-	-	-	50,400
CO2e Emission Reduction (metric tons) Lifetime		-	267,000	267,000	222,000	-	-	-	756,000
Customer Bill Savings Annual (\$ million)		\$-	\$2.76	\$2.76	\$2.29	\$-	\$-	\$-	\$7.81
Customer Bill Savings Lifetime (\$ million)		\$-	\$41.30	\$41.30	\$34.40	\$-	\$-	\$-	\$117.00
Private Investment (\$ million)		\$-	\$20.20	\$20.20	\$15.40	\$-	\$-	\$-	\$55.80

<b>Primary Metrics: Strategic Energy Management (SEM)</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	-	52,500	-	-	-	-	-	52,500
	MWh Lifetime	-	525,000	-	-	-	-	-	525,000
	MMBTU Annual	-	406,000	-	-	-	-	-	406,000
	MMBTU Lifetime	-	4,060,000	-	-	-	-	-	4,060,000
	MW	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	50,600	-	-	-	-	-	50,600
CO2e Emission Reduction (metric tons) Lifetime		-	506,000	-	-	-	-	-	506,000
Customer Bill Savings Annual (\$ million)		\$-	\$7.88	\$-	\$-	\$-	\$-	\$-	\$7.88
Customer Bill Savings Lifetime (\$ million)		\$-	\$78.80	\$-	\$-	\$-	\$-	\$-	\$78.80
Private Investment (\$ million)		\$-	\$84.00	\$-	\$-	\$-	\$-	\$-	\$84.00

<b>Primary Metrics: Energy Management Information System (EMIS)</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	-	-	5,010	11,200	20,700	17,700	12,500	67,050
	MWh Lifetime	-	-	50,100	112,000	207,000	177,000	125,000	670,500
	MMBTU Annual	-	-	38,700	86,300	160,000	137,000	571,000	992,500
	MMBTU Lifetime	-	-	387,000	863,000	1,600,000	1,370,000	5,710,000	9,925,000
	MW	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	4,820	10,800	19,900	17,100	38,800	91,380
CO2e Emission Reduction (metric tons) Lifetime		-	-	48,200	108,000	199,000	171,000	388,000	913,800
Customer Bill Savings Annual (\$ million)		\$-	\$-	\$0.75	\$1.68	\$3.10	\$2.66	\$5.93	\$14.12
Customer Bill Savings Lifetime (\$ million)		\$-	\$-	\$7.510	\$16.800	\$31.00	\$26.60	\$59.30	\$141.21
Private Investment (\$ million)		\$-	\$-	\$0.21	\$0.47	\$0.90	\$0.87	\$0.74	\$3.19

**Table 5. Annual Projected Initiative Participation**

		2016	2017	2018	2019	2020	2021	2022	Total
Participants <sup>10</sup>	On-Site Energy Manager (OsEM)	-	15	15	10	-	-	-	40
	Strategic Energy Management (SEM)	-	20	20	-	-	-	-	40
	Energy Management Information Systems (EMIS)	-	-	9	13	23	19	15	79
<b>Total</b>		-	35	44	23	23	19	15	159

Benefits shown in Tables 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 6: Estimated Indirect Market Impact**

<b>On-site Energy Manager (OsEM)</b>		<b>2020</b>	<b>2025</b>	<b>2030</b>
Energy Efficiency	MWh Cumulative Annual	30,000	105,000	180,000
	MMBtu Cumulative Annual	375,000	1,312,500	2,250,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		36,981	129,435	221,888
<b>Strategic Energy Management (SEM)</b>		<b>2020</b>	<b>2025</b>	<b>2030</b>
Energy Efficiency	MWh Cumulative Annual	12,081	42,283	72,486
	MMBtu Cumulative Annual	93,288	419,794	559,725
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		11,426	45,059	68,553
<b>Energy Management Information System</b>		<b>2020</b>	<b>2025</b>	<b>2030</b>
Energy Efficiency	MWh Cumulative Annual	-	34,331	91,548
	MMBtu Cumulative Annual	-	530,193	706,925
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		-	48,033	88,124

<sup>10</sup> Participants include the number of industrial sites employing the identified continuous energy improvement strategy

### 5.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• NYSERDA intends to offer On-site Energy, Manger, SEM, and EMIS components of the Continuous Energy Improvement initiative in a fuel neutral manner to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State’s clean energy goals.</li> <li>• Offering Continuous Energy Improvement initiatives on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$91 per ton of carbon, compared to a cost of \$206 per ton of carbon in an electric only scenario.</li> </ul>
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### 5.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p>Routine reporting on energy savings to date, project lists developed, and progress against identified annual energy savings goals will be collected and reviewed. Redirecting (as needed) will ensure continued progress against goals.</p> <p><b><u>Test-Measure-Adjust Strategy – On-site Energy Manager</u></b></p> <ul style="list-style-type: none"> <li>• Year 1: Monitor market demand for On-Site Energy Managers at industrial and manufacturing facilities. Review and analyze early energy assessments and performance scorecard of pilot participants. Assess requirements for pilot participants. Receive input from pilot participants- both end-user and on-site energy managers, Consortium for Energy Efficiency’s Industrial SEM Committee and the Northeast Regional Continuous Energy Improvement Discussion Group, and other stakeholders. Review energy and productivity reports, continue to monitor market demand for services.</li> <li>• Year 2: Repeat Year 1 actions.</li> <li>• Year 3: Repeat Year 1 actions. Assess market uptake of standardized documentation, effectiveness of training materials.</li> </ul> <p><b><u>Test-Measure-Adjust Strategy – Strategic Energy Management</u></b></p> <ul style="list-style-type: none"> <li>• Year 1: Assess requirements for cohort participants. Receive input from cohort participants, Consortium for Energy Efficiency’s Industrial SEM Committee and the Northeast Regional Continuous Energy Improvement Discussion Group, and other stakeholders. Analyze data from cohort participants to understand performance and market capabilities.</li> <li>• Year 2: Repeat Year 1 actions.</li> <li>• Year 3: Repeat Year 1 actions. Assess market uptake of standardized documentation and training effectiveness. Assess the need to continue SEM pilots.</li> </ul> <p><b><u>Test-Measure-Adjust Strategy – Energy Management Information System</u></b></p> <ul style="list-style-type: none"> <li>• Year 1: Monitor market demand for EMIS at industrial and manufacturing facilities. Review and analyze site-specific readiness assessments to decipher market aptitude for EMIS at the facility and enterprise levels. Develop and assess requirements for EMIS Vendors and pilot participants. Receive input from EMIS subscribers about their adoption and persistence of technology use. Review energy and productivity reports, continue to monitor market demand for EMIS services.</li> <li>• Year 2: Repeat Year 1 actions.</li> <li>• Year 3: Repeat Year 1 actions. Assess market uptake of EMIS at the facility and enterprise levels.</li> </ul>
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**Market Evaluation**

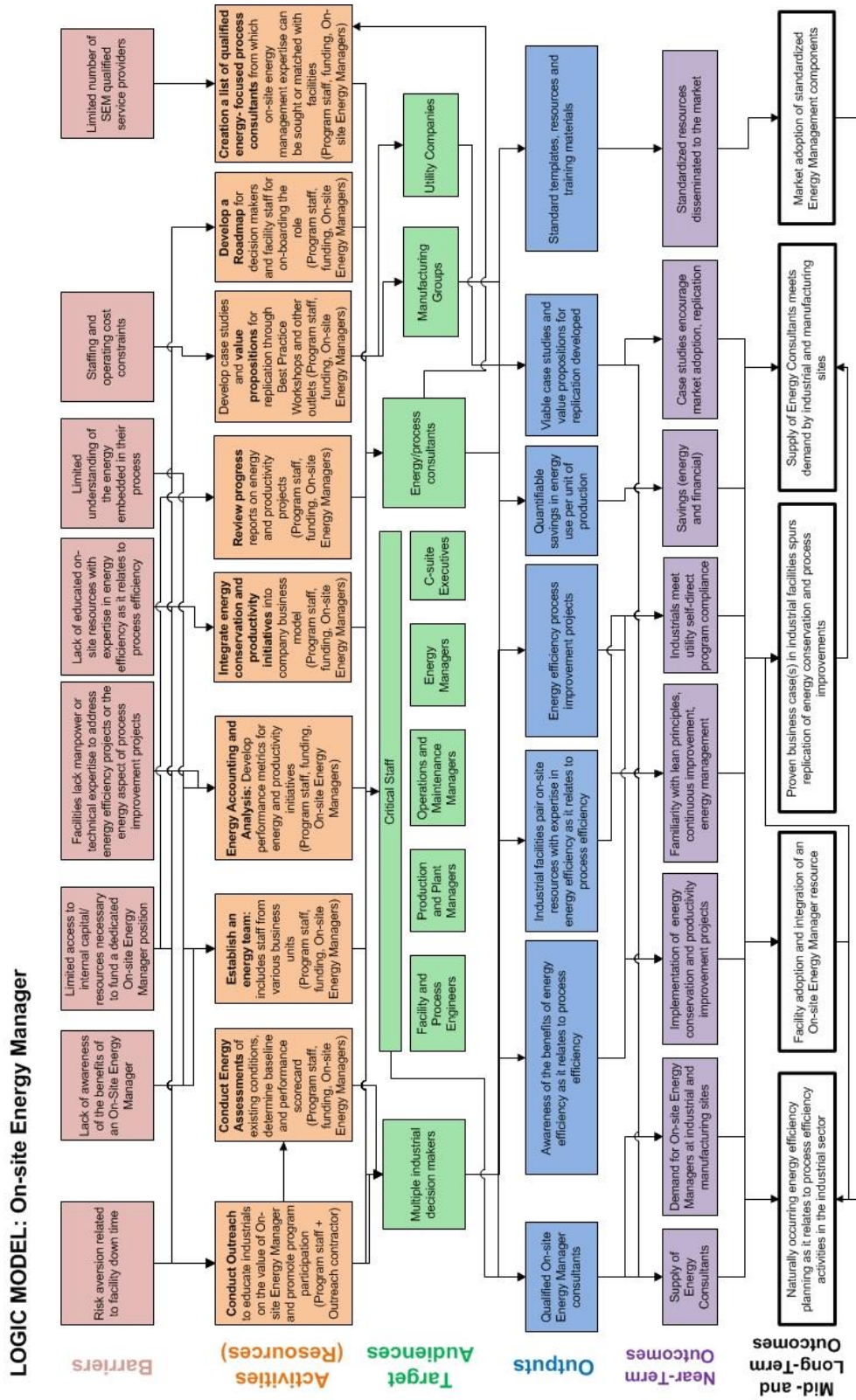
- Market Evaluation will be done in a coordinated manner for On-site Energy Manager and Strategic Energy Management. Because the market actors overlap across strategies and the evaluation of SEM and OSEM are underway, to reduce survey fatigue, the evaluation of EMIS will be included in the future assessment activities of SEM and OSEM. Market Evaluation will be aligned with the logic model(s) and will include baseline and longitudinal measurement of key indicators of programmatic and broader market success.
- Baseline measurements of key performance indicators will occur soon following initiative approval and will address indicators including:
  - For On-site Energy Manager current market penetration of On-site Energy Managers, current state of service provider knowledge and experience in providing these services, etc.
  - For Strategic Energy Management, the current market penetration of SEM, current state of facility knowledge and experience in SEM practices, etc.
- Regular (e.g., annual or biennial) measurement of market change will occur once the program is underway and will provide follow up measurement to these baseline indicators as well as assess level of replication of strategic energy management practices and on-site energy managers into non-pilot facilities, the models for replication, and the associated benefits.
- Sources of data for market evaluation include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.

**Impact Evaluation/Field Verification**

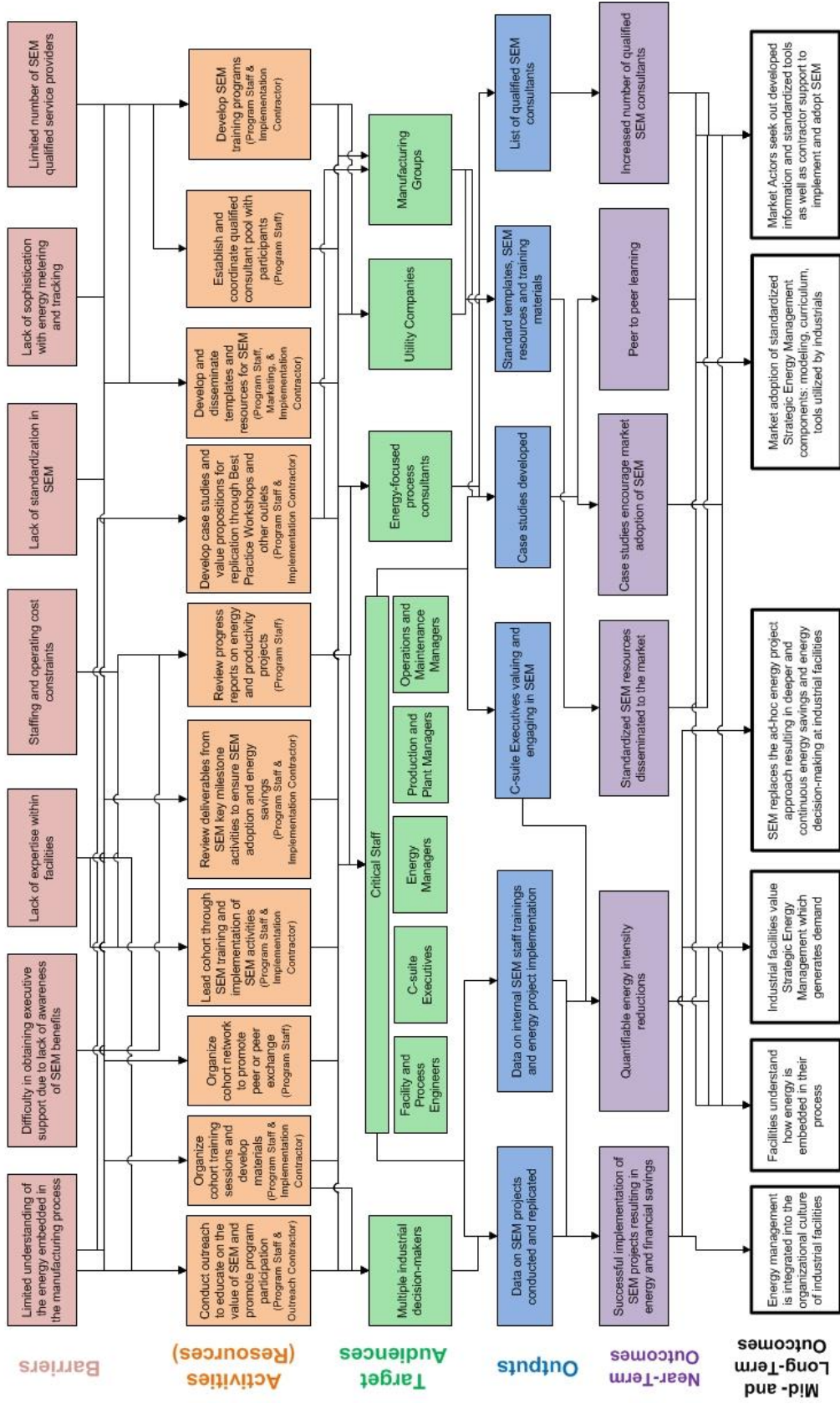
- Impact Evaluation/Field Verification will also be coordinated for the two components of this overall Continuous Energy Improvement strategy.
- As projects mature and measures are installed or process improvements implemented, measurement and verification will be conducted at the pilot facilities to verify energy savings. This verification will be conducted according to the International Performance Measurement & Verification Protocol (IPMVP) method(s) most appropriate given the improvements made.
- Depending on the extent of replication identified in Market Evaluation, impact evaluation will quantify the level of benefits, including energy savings.
- Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.



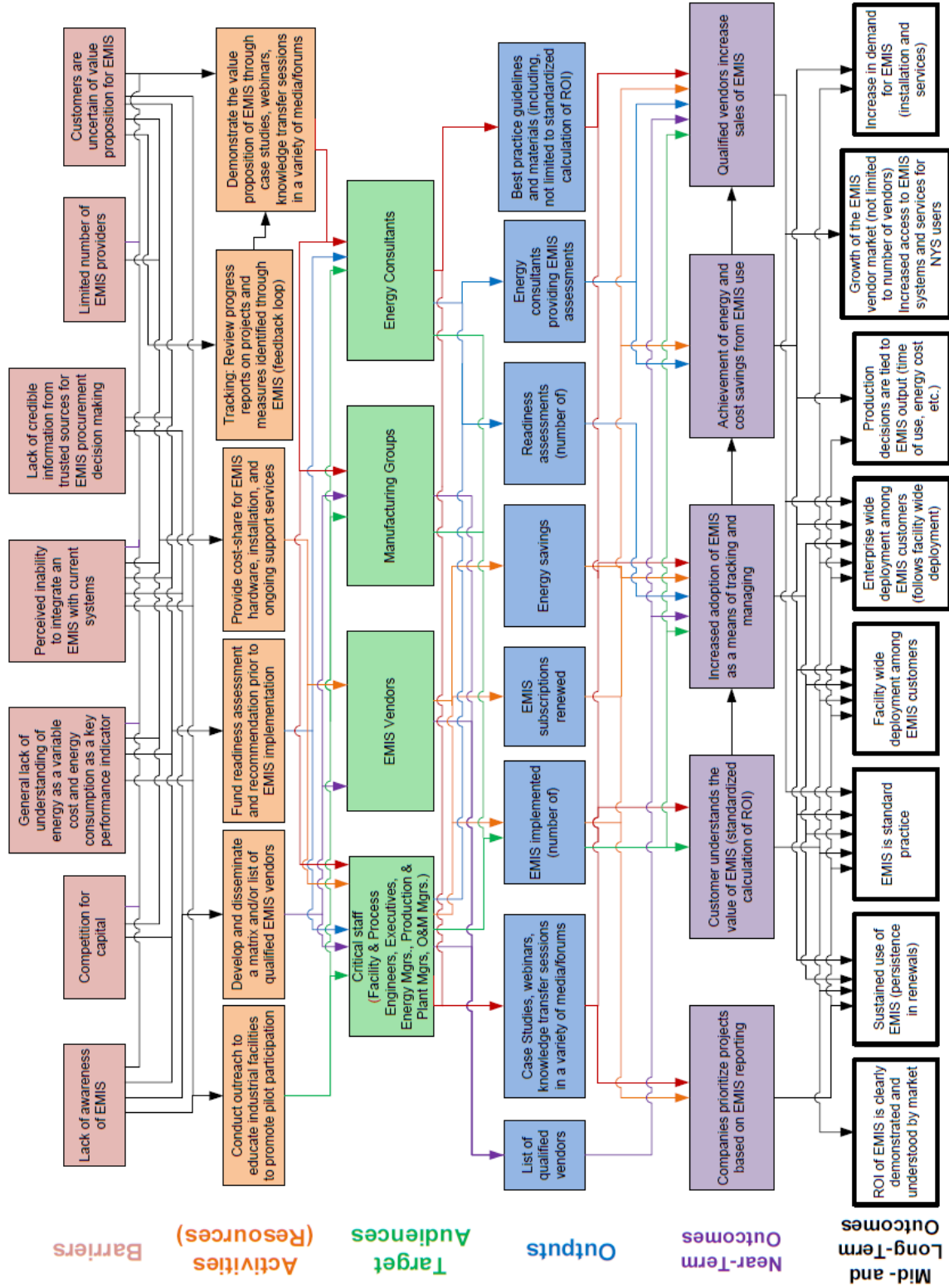
# Appendix A – Logic Models



# LOGIC MODEL: Industrial Strategic Energy Management



# LOGIC MODEL: Energy Management Information System (EMIS)



## Appendix B – Investment Plan Review Supplement

### Continuous Energy Improvement On-Site Energy Manager

#### Results to Date – Metrics

The Continuous Energy Improvement On-Site Energy Manager Initiative is on track, either exceeding or nearly meeting all of its cumulative current targets through Q2 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	27,253	27,253	7,500	363%	42,000	65%
	MWh Lifetime	-	-	-	408,795	408,795	112,500	363%	630,000	65%
	MMBtu Annual	-	-	-	159,400	159,400	87,500	182%	500,000	32%
	MMBtu Lifetime	-	-	-	2,391,000	2,391,000	1,315,000	182%	7,500,000	32%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	22,618	22,618	8,900	254%	50,400	45%
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	339,275	339,275	133,500	254%	755,000	45%
	Annual Dollars	-	-	-	\$3.11	\$3.11	\$1.38	225%	\$7.80	40%
Private Investment (millions)	Lifetime Dollars	-	-	-	\$46.58	\$46.58	\$20.65	226%	\$117.00	40%
	Dollars	-	-	-	\$9.50	\$9.50	\$10.10	94%	\$55.80	17%
Participants	Participants	-	-	-	7	7	8	93%	40	18%

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	June 2017 Actual <sup>1</sup>
		(Cumulative)	(Cumulative)
Number of energy management plans with energy reduction target developed	0	30	3
Number of energy efficiency projects identified and completed during pilot engagement (likely starts with low/no cost and Operations & Maintenance type measures)	0	30	TBD
Number of case studies/testimonials developed	0	30	TBD

<sup>1</sup> Outputs with “TBD” in the June 2017 Actual column were not yet measured as of the end of June but will have progress included in future reporting.

Performance Against Key Milestones

The Continuous Energy Improvement On-Site Energy Manager Initiative is making progress toward all 2017 milestones, though none were yet completed through June 2017. The seven applicants approved and contracted from PON 3334 have begun kick-off meetings and will be submitting the first quarterly reports through October 2017. Four energy-focused consultants were approved and contracted in the first pilot, and these consultants can match their expertise with industrial facilities. Case studies and road maps that prove the business case will be developed through 2018. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓	2017	List of qualified energy-focused process consultants from which On-site Energy Management expertise can be sought and/or matched with industrial facilities.
	2017	C-suite executive buy-in and engagement that provides momentum for energy planning and management activities at industrial sites.
	2017	Industrial end-user commitment to energy goal creation and realization is key to successful On-site Energy Manager engagements.
	2017	Robust tracking and reporting of energy and nonenergy benefits of the On-site Energy Manager role.
	2017 and 2018	A credible business case that proves the benefits of on-site energy management in industrial facilities. Large sites will save at least 1,200 MWh and 15,000 MMBtu annually. Medium sites will save at least 500 MWh and 5,000 MMBtu annually.
	2017 and 2018	Business case content for consultant marketing plans, which address this need in the industrial market.

Plan for Continuation/Modification/Termination

The On-Site Energy Manager component of the Continuous Energy Management Initiative was updated in June 2017 to shift the anticipated budget and benefit commitments out one year (from 2016-2018 to 2017-2019) to reflect a later than anticipated program launch. Following this modification, the initiative will continue as planned.

## Continuous Energy Improvement Strategic Energy Management

### Results to Date – Metrics

The Continuous Energy Improvement Initiative Strategic Energy Management Initiative is currently exceeding all its cumulative current targets through Q2 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	34,500	34,500	26,250	131%	52,500	66%
	MWh Lifetime	-	-	-	517,500	517,500	262,500	197%	525,000	99%
	MMBtu Annual	-	-	-	267,000	267,000	203,000	132%	406,000	66%
	MMBtu Lifetime	-	-	-	4,005,000	4,005,000	2,030,000	197%	4,060,000	99%
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	32,020	32,020	25,300	127%	50,600	63%
	Lifetime Tons	-	-	-	480,297	480,297	253,000	190%	506,000	95%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$4.37	\$4.37	\$3.94	111%	\$7.88	55%
	Lifetime Dollars	-	-	-	\$65.54	\$65.54	\$39.40	166%	\$78.80	83%
Private Investment (millions)	Dollars	-	-	-	\$54.62	\$54.62	\$42.00	130%	\$84.00	65%
Participants	Participants	-	-	-	-	-	10	-	40	-

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA's current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	June 2017 Actual	
		(Cumulative)	(Cumulative)	
<b>Activity/Outputs</b>	Number of qualified SEM providers	0	5	0
	Number of C-suite executives who engage in SEM	0	27	8
	Number of facilities providing internal SEM staff trainings	0	27	0
	Number of facilities evaluating projects using an SEM energy intensity metric	0	27	0
	Number of requests for standardized SEM resources	0	9	0

### Performance Against Key Milestones

The Continuous Energy Improvement Initiative Strategic Energy Management Initiative is making progress toward its current milestones. Current milestones that are not yet complete are multi-year

efforts and are in progress. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓		
	2016 and 2017	Facilities understand how energy intensity is embedded in their process and have integrated energy management into their organizational culture. <ul style="list-style-type: none"> <li>• Facilities possess knowledge of Strategic Energy Management (have an energy map, identified goals and metrics, and have developed a project register identifying projects and an action plan for project implementation) and have a system for monitoring, tracking, and making decisions based on their energy use.</li> </ul>
	2017 and beyond	Facility executives value and adopt Strategic Energy Management due to organizational change and systematic energy management that enables them to identify attractive investments for their facility. <ul style="list-style-type: none"> <li>• Continuation of energy champion and team beyond the cohort (for participating facilities) or the adoption of an energy champion and/or team (for new facilities).</li> <li>• Executive support to implement energy-related projects.</li> </ul>

Plan for Continuation/Modification/Termination

The Continuous Energy Improvement Strategic Energy Management initiative was modified in June 2017 to move the anticipated budget and benefit commitments out one year to reflect a later than anticipated program launch, include a broader pool of industrial facilities, and update the lifetime benefits to reflect a ten-year measure life, to correct an error in the previously filed version. \$1 million of funding was also added to the initiative to support an additional pilot cohort (with a corresponding increase in benefits). Following these modifications, the initiative will continue as planned.

## Continuous Energy Improvement Energy Management Information Systems

### Results to Date – Metrics

No benefit metrics have yet been attained as the Energy Management Information Systems Initiative is anticipated to launch in Q3 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2022)	% of Total Target through Initiative Completion (2022)
Energy Efficiency	MWh Annual	-	-	-	-	-	-	-	67,050	-
	MWh Lifetime	-	-	-	-	-	-	-	670,500	-
	MMBtu Annual	-	-	-	-	-	-	-	992,500	-
	MMBtu Lifetime	-	-	-	-	-	-	-	9,925,000	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	-	-	91,380	-
	Lifetime Tons	-	-	-	-	-	-	-	913,800	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	-	-	\$14.12	-
	Lifetime Dollars	-	-	-	-	-	-	-	\$141.21	-
Private Investment (millions)	Dollars	-	-	-	-	-	-	-	\$3.19	-
Participants	Participants	-	-	-	-	-	-	-	79	-

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA's current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	June 2017 Actual <sup>2</sup>	
		(Cumulative)	(Cumulative)	
Activity/Outputs	Number of qualified EMIS providers	6	10	0
	Number of EMISs deployed in NYS as a result of this initiative	0	50	0
	EMIS subscription renewal rate	75%	85%	TBD
	Number of EMIS assessments/audits as a result of this initiative	0	60	0

<sup>2</sup> Outputs with "TBD" in the June 2017 Actual column were not yet measured as of the end of June but will have progress included in future reporting.



### Performance Against Key Milestones

The Energy Management Information Systems Initiative is early in its development and is expected to launch in Q3 2017, thus current milestones that are not yet complete are or will soon be in progress. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
	2017	Develop and release RFP for qualified EMIS vendors.
	2017	Solicit and contract with EMIS assessment provider(s).
	2017	Develop solicitation for participants.
	2017	Develop and disseminate a matrix or list of qualified EMIS vendors.

### Plan for Continuation/Modification/Termination

The Energy Management Information Systems initiative has not yet launched, and as such there are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative for progress against 2017 metrics, outputs, and milestones following program launch to determine if any changes are needed.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Communities Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan: Communities Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
April 29, 2016	Original Issue	Original Issue
March 3, 2017	Added Communities Energy Engagement initiative	Multiple
June 23, 2017	Revised benefit estimates to reflect updated data. Tables 1, 2, 4, 5, 6a, 6b, 7 and 8 have been updated to reflect this revision, 2016 actual values, and a shift in timing of budget and benefits.	Multiple
July 17, 2017	Updated to correct an error in the allocation of committed funds between RGGI and CEF in 2016. Tables 1 and 2 have been updated to reflect CEF committed funds in 2016, and Tables 4, 5, 6a, and 6b have been updated to show revised benefits.	Multiple
November 1, 2017	Updated the baseline values in Table 3 to reflect latest data available. In addition, updated 2019 values to show cumulative targets rather than incremental targets as previously filed. Added a new Table 4 to provide additional detail on the baseline values. Renumbered subsequent tables accordingly.	13-14

## 6 Communities

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This plan has been updated to reflect a timing shift in when budgets, benefits, and participants will be committed. Since program launch, NYSERDA has acquired additional data from applications that have been submitted since the program launched on which to base savings estimates. Estimates have been updated accordingly based on factors such as preliminary program participation rates, participant attributes, and some verified project savings. This revision also includes a minor adjustment to the RGGI budget (-\$97,512) due to a technical assistance contract being executed for less than originally anticipated. Finally, the CEF Only share of “CO<sub>2</sub>e Emission Reduction (metric tons) Annual” (Table 5) went down slightly, while the overall program portfolio of emissions reductions increased. This change is due to CEF Only savings originally being more heavily weighted on anticipated savings from grant projects, which were also more heavily weighted in fossil fuel savings. After revising the grant project savings estimates to more accurately reflect the expected variety of projects, the overall savings associated with fossil fuels were reduced by a larger percentage than electric, disproportionately affecting the CEF Only emission reductions.

NYSERDA aims to enable and partner with local governments and communities in affecting energy choices in their communities, government operations, homes, businesses, and community institutions. Local governments and communities also struggle with the lack of funding, staff capacity, and inability to prioritize the highest impact clean energy actions. NYSERDA will engage with local governments and communities to focus on addressing these issues.

The first initiative described in this Chapter is the Clean Energy Communities initiative, which will provide grants, direct technical support, tools and resources, and recognition to local governments that demonstrate leadership in clean energy. Clean Energy Communities will help to decrease resources communities need to advance clean energy in their neighborhoods, demonstrate the benefits of such investments, and encourage replication throughout communities and across the State. The second initiative described in this Chapter is the Community Energy Engagement Program, which will deploy locally-based organizations to drive energy efficiency and renewable energy deployment to residential, multi-family, and small business customers. The Community Energy Engagement Program will focus on improving energy affordability and increasing deployment of distributed energy resources, with an emphasis on LMI households and communities. Additionally, this effort will increase access to financing for LMI communities and households and shall create opportunities for green jobs.

Projected additional initiatives under development include development of additional resources aimed at helping resource-constrained and staff-strapped local governments and communities through partnerships with universities, local associations, and other organizations. In addition, NYSERDA will develop competitions aimed at challenging communities to take innovative clean energy actions through a variety of structured, NYSERDA-funded community competitions.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 6.1 Clean Energy Communities

### 6.1.1 Overview

<b>Present Situation</b>	Many local governments in New York State are not aware of the clean energy opportunities that are available to them. Those that are aware of the opportunities often struggle with how to prioritize, and eventually implement, the most impactful actions.
<b>Intervention Strategy</b>	The “Clean Energy Communities Program” will drive energy efficiency and deployment of clean energy in local government (‘municipality’ or ‘community’ – villages, cities, towns, and counties) operations and within the communities where local governments have control (i.e., permitting for renewable energy). NYSERDA will provide technical assistance, outreach, engineering support, tools, and clear guidance for implementing 10 low cost, clean energy High-Impact Actions, listed in Activities Section below. Upon completion of at least 4 of those High-Impact Actions, NYSERDA will reward local governments with recognition and grant funding to implement more innovative clean energy initiatives and demonstration projects. This strategy encourages replication by promoting the successes of participating local governments and demonstrating, with real-world data, the cost-effectiveness of specific High-Impact Actions. The Clean Energy Communities Program will serve as the primary entry for local governments into the State’s clean energy programs and will complement the State’s existing, and more comprehensive, Climate Smart Communities (CSC) Certification Program <sup>1</sup> and the recent Public Service Commission’s approval of Statewide Community Choice Aggregation (CCA). <sup>2</sup> By supporting initial local government clean energy action through the Clean Energy Communities Program, NYSERDA expects that communities will gain the capacity needed to take on more projects that could eventually lead to CSC Certification. Many communities have expressed an interest and a willingness to take on clean energy actions, but have indicated that they aren’t sure where to start. The Clean Energy Communities Program will finally provide local governments with a simple, but robust, framework to guide them through implementation of the most impactful clean energy actions. For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Clean Energy Communities,” which can be found in Appendix A.
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Decrease the amount of time, expertise, and funding needed to prioritize and implement clean energy actions in New York State communities.</li> <li>• Increase adoption of high-impact, clean energy policies and actions in city, town, village, and county governments across New York State.</li> <li>• Support and replicate innovative clean energy initiatives and demonstration projects.</li> <li>• Demonstrate the value proposition associated with high-impact clean energy actions.</li> </ul>

<sup>1</sup> The Climate Smart Communities Certification program provides local governments with a robust framework to guide their climate action and enables high-performing communities to achieve recognition for their leadership. Designed around ten pledge elements, the certification program recognizes communities for their accomplishments through a rating system leading to four levels of award: Certified, Bronze, Silver, and Gold. Participating communities are also eligible to apply for \$11 Million worth of Climate Smart Communities grant funding focusing on climate change mitigation and adaptation. The program is jointly sponsored by six New York State agencies: The Departments of State (DOS), Health (DOH), and Transportation (DOT), NYSERDA, the Public Service Commission, and the Department of Environmental Conservation (DEC), which administers the program.

<sup>2</sup> Case 14-M-0224. Proceeding on Motion of the Commission to Enable Community Choice Aggregation Programs, Order Authorizing Framework for Community Choice Aggregation Opt-Out Program, filed April 21, 2016.

<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• Supports State Energy Plan (SEP) goals for the interagency New York State Community Partnership<sup>3</sup> (NYSCP) initiative: providing packaged clean energy resources that will help communities save on energy costs, stimulate their local clean economies, and reduce greenhouse gas (GHG) emissions</li> </ul>
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### 6.1.2 Target Market Characterization

<b>Target Market</b>	<p>Primary: Local Government Operations/Municipalities (initial roll-out to a subset of 80 communities, explained in more detail in the Market Readiness section)  Secondary: Private and public transportation, Commercial and Residential Buildings</p> <p><u>Composition of 1,601 General Purpose Local Governments (Municipalities) in New York State</u>  Villages: 545  Cities: 62  Towns: 932  Counties: 62</p> <p>Local government elected officials, public works officials, non-governmental organizations (i.e., Chambers of Commerce), community volunteers, and private consultants, as well as utility and industry representatives.</p> <p>Early Adopter Municipalities</p> <ul style="list-style-type: none"> <li>• Climate Smart Communities tend to have higher levels of involvement in all community-related state offerings, have already undertaken many actions, and are likely to recognize the benefits of doing more going forward. Their feedback as early adopters will be critical in shaping the Clean Energy Communities Program strategy going forward. The tools, guidance, and technical support that were made available to communities during the Climate Smart Communities Coordinators Pilot Program proved to be successful as demonstrated by the progress made by many of the participating communities. Year-end reports summarizing the successes and lessons learned in each of the pilot regions involved in the program can be found on the Department of Environmental Conservation’s website: <a href="http://www.dec.ny.gov/energy/84508.html">http://www.dec.ny.gov/energy/84508.html</a>.</li> </ul> <p>Mid-Late Adopter Municipalities</p> <ul style="list-style-type: none"> <li>• Tying grant funding to adoption of four or more High-Impact Actions will encourage mid-late adopters to initiate action, realize benefits, and eventually implement more advanced actions with grant funding. NYSERDA expects to see increased rates of participation within six months to a year of launching the Clean Energy Communities Program, after mid-late adopter municipalities have had time to implement some of the High-Impact Actions.</li> </ul>
<b>Market Participants</b>	CSC and Clean Energy Communities program partnering agencies, including the New York State DEC, DOT, DOH, DOS, the Public Service Commission, the New York Power Authority (NYPA), and the Governor’s Office.

<sup>3</sup> The New York State Community Partnership (NYSCP) is New York State’s new, unified approach to driving clean energy action and energy literacy in local governments and communities across the state. The NYSCP and associated program components are managed by a dedicated NYSERDA staff team working in close collaboration with the Governor’s Office, the New York Power Authority NYPA, the Department of Public Service, and the Department of Environmental conservation.

	<ul style="list-style-type: none"> <li>• Provide technical expertise and input regarding High-Impact Actions and associated tools and resources, including alignment with existing agency offerings.</li> <li>• Provide ongoing input regarding overall structure of Clean Energy Communities program.</li> </ul> <p>Private consultants, engineering firms, and other clean energy service providers</p> <ul style="list-style-type: none"> <li>• Work with municipalities to implement innovative clean energy projects.</li> </ul> <p>Partner Organizations (environmental groups, schools, etc.)</p> <ul style="list-style-type: none"> <li>• Help to promote High-Impact Actions and provide support to communities in line with existing organizational goals.</li> <li>• Help to organize and host events related to organizational goals.</li> </ul> <p>Local government elected officials, public works officials, non-governmental organizations (i.e., Chambers of Commerce), community volunteers, and private consultants, as well as utility and industry representatives.</p>
<p><b>Market Readiness</b></p>	<p>Municipal officials – At least 423 (26%) municipalities in New York State have participated in one or more of the following clean energy programs. 49 municipalities have participated in 3 or more, demonstrating there is municipal interest in clean energy.</p> <ul style="list-style-type: none"> <li>• Adopted Unified Solar Permit</li> <li>• Adopted streamlined electric vehicle supply equipment permitting</li> <li>• NY Prize</li> <li>• Property Assessed Clean Energy (PACE) Financing</li> <li>• Community Solar</li> <li>• NYPA Energy Services Project</li> <li>• CSC</li> <li>• CSC Certified</li> </ul> <p>In addition, over the past 6 years, the CSC program, a strong indicator of municipal interest in clean energy, has seen significant growth. To date, 170 municipalities in New York have joined the CSC program and more continue to join each month. Over the past couple of years, they have been joining at an increasing rate. Most of these communities have been diligently working to implement clean energy and sustainability initiatives and are eager for more support.</p> <p>NYSERDA also interviewed more than 50 municipal representatives and other stakeholders (i.e., regional planning organizations) to understand what High-Impact Actions would be of interest to communities, including barriers to adoption, and developed the list accordingly. While the Clean Energy Communities Program is open to any municipality, NYSERDA’s initial roll-out is going to target 80 specific municipalities for proactive outreach. These municipalities were selected based on the following criteria to help ensure success:</p> <ul style="list-style-type: none"> <li>• Geographic parity.</li> <li>• Record of previous accomplishments indicating willingness to go further. <ul style="list-style-type: none"> <li>○ Track record of participation in CSC, CSC Certification, PACE, Unified Solar Permit, Community Solar, NY Prize, and NYPA Energy Services.</li> <li>○ Only 1 of the 80 has taken no action.</li> </ul> </li> <li>• Favored medium and large population communities to leverage impact, but also included small communities to assess replicability of actions across New York’s approximately 1000 smaller communities.</li> </ul>

	<ul style="list-style-type: none"> <li>• Selected the Five Cities, which are highly likely to participate, so that they can be held up as case studies for other communities early on.</li> </ul> <p>Emerging Partners Include:</p> <ul style="list-style-type: none"> <li>• Sustainable Westchester provides lessons learned in developing and implementing Community Choice Aggregation (CCA) for municipalities in Westchester County.</li> <li>• NYPA – provides technical assistance, project management services, and financing for energy upgrades</li> <li>• New York State DEC – provides joint support for CSC Certification, which will award credit for Clean Energy Community High-Impact Actions</li> <li>• Natural Resources Defense Council (NRDC) – Provides assistance with developing guidance and support materials essential for communities implementing High-Impact Actions</li> <li>• New York State DOS: Developing updated green building standards (NY Stretch)</li> <li>• Other potential partners include organizations whose mission relates to clean energy. NYSERDA will work to develop new and expand existing relationships with all relevant or interested partners.</li> </ul> <p>In general, there has been an increasingly strong focus on community clean energy and sustainability initiatives recently as evidenced by the growth of organizations such as ICLEI<sup>4</sup> for- Local Governments for Sustainability, the Compact of Mayors, and the Urban Sustainability Directors Network.</p>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Local government leaders constantly struggle with where to start and what to prioritize with respect to clean energy action. NYSERDA will provide them with tools and resources to accomplish the following: <ul style="list-style-type: none"> <li>○ Reduce the cost of implementing clean energy actions.</li> <li>○ Reduce information overload, giving municipalities clear options and a path forward.</li> <li>○ Alleviate confusion regarding prioritizing highest impact actions and what State support is available.</li> <li>○ Refocus on most impactful actions to facilitate participation and increase penetration of those actions.</li> <li>○ Animate consumer demand by clarifying available resources and recommended actions.</li> </ul> </li> <li>• Local governments also struggle with staff capacity and lack of technical knowledge. The combination of technical assistance, outreach, engineering support, and tools will not only help municipalities overcome this barrier in the near term, it will help to build capacity and an institutionalized knowledge base for them to take future action with less external support.</li> <li>• Lack of funding is a critical barrier in local governments. The Clean Energy Communities Program motivates communities to implement High-Impact Actions (i.e., benchmarking laws) by offering rewards in the form of grant funding for future projects.</li> <li>• The flexible grant structure (no narrowly defined eligible project types) allows municipalities to come to NYSERDA for support without trying to fit their well-planned, innovative projects into currently available solicitations that are not a good fit. Providing this ongoing opportunity reduces the amount of time municipalities need to spend searching for solicitations, applying, and failing,</li> </ul>

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<sup>4</sup> ICLEI originally stood for “International Council for Local Environmental Initiatives,” but the full phrase has since been dropped.



	<p>and makes it more likely that they will dedicate staff time to developing a great project.</p> <ul style="list-style-type: none"> <li>• The grant funding also creates demand for innovative solutions in communities, providing a market ripe for the most innovative companies, including clean energy providers, to bring their business to New York State.</li> </ul> <p>In addition to grant funding, local governments will also receive numerous other benefits associated with implementation of the High-Impact Actions. For example, communities that would like to implement the Solarize Community High-Impact Action are eligible to apply for funding to support outreach and marketing efforts through NYSERDA’s Community Solar program. Similarly, communities that adopt the Unified Solar Permit are eligible for incentives through NYSERDA’s existing Streamlined Permitting program.</p> <ul style="list-style-type: none"> <li>• While the High-Impact Actions require little to no up-front investment, the staff time associated with implementing them varies widely by community. Developing refined estimates will be a focus of immediate and ongoing market research to give communities a better up-front understanding of the amount of time and effort required to complete each High-Impact Action. Expected direct financial benefits<sup>5</sup> include approximately \$29 million in annual energy cost savings through 2019, cumulatively totaling more than \$433 million saved by 2030. Without investment in the Clean Energy Communities program, NYSERDA estimates that uptake of the High-Impact Actions, and the associated savings, would be reduced by approximately 75%<sup>6</sup>.</li> </ul>
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6.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<p>To-date:</p> <ul style="list-style-type: none"> <li>• Developed, and will continue to refine, overall program structure and list of High-Impact Actions in collaboration with NYPA, DEC, Governor’s office, municipal representatives, other New York State agency partners, and the private sector.</li> <li>• Interviewed 50+ communities asking them what actions they’ve taken, what they would like to do, and what support they need to do it.</li> </ul> <p>Planned:</p> <ul style="list-style-type: none"> <li>• Continued engagement with stakeholders and key market partners to gather real-time feedback on the success of the strategy, remaining barriers, and market changes.</li> <li>• Continue outreach: In-person meetings, webinars, and conference presentations.</li> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) to engage with stakeholders, as appropriate.<sup>7</sup></li> </ul>
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<sup>5</sup> Benefits are based on approximately 800 actions being implemented by approximately 300 communities (approximately 2.5 actions each on average), 163 of which (including the initial target 80) NYSERDA expects will implement enough to be designated Clean Energy Communities, through 2019.

<sup>6</sup> Currently, only 75 communities have implemented 2 or more comparable actions (i.e., participating in NY Prize). By increasing uptake to 300 communities, NYSERDA more than triples the number of communities implementing High-Impact actions. (75/300 = 25%)

<sup>7</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

## 6.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Many municipalities lack information regarding what clean energy opportunities exist, have inadequate financial resources readily available for implementing clean energy projects, lack staff capacity, and often do not have the in-house technical knowledge needed to properly implement clean energy projects.</li> <li>• There are few opportunities for municipal staff to engage in peer-to-peer exchange to learn from the successes of other, similar municipalities.</li> <li>• Municipalities that are aware of clean energy opportunities or programs are often overwhelmed with too many choices and have trouble prioritizing the highest impact actions.</li> <li>• There is no reliable (ongoing), open source of funding that municipalities know will be there if they take the time to put together plans for innovative clean energy projects.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If templates and standardized tools highlight the most impactful clean energy actions and take the guess work out of prioritization of initiatives, then more communities will act.</li> <li>• If competition, rewards, and recognition are provided, then uptake of clean energy actions among the State’s municipalities will increase.</li> <li>• If communities with unique values and priorities are presented with a limited number of tailored options with clear value propositions, then they will be more likely to act.</li> </ul>
<b>Activities</b>	<p><u>All activities are ultimately intended to increase adoption of the following High-Impact Actions among municipalities in New York State:</u></p> <ol style="list-style-type: none"> <li> <b>1. Benchmarking</b>  Municipalities adopt a policy to report the energy use of municipal buildings on an annual basis and, in large communities, municipalities also adopt legislation requiring the annual disclosure of energy use in large private buildings. </li> <li> <b>2. Clean Energy Upgrades</b>  Municipalities achieve a 10 percent reduction in the greenhouse gas emissions from municipal buildings through energy efficiency upgrades and renewable energy. </li> <li> <b>3. LED Street Lights</b>  Municipalities convert at least half of the municipal “cobra-head” style street lights within the jurisdiction to energy-efficient light-emitting diode (LED) technology. </li> <li> <b>4. Clean Fleets</b>  Municipalities increase the deployment of alternative fuel vehicles by installing electric vehicle charging stations or other alternative fuel infrastructure and/or by expediting permitting for charging stations. </li> <li> <b>5. Solarize</b>  Municipalities undertake a solarize campaign to increase the number of solar rooftops in the jurisdiction through group purchasing, locally-organized community education and outreach, and a limited time offer. </li> <li> <b>6. Unified Solar Permit</b>  Municipalities pass an ordinance to adopt the New York State Unified Solar Permit to reduce costs and delays for solar projects in the jurisdiction. </li> </ol>

**7. Energy Code Enforcement Training**

Municipalities train code compliance officers and other municipal officials in best practices in energy code enforcement through training, collaborative plans reviews, and joint onsite inspections of local construction projects.

**8. Climate Smart Communities Certification**

Municipalities earn Climate Smart Community (CSC) Certification at the certified, bronze, silver and gold levels through compliance with this robust, comprehensive rating system.

**9. Community Choice Aggregation**

Municipalities transition to a cleaner, more affordable energy supply by passing an ordinance to allow for the aggregated purchase of electric and gas supply for residential and commercial customers within the jurisdiction.

**10. Property Assessed Clean Energy (PACE) Financing**

Municipalities help property owners undertake clean energy improvements to commercial properties by passing an ordinance to establish a Property Assessed Clean Energy (PACE) financing program.

Activities/Outputs:

*1. Accelerate the development of tools, resources, and policies for successful deployment of High Impact Actions (2016-2019)*

- NYSERDA will develop standard packages of tools and resources for the High-Impact Actions, including benefits and best practices. Tools and resources will be made publicly available to all communities regardless of program participation status.
- Implement Customer Relationship Management (i.e., Salesforce) software for NYSERDA to track community progress of High-Impact Actions and innovative project implementation.
- As certain High-Impact Actions become widely adopted or standard practice, NYSERDA will begin developing and promoting tools and resources for new High-Impact Actions with the next highest potential impact, gradually phasing out previous actions (“grandfathering” them in) to ensure the success of communities currently working on implementation.
- In addition to being phased out after successful adoption across the state, High-Impact Actions may also be adjusted, phased out, or newly developed based on a variety of other factors including, but not limited to, level of uptake in communities relative to other actions, changes in the regulatory environment, consistency with NYSERDA and other New York State agency program offerings, and availability of external assistance, such as federal programs, tools, and resources.
- Compile data and lessons learned from successful implementation of the High-Impact Actions and consequently adjust the outreach strategy, program requirements, and tools and resources to ensure the most impactful subsequent implementation.

*2. Provide Technical Assistance (2016-2019)*

- NYSERDA will provide free, on-demand, locally-based general technical assistance, including supplemental engineering support services, with contractors covering every region of New York State. Technical assistance providers will work with one-on-one with communities, providing overall guidance and assistance with using the tools and resources. Monitoring the usefulness of the tools and resources, they will also work with NYSERDA to refine them based on feedback from municipalities. For communities implementing actions that require more specific technical expertise, the supplemental engineering support contractors

	<p>can provide more in-depth services, such as energy audits or assessments. (Technical assistance, although supporting this effort, is funded via a separate funding source (Regional Greenhouse Gas Initiative auction proceeds – RGGI) and is not included in the budget for this Investment Plan. Supplemental engineering support services are included.)</p> <p><i>3. Assist Communities with achieving the Clean Energy Communities designation (2016-2019)</i></p> <ul style="list-style-type: none"> <li>• Assist communities with achieving the Clean Energy Community designation. To accomplish this objective, municipalities will advance through a five-step process facilitated by NYSERDA and its technical assistance and engineering support network: <ul style="list-style-type: none"> <li>Step 1) NYSERDA engages with Municipalities to complete a survey to capture baseline information</li> <li>Step 2) NYSERDA will work with the municipality to identify the recommended high impact actions most applicable to each municipality.</li> <li>Step 3) NYSERDA and the municipality will work together to develop a detailed action plan with the support of state tools and resources.</li> <li>Step 4) Municipalities document and report at least 4 High-Impact Actions taken.</li> <li>Step 5) Municipalities will be designated a Clean Energy Community to earn recognition and be eligible to apply for grant funding for more innovative projects.</li> </ul> </li> </ul> <p><i>4. Provide an on-line communications and resource portal for peer-to-peer learning and engagement (initially rolled out by Q4 2016, enhancements ongoing through 2019)</i></p> <ul style="list-style-type: none"> <li>• Develop and implement an interactive, online communications and resource portal (Clean Energy Communities Portal) hosting publicly available tools and resources. Include a peer-to-peer learning platform, a mechanism to distribute aggregated community-level energy use data<sup>8</sup> by sector, and a link with the Customer Relationship Management software for communities to track progress.</li> </ul> <p><i>5. Provide innovation and replication support (2016-2019)</i></p> <ul style="list-style-type: none"> <li>• Offer flexible grants for implementation of innovative clean energy projects to communities that have achieved the Clean Energy Community designation.</li> <li>• Host regular summits and other, less formal meetings through which community leaders can learn from one another, exchange best practices, provide feedback to NYSERDA, and learn about new opportunities from the State.</li> </ul> <p><i>6. Provide quality assurance, making periodic adjustments as needed in response to the needs of the communities (2016-2019)</i></p> <ul style="list-style-type: none"> <li>• Adjust the list of High-Impact Actions periodically, including new tools and resources, in accordance with market demand and changing community needs.</li> <li>• Conduct ongoing market research to fully understand the current needs of communities and changing market conditions.</li> </ul> <p>The combination of technical assistance, outreach, engineering support, tools, resources, and dedicated funding will provide the foundation necessary to enable</p>
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<sup>8</sup> Data will be collected and distributed in accordance with all privacy rules established by the Public Service Commission. Efforts are already underway to make this non-private, aggregated (on a community-level by service class) data easily accessible for community clean energy planning and tracking purposes.

	communities to undertake clean energy actions and projects. One of the key aims of this support structure is to help build the capacity needed for local governments and communities to take future action on their own.
<b>Key Milestones</b>	<p><u>Milestone 1</u></p> <ul style="list-style-type: none"> <li>80 communities complete, and demonstrate replicability of, four out of ten High-Impact Actions and submit successful grant applications to the Clean Energy Communities Program to complete innovative clean energy projects.</li> </ul> <p><u>Milestone 2</u></p> <ul style="list-style-type: none"> <li>After realizing the benefits associated with completing High-Impact Actions, many communities go on to pursue the more rigorous CSC Certification. The number of Certified CSCs doubles, from 6 currently certified to 12 certified.</li> </ul> <p><u>Milestone 3</u></p> <ul style="list-style-type: none"> <li>NYSERDA has conducted market research on impact of initial uptake of High-Impact Actions and has adjusted the Clean Energy Communities Program accordingly. NYSERDA will continuously compile feedback from communities on High-Impact Actions and associated tools and resources, and adjust accordingly.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>Tools and resources developed for all current and future potential High-Impact Actions.</li> <li>75% of communities in New York State are taking advantage of tools and resources provided.</li> <li>Reduce level of perceived difficulty associated with implementing High-Impact Actions to between 1 and 4 on a scale of 1-10, with 10 being most difficult.</li> <li>Significant private sector participation in related activities.</li> <li>Self-sustaining mechanism is in place to facilitate knowledge transfer among communities, including tools and resources.</li> <li>Municipal greenhouse gas inventories indicate that the trajectory of community emissions is on track to meet 2050 goal of reducing statewide emissions 80% below 1990 levels.</li> </ul>

6.1.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>Utilities play a critical role in increasing access to aggregated community-level energy use data needed for clean energy planning and tracking. To date, many utilities have demonstrated a willingness and have begun to work with NYSERDA to figure out how best to go about providing data in a way that is useful to municipalities, while simultaneously protecting customer privacy.</li> <li>Coordination with utilities, as well as other state agencies (i.e., NYPA), other NYSERDA groups, non-profits, and federal organizations to ensure their offerings, as applicable, are incorporated in all tools and resources that support High-Impact Actions as well as innovative projects funded through resulting grants.</li> <li>Coordination is needed with utilities on issues related to LED street lighting tariffs/municipal ownership and aggregated community energy use data needed to facilitate Community Choice Aggregation and NYSERDA tracking of program success.</li> <li>NYSERDA will also work to ensure that utilities are kept apprised of various clean energy actions happening in their respective territories so that they can better serve municipal customers.</li> <li>NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
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<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>Incentives for energy upgrades, enabling LED street light conversions, economic development grants, approval for installing charging stations in public right-of-ways</li> </ul>
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### 6.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

To ensure the success of the Clean Energy Communities program statewide, including in municipalities that do not pay into the System Benefits Charge, such as those on Long Island or that run their own municipal utilities, RGGI funding is being used to supplement CEF activities. In addition to the budget outlined below, \$13,504,488 of RGGI funding is being used: \$8,902,488 for the Technical Support contractors; \$4,500,000 to supplement the Clean Energy Communities grant funding; and \$102,000, to build the first iteration of an interactive web portal for communities to track progress of their clean energy action.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis (CEF only)**

Budget		2016	2017	2018	2019	2020	Total
Clean Energy Communities (CEF Only)	Tools, Training, and Replication	\$12,941	\$178,489	\$1,064,340	\$588,913	\$0	\$1,844,683
	Implementation Support	\$0	\$182,315	\$182,315	\$182,315	\$0	\$546,946
	Direct Incentives and Services	\$0	\$2,569,073	\$3,778,020	\$3,785,020	\$1,694,785	\$11,826,898
	Sub-Total	\$12,941	\$2,929,877	\$5,024,675	\$4,556,249	\$1,694,785	\$14,218,527

**Table 2: Annual Expenditures Projection – CEF Only**

Expenditures	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
<b>Total</b>	0.1%	1%	7%	14%	22%	25%	18%	10%	3%	100%

### 6.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

Table 4 provides additional detail on the baseline perceived level of difficulty in implementing each High Impact Action.

Because the Clean Energy Communities program is being co-funded with CEF and RGGI funding, the table below includes metrics associated with program implementation in its entirety. Program success will be measured on a funding-agnostic basis, with *reported* savings and metrics being allocated proportionately to the CEF and RGGI budgets committed/spent to date.

**Table 3. Initiative Specific Metrics**

Indicators <sup>9</sup>		Baseline (Before/Current) <sup>10</sup>	2019 (Cumulative)
Activity/ Outputs	Number of communities that are aware of the Clean Energy Communities Program	0	800
	Number of Communities that have joined the Clean Energy Communities Program	0	400
	<i>Number of communities that have completed:</i>		
	1 or more High-Impact Action	467	800 (333 since initiative began)
	2 or more High-Impact Actions	248	498 (250 since initiative began)
	3 or more High-Impact Actions	128	353 (225 since initiative began)
	4 or more High-Impact Actions (minimum for designation)	10	173 (163 since initiative began)
	Number of Designated Clean Energy Communities	0	163
	Number of registered Climate Smart Communities (indicates interest in going beyond High-Impact Actions)	175	219
	Partner engagement: Number of organizations helping to promote High-Impact Actions without NYSERDA contracts	0	3
Outcomes	Number of communities that indicate clean energy is a priority	473	800
	Number of communities regularly accessing Clean Energy Communities Portal and tracking progress	0	80
	Perceived level of difficulty, on the part of community representatives, in implementing each High-Impact Action (1-10, with 10 being most difficult)	See table 4 below	4 (or less, on average, for each action)
	Number of communities that have participated in NYS clean energy programs	423	560
	Number of communities that have completed High-Impact Actions but are not designated Clean Energy Communities	0 <sup>11</sup>	100
	Percentage of communities in New York State taking advantage of tools and resources provided	0	75% (1,200)

<sup>9</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>10</sup> Revised baseline metrics reflect the recently-completed Clean Energy Communities market baseline evaluation. This study will be available publicly on NYSERDA's website and in the DPS Document and Matter Management system in the near future.

<sup>11</sup> At the time of the baseline measurement, some communities had completed High Impact Actions, but since these actions took place prior to the program start, these communities would not have been designated clean energy communities. Thus, the metric value is zero.

**Table 4. Baseline Average Difficulty to Implement Each Action**

Action <sup>12</sup>	Average perceived level of difficulty to implement (1-10 scale with 10 being most difficult)
Benchmarking overall	6.2
Benchmarking - Small and medium communities (n=1076)	6.2
Benchmarking - Large communities (n=110)	6.1
Clean Energy Upgrades (n=1075)	6.0
LED Street Lights (n=943)	5.1
Clean Fleets overall	7.5
Clean Fleets - Add vehicle to fleet (n=1448)	8.1
Clean Fleets - Install charging station (n=1377)	6.9
Solarize overall	6.3
Solarize - Conduct a Solarize Campaign (n=1248)	6.1
Solarize - Achieve 10 solar installations (n=1314)	6.4
Unified Solar Permit (n=1003)	5.6
Energy Code Enforcement Training (n=688)	4.2
Climate Smart Communities Certification (n=1194)	5.7
Community Choice Aggregation (n=1231)	6.7
PACE Financing (n=136)	6.8

Benefits shown in Tables 5 through 7 are direct, near term benefits associated with program implementation. Because the Clean Energy Communities program is being co-funded with CEF and RGGI funding, all reported metrics associated with implementation of the program will be split proportionately according to the level of funding coming from each source. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. The first table (5) shows all metrics associated with the entire program, including both CEF and RGGI funding, and the second table (6) shows prorated metrics associated only with CEF funding. Table 7 shows program participation associated with the entire program, including both CEF and RGGI funding.

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<sup>12</sup> Community contacts rated the difficulty to implement each action in Spring 2017. The value in parentheses indicates size of the population represented, which is the number of communities that were eligible for, but had not completed, the action.



**Table 5: Direct Impacts – CEF + RGGI (entire initiative) <sup>13</sup>**

Primary Metrics		2016	2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	35,400	47,700	68,100	47,900	18,700	217,900
	MWh Lifetime	532,000	716,000	1,020,000	719,000	281,000	3,268,000
	MMBTU Annual	35,200	214,000	371,000	427,000	253,000	1,300,000
	MMBTU Lifetime	529,000	3,210,000	5,560,000	6,400,000	3,790,000	19,500,000
	MW	-	-	-	-	-	-
Renewable Energy	MWh Annual	14,000	49,700	73,900	71,000	50,400	259,100
	MWh Lifetime	210,000	747,000	1,110,000	1,070,000	755,000	3,886,000
	MW	10	41	102	49	19	221
CO2e Emission Reduction (metric tons) Annual		28,000	63,500	95,900	87,000	50,800	325,200
CO2e Emission Reduction (metric tons) Lifetime		421,000	953,000	1,440,000	1,300,000	762,000	4,878,000
Customer Bill Savings Annual (\$ million)		\$6.91	\$15.00	\$22.30	\$19.80	\$11.50	\$75.55
Customer Bill Savings Lifetime (\$ million)		\$104.00	\$224.00	\$335.00	\$297.00	\$173.00	\$1,133.00
Private Investment (\$ million)		\$25.60	\$34.50	\$49.20	\$34.60	\$13.50	\$157.50

**Table 6: Direct Impacts – CEF only<sup>14</sup>**

Primary Metrics		2016	2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	-	24,600	41,900	38,000	14,100	118,700
	MWh Lifetime	-	368,000	629,000	571,000	212,000	1,780,000
	MMBTU Annual	-	138,000	236,000	214,000	79,500	666,700
	MMBTU Lifetime	-	2,070,000	3,530,000	3,200,000	1,190,000	10,000,000
	MW	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	26,100	44,500	40,400	15,000	125,900
	MWh Lifetime	-	391,000	668,000	605,000	225,000	1,889,000
	MW	-	22	38	34	13	107
CO2e Emission Reduction (metric tons) Annual		-	34,500	58,900	53,400	19,900	166,800
CO2e Emission Reduction (metric tons) Lifetime		-	518,000	884,000	802,000	298,000	2,502,000
Customer Bill Savings Annual (\$ million)		\$-	\$8.02	\$13.70	\$12.40	\$4.62	\$38.75
Customer Bill Savings Lifetime (\$ million)		\$-	\$120.00	\$205.00	\$186.00	\$69.30	\$581.20
Private Investment (\$ million)		\$-	\$16.70	\$28.50	\$25.90	\$9.63	\$80.78

<sup>13</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<sup>14</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

**Table 7a. Annual Projected Initiative Participation (CEF + RGGI)**

	2016	2017	2018	2019	Total
Participants	76	126	80	51	333

**Table 7b. Annual Projected Initiative Participation (CEF Only)**

	2016	2017	2018	2019	Total
Participants	0	40	80	51	171

Benefits shown in Tables 8 and 9 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. Because the Clean Energy Communities program is being co-funded with CEF and RGGI funding, all reported metrics associated with implementation of the program will be split proportionately according to the level of funding coming from each source. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter. Table 8 shows all metrics associated with the entire program, including both CEF and RGGI funding, and Table 9 shows prorated metrics associated only with CEF funding.

**Table 8. Estimated Indirect Market Impact – CEF + RGGI (entire initiative)**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	141,000	494,000	847,000
	MMBtu Cumulative Annual	545,000	1,910,000	3,270,000
Renewable Energy	MWh Cumulative Annual	168,000	587,000	1,010,000
	MW	175	612	1,050
CO2e Emission Reduction (metric tons) Cumulative Annual		194,000	569,000	975,000

**Table 9: Estimated Indirect Market Impact – Prorated with CEF funding only**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	76,900	269,000	461,000
	MMBtu Cumulative Annual	279,000	978,000	1,680,000
Renewable Energy	MWh Cumulative Annual	81,600	286,000	490,000
	MW	90	314	538
CO2e Emission Reduction (metric tons) Cumulative Annual		99,300	292,000	500,000

### 6.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<p>NYSERDA intends to offer this program in a fuel neutral manner to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State’s clean energy goals. Offering the program on a fuel neutral basis will allow NYSERDA to achieve a ton of carbon savings at a cost of \$85.20, compared to a cost of \$110.47 in an electric only scenario.<sup>15</sup></p>
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### 6.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <p>Each year, NYSERDA will undertake a reassessment of priorities and funding levels and will adjust the program as appropriate. Specifically:</p> <ul style="list-style-type: none"> <li>• Uptake of High-Impact Actions will be tracked in the Clean Energy Communities Portal and Customer Relationship Management software.</li> <li>• As uptake of certain High-Impact Actions are scaled to the point where funding is no longer necessary for communities to act, funding will be eliminated or shifted to new actions.</li> <li>• Depending on identified needs, NYSERDA may use portion of the grant funding budget to support new, more structured project grant funding offerings, rather than keeping all funding open for loosely defined ‘innovative’ projects.</li> </ul> <p>If the Clean Energy Communities program is continuing to make progress after the initial three-year period, NYSERDA will reassess longer term programmatic needs and submit a revised Investment Plan outlining new funding requirements and updated implementation strategies. NYSERDA anticipates that this program will continue in some form after the initial three-year period.</p> <p><b><u>Market Evaluation</u></b></p> <p>This program intervention will include surveys/interviews with samples of communities at various stages and levels of involvement to assess:</p> <ul style="list-style-type: none"> <li>• Effectiveness and value of the Clean Energy Communities Portal and resources provided</li> <li>• Which High-Impact Actions communities have implemented, and which ones they have not</li> <li>• Barriers to implementing energy actions</li> <li>• Cost of implementing High-Impact Actions</li> <li>• Detailed information on implemented actions, including project impacts</li> <li>• Related actions by non-participating communities that are causally linked to the intervention</li> </ul> <p>These surveys/interviews will be used to provide real-time insights and support systematic evaluation of the intervention, including its effectiveness for participating communities and in other communities that may replicate the program actions.</p>
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<sup>15</sup> Fossil fuel savings make up 23% of overall program savings. This equates to 29.65% more emissions saved per dollar invested compared to electric-only projects. If current fossil fuel emissions savings were replaced with electric-only projects, the program costs would increase by approximately 29.65%.

**Impact Evaluation/Field Verification**

For communities implementing actions, impact evaluation will involve measurement and verification (M&V) of energy and other benefits for a sample of communities/measures. M&V will also examine a subset of innovative clean energy projects funded through Clean Energy Community grants to determine replication opportunities through potentially adding the project type as a new High-Impact Action.

Where communities participate in other NYSERDA programs, this data will also be gathered and used in assessing impact in a coordinated manner.

Aggregated community-level energy use data will be used, as available, to track progress toward 2050 goals across communities implementing certain High-Impact Actions and those that are not.

## 6.2 Community Energy Engagement Program<sup>16</sup>

### 6.2.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"> <li>• Many households and communities are not aware of the clean energy opportunities that are available to them or are unable to access them due to financial barriers to project implementation.<sup>17</sup></li> <li>• Low- to moderate-income (LMI) consumers<sup>18</sup> are less likely than market rate consumers to be reached in the near term by clean energy market actors and project developers because of poor profitability and financial barriers.<sup>19</sup></li> <li>• These consumers also pay a disproportionate share of their income toward the cost of energy.</li> <li>• LMI households are an important targeted community for enhancing access to and uptake of renewable and energy efficiency solutions under Reforming the Energy Vision (REV).</li> </ul>
<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• NYSERDA will build on the model developed under Green Jobs-Green NY including the success of organizations in being able to leverage multiple sources of funding for completion of clean energy projects. It will competitively select locally-based organizations (LBOs) across the State, each with a strong local presence, to provide outreach and education services to drive energy efficiency and renewable energy deployment to residential, multi-family, and small business customers (collectively referred to herein as “communities”).</li> <li>• Although the primary focus of the Program and of these LBOs will be to serve the needs of LMI households and communities and the outreach efforts will target these communities, this initiative may also assist market-rate customers as individual customers will not be screened for outreach based on income-eligibility criteria.</li> <li>• The Program will focus on increasing adoption rates for clean energy programs and services in economically distressed, LMI communities and making linkages to local labor for completion of clean energy projects. Additional activities will allow local organizations to propose regional specific projects that leverage a variety of resources to reduce the energy bills of households and communities.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Community Engagement Program”, which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Address the energy affordability needs and reduce the energy bills of households and communities.</li> </ul>

<sup>16</sup> The Fuel Neutrality section that is included in other CEF Investment Plan Chapters is not included for the Community Energy Engagement initiative because it is not relevant for a community-based outreach and education effort.

<sup>17</sup> See the Green Jobs-Green New York Community Outreach Discussion Working Group Recommendations Report, available at <https://www.nyscrda.ny.gov/-/media/Files/EDPPP/GJGNY/Advisory-Council-Updates/GJGNY-Community-Outreach-Working-Group-Recommendations.pdf>, and the 2012-2013 Home Performance with ENERGY STAR® Process Evaluation/Market Characterization Assessment Final Report, available at <https://www.nyscrda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/2012-2013-HPwES-Process-Evaluation-Market-Characterization-Assessment-FinalReport.pdf>.

<sup>18</sup> NYSERDA defines the low-income market segment as households with annual incomes at or below 60% of the State Median Income (SMI), and the moderate-income market segment as households with an annual income between 60% and 80% of the SMI or the Area Median Income (AMI), whichever is greater. Together these form the LMI market segment.

<sup>19</sup> 2015 New York State Energy Plan: <http://energyplan.ny.gov/Plans/2015>

	<ul style="list-style-type: none"> <li>• Increase participation in energy efficiency and renewable energy solutions and programs for LMI households and communities.</li> <li>• Increase participation in financing opportunities and programs for LMI communities and households.</li> <li>• Demonstrate the value proposition of clean energy solutions and programs through education to households and communities to achieve greater energy literacy.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	This strategy supports the State Energy Plan (SEP) goals to increase the State’s emphasis on improving energy affordability for LMI households, while increasing deployment of distributed energy resources in LMI communities throughout New York, both as a matter of equity, and as a matter of necessity if the State is to meet its clean energy targets.

6.2.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market is locally-based organizations that have strong ties to their community, an established group of local partners, and are well-positioned to engage and stimulate the regional market to influence and drive clean energy actions of homeowners, renters, and community stakeholders, especially with LMI participants.
<b>Market Participants</b>	Market participants include: <ul style="list-style-type: none"> <li>• Locally-based organizations</li> <li>• Partner organizations (environmental groups, economic development organizations, schools, community action agencies, etc.)</li> <li>• LMI and market-rate households</li> <li>• Clean energy service providers</li> <li>• External Funding Sources (e.g. State, non-profit, financiers)</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• LMI and environmental justice (EJ) communities<sup>20</sup> have demonstrated their interest in participating in their clean energy future, as evidenced by their active party status in many of the Reforming the Energy Vision (REV) proceedings.</li> <li>• Additionally, previous LMI outreach and education efforts through the Green Jobs, Green New York (GJGNY) conducted by Constituency-Based Organizations (CBOs) have resulted in the successful completion of numerous energy efficiency and renewable energy projects, including aggregation strategies. <ul style="list-style-type: none"> <li>○ As of June 2016, CBOs conducted 1,686 events to raise awareness and educate customers. These events, in addition to other outreach efforts, resulted in a total of 11,430 applications for the Home Performance with ENERGY STAR®.</li> <li>○ CBOs have worked with customers to realize the completion of 7,755 audits; and to approve work scopes and assist completions for a total of 2,201 residential retrofit projects through the Home Performance with ENERGY STAR® program.<sup>21</sup></li> </ul> </li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• LMI households and communities will benefit from education and assistance through the entire process of making improvements to the home and in ways that they may not otherwise be assisted by contractors (e.g. completing applications, working with lenders, applying for financing, following up with consumers, etc.).</li> <li>• Customers will be more likely to pursue these improvements, which can reduce their energy bills and improve their air quality and comfort.</li> </ul>

<sup>20</sup> Environmental justice communities are commonly identified as those where residents are predominantly minorities or low-income; where residents have been excluded from the environmental policy setting or decision-making process; where they are subject to a disproportionate impact from one or more environmental hazards; and where residents experience disparate implementation of environmental regulations, requirements, practices and activities in their communities. [http://www.energy.ca.gov/public\\_adviser/environmental\\_justice\\_faq.html](http://www.energy.ca.gov/public_adviser/environmental_justice_faq.html)

<sup>21</sup> NYSERDA. (2016). Green Jobs-Green New York 2016 Annual report. Retrieved from <https://www.nyserd.org/About/Publications/GJGNY-Advisory-Council-Reports>.

### 6.2.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• Meetings with CBOs, low-to moderate-income consumer advocates, and stakeholders (including contractors) of the home energy services industries through a Community Outreach Discussion Working Group that was established by the Green Jobs – Green New York (GJGNY) Advisory Council have included discussions to determine how best to leverage valuable resources toward achieving the best outcome for low- to moderate-income households.<sup>22</sup></li> <li>• Market research has been conducted on other State and national clean energy programs focused on LMI households and communities, as well as interviews conducted with associated program staff.</li> <li>• Interviews with other locally-based organizations such as local development corporations (LDCs), non-profits, and foundations on best practices and strategies for addressing the energy affordability needs of the LMI consumer and how to ensure the new initiative will target the best organizations to provide this support.</li> <li>• NYSERDA will ensure ongoing and future market engagement through establishing partnerships with low-to moderate-income consumer advocates, stakeholders (including contractors) of the home energy services industries, community action agencies, non-profits, etc.</li> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) to engage with stakeholders, as appropriate.<sup>23</sup></li> </ul>
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### 6.2.4 Theory of Change

<b>Market Barriers Addressed</b>	<p>LMI households and communities are interested in taking advantage of clean energy programs and resources, but they are often under-resourced and lack the knowledge and expertise necessary to take advantage of the opportunities available to them. LMI households and communities face several barriers to participating in clean energy programs and opportunities including:</p> <ul style="list-style-type: none"> <li>• Lack of capital for homeowners (who have difficulty paying utility bills) and building owners (who are hesitant to take on additional debt).</li> <li>• Difficulty obtaining financing for clean energy projects.</li> <li>• Lack of confidence in clean energy projects' ability to deliver energy savings.</li> <li>• Minimal understanding of clean energy practices and operation of equipment (e.g., boilers and furnaces).</li> <li>• Lack of awareness of available clean energy resources.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If locally-based organizations support home owners, tenants, and landlords through the complete process of clean energy projects then there will be an increase in the number of completed projects and in participants that previously did not participate in clean energy programs.</li> <li>• If locally-based organizations with experience working on community projects and accessing NYSERDA and other State, Federal, and non-profit funding identify available resources to households that can successfully leverage these resources to</li> </ul>

<sup>22</sup> NYSERDA. (2016). Green Jobs-Green New York Community Outreach Discussion Working Group Recommendations. Retrieved from <https://www.nysERDA.ny.gov/About/Publications/GJGNY-Advisory-Council-Reports>.

<sup>23</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

	<p>deploy energy efficiency improvements and renewable energy projects, then the number of completed projects will increase.</p> <ul style="list-style-type: none"> <li>• If locally-based organizations provide education on energy efficiency and renewable energy to households and communities, then market rate and LMI households and communities will gain the necessary knowledge to reduce their energy bills.</li> </ul>
<p><b>Activities</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA will issue a competitive solicitation to select up to ten organizations covering each of the 10 Economic Development Regions, as defined by Empire State Development, to conduct outreach and provide support to New York State households and communities, with an emphasis on LMI engagement. These “base activities” will include: <ul style="list-style-type: none"> <li>○ Educating consumers about clean energy programs and resources: Involves working with contractors and funding entities to help customers understand and access NYSERDA and other State, Federal, and local funding resources to complete clean energy projects and to reduce energy burden including payment assistance. Additionally, organizations will need to leverage funding for non-energy benefits (e.g. roof repair, electrical work, health and safety) for completion of clean energy projects.</li> <li>○ Contractor engagement: Involves developing strong relationships with Contractors including routine coordination meetings to create tools and templates to help make work scopes easier for customers to understand and make decisions about, and providing qualified customer leads to contractors.</li> <li>○ Develop local partnerships: Involves working with other locally-based service organizations that engage LMI consumers on related practices (i.e., lead paint abatement) to form partnerships, extending the outreach efforts for mutually beneficial results.</li> <li>○ Consumer outreach: Involves participation in events conduct energy literacy activities, and one on one outreach to community leaders (includes speaking at rotary clubs, chambers of commerce, block clubs, community groups, church groups, etc. and responding to customer inquiries).</li> <li>○ Facilitate loan applications: Assisting customers with processing loan applications (including assisting with paperwork and loan qualification). Often, customers do not feel comfortable providing personal financial information to contractors so organizations can fill a critical role in the process.</li> </ul> </li> <li>• Outside of the base activities, NYSERDA will reserve funds (approximately \$600,000) for complementary activities that the organizations selected under the base activities solicitation can submit proposals to during the duration of the initiative on a quarterly basis. Proposals will be reviewed each quarter on a competitive basis subject to a set of specific view criteria and detailed scoring rubric. These review criteria will include the extent to which the project helps to reduce the energy bills of households and communities (specifically LMI); estimated energy savings, renewable energy generation, and greenhouse gas emission savings; amount of external funding leveraged; etc. Examples of what NYSERDA anticipates for these regional-specific activities may include: <ul style="list-style-type: none"> <li>○ Aggregation: Bringing together eligible homes, businesses and/or not-for-profits in a neighborhood who have all agreed to use the same contractor(s) to perform audits and the ensuing retrofit work. This will include a community benefits agreement that comes with discount for people getting the retrofit as well as benefits that create pathways for people to attain jobs.</li> <li>○ Workforce development: Facilitating and connect contractors with resources in the community that they may not be aware of, such as courses or training programs with the goal of attaining new or advanced job positions in the clean energy industry.</li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>○ Pilot projects to reduce energy bills for LMI households and communities: Potential projects could include bulk fuel purchasing where outreach organizations work to obtain funding from non-profits, foundations, state, federal, or other entities to create and maintain a program for assistance to LMI customers.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• NYSERDA issues competitive “base activities” solicitation.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Awards from base activity solicitation are contracted.</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>• Commencement of local outreach and support to households and communities (with the focus on LMI).</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• NYSERDA initiates awards proposals for regional-specific pilot projects.</li> </ul> <p><u>Milestone 5 (Annually 2018-2020)</u></p> <ul style="list-style-type: none"> <li>• NYSERDA develops one or more case study on regional-specific pilot projects and other support provided through the base activities.</li> </ul> <p><u>Milestone 6 (2019)</u></p> <ul style="list-style-type: none"> <li>• Conduct surveys of customers assisted by LBOs to assess performance.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• Households and communities have increased awareness and access to resources, including capital and finance opportunities, for completion of clean energy projects.</li> <li>• Increased funding from developers and financiers for clean energy projects in households without direct support from NYSERDA.</li> <li>• Increase the number of organizations promoting clean energy and other benefits to households and communities.</li> <li>• Increase the number of completed residential clean energy projects with a focus on LMI.</li> </ul>

6.2.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>• Utilities offer incentive programs for residential customers, which organizations awarded through this initiative will leverage to assist LMI households.</li> <li>• Utilities administer bill payment assistance programs for LMI households.</li> <li>• NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<p>Utilities have incentive programs that LMI households and communities could take advantage of. Utilities may also be useful partners in reaching out to LMI households and communities to provide them with information about programs that they administer. Locally-based organizations will work to develop relationships with their local utility providers to assist customers with accessing available clean energy programs.</p>

## 6.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 10. The annual expenditure projection is included in Table 11. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

To ensure the success of the LMI Community Engagement program statewide, including in LMI households and communities that do not pay into the System Benefits Charge, such as those on Long Island or communities that run their own municipal utilities, RGGI funding is being used to supplement CEF activities. In addition to the budget outlined below, \$1,400,000 of RGGI funding is being used for LMI community engagement activities and pilot projects.

**Table 10. Annual Market Development Budget Allocation – Commitment Basis (CEF Only)**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Implementation Support	\$4,409,882	\$0	\$0	\$0	\$4,409,882
<b>Total</b>	\$4,409,882	\$0	\$0	\$0	\$4,409,882

**Table 11. Annual Expenditures Projection (CEF Only)**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
<b>Total</b>	17%	33%	33%	17%	100%

## 6.2.7 Progress and Performance Metrics

Table 12 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

Because the LMI Community Engagement program is being co-funded with CEF and RGGI funding, the table below includes metrics associated with program implementation in its entirety. Program success will be measured on a funding-agnostic basis, with reported savings and metrics being allocated proportionately to the CEF and RGGI budgets committed/spent to date.

**Table 12. Initiative Specific Metrics**

Indicators <sup>24</sup>		Baseline <sup>25</sup> (Before/Current)	2020 (Cumulative)
Activity/Outputs	Amount of funding received by customers (including NYSERDA and non-NYSERDA funding)	\$5,190,000	\$9,750,000
	Number of new partnerships developed with other locally-based organizations	0	10
	Number of customers assisted with clean energy applications (audit, grant, and finance applications)	5,230	9,650
	Number of completed (closed) loans	726	2,020
Outcomes	Number of organizations promoting clean energy and other benefits to households and communities	0	10
	Number of projects completed with NYSERDA and non-NYSERDA funding	726	2,020

Benefits shown in Table 13 and Table 14 are direct, near term benefits associated with this initiative’s implementation. Because the Community Energy Engagement program is being co-funded with CEF and RGGI funding, all reported metrics associated with implementation of the program will be split proportionately per the level of funding coming from each source. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Table 13 shows all metrics associated with the entire program, including both CEF and RGGI funding, and Table 14 shows prorated metrics associated only with CEF funding. Table 15 shows program participation associated with the entire program, including both CEF and RGGI funding, and Table 15 shows participation associated with CEF funding only. Participants are defined as all single-family residential customers that are assisted by LBOs with clean energy applications (audit, grant, and finance applications) in Tables 15 and 16.

Due to the nature of the activities, estimating energy savings impacts at this stage is difficult due to the potential for significant overlap in savings with other CEF initiatives that offer financial support to the residential sector for clean energy projects. However, energy savings for projects supported directly and exclusively by this initiative will be tracked and reported. The Community Energy Engagement program will drive benefits not directly captured by the CEF metrics, including bringing participants into existing programs at a faster rate, as well as bringing in participants from populations that wouldn’t have been reached otherwise. NYSERDA will also track additional efforts beyond NYSERDA activities spurred by this work, including funding leveraged from foundations and other sources (included in the private investment estimates in Table 13 and 14), as well as energy savings efforts that originate outside of existing programs, such as challenges and campaigns driven directly by locally-based organizations.

<sup>24</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>25</sup> Value shown here is total cumulative Home Performance with ENERGY STAR® audits and incentives and GJGNY financing associated with CBO activity from January 1, 2014 through September 30, 2016, and is not discounted based on a percent attributable to the CBO program vs. the GJGNY program.

**Table 13. Direct Impacts – CEF + RGGI (entire initiative)**

Primary Metrics <sup>26</sup>		2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MMBTU Annual	-	-	-	-	-
	MMBTU Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-	-
Customer Bill Savings Annual (\$ million)		\$ -	\$ -	\$ -	\$ -	\$ -
Customer Bill Savings Lifetime (\$ million)		\$ -	\$ -	\$ -	\$ -	\$ -
Private Investment (\$ million)		\$2.28	\$ -	\$ -	\$ -	\$2.28

**Table 14. Direct Impacts – CEF Only**

Primary Metrics <sup>27</sup>		2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MMBTU Annual	-	-	-	-	-
	MMBTU Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-	-
Customer Bill Savings Annual (\$ million)		\$ -	\$ -	\$ -	\$ -	\$ -
Customer Bill Savings Lifetime (\$ million)		\$ -	\$ -	\$ -	\$ -	\$ -
Private Investment (\$ million)		\$1.73	\$ -	\$ -	\$ -	\$1.73

**Table 15. Annual Projected Initiative Participation (CEF+RGGI)**

	2017	2018	2019	2020	Total
Participants <sup>28</sup>	3964	274	183	0	4420

<sup>26</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSEDA's programs.

<sup>27</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSEDA's programs.

<sup>28</sup> Participants include all single-family residential customers that are assisted by LBOs with clean energy applications (audit, grant, and finance applications). Metrics are on a commitment basis; however, it is anticipated that actual participation will occur through 2020.

**Table 16. Annual Projected Initiative Participation (CEF Only)**

	2017	2018	2019	2020	Total
Participants <sup>29</sup>	3353	-	-	-	3353

Due to the nature of the activities, estimating indirect market impacts at this stage is difficult due to the potential for significant overlap in savings with other CEF initiatives that offer financial support to the residential sector for clean energy projects. However, it is expected there will be additional (non-overlapping) energy and private investment benefits over time and NYSERDA will seek to track and evaluate them.

### 6.2.8 Performance Monitoring and Evaluation Plans

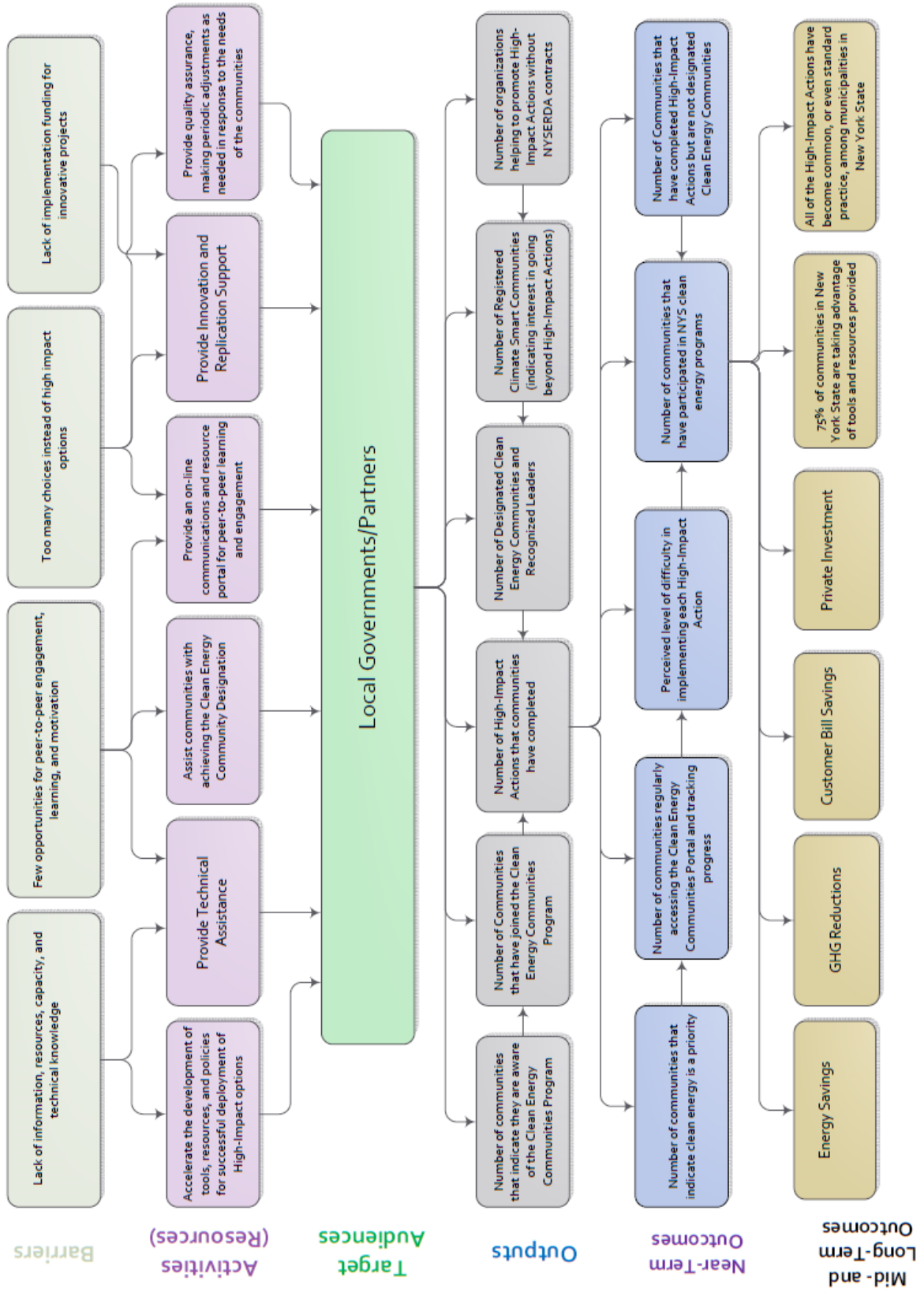
<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• NYSERDA will institute quarterly plans with the locally-based organizations so that each quarter, organizations must develop and submit a plan for that quarter’s activities with defined actions and target metrics. This will allow NYSERDA to review and approve activities on a real-time basis and adjust efforts based on the needs of the market at that point in time.</li> <li>• At the end of each year, NYSERDA will evaluate performance of each locally-based organization and adjust as needed to ensure effectiveness of their efforts and that the goals of the initiative are being met.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <p>This program intervention will include surveys/interviews with samples of households and communities at various stages and levels of involvement to assess:</p> <ul style="list-style-type: none"> <li>• Effectiveness of the locally-based organizations and the resources provided;</li> <li>• Barriers to households and communities to implementing clean energy projects;</li> <li>• Investigating the awareness of and interest in locally-based organizations’ services; and</li> <li>• Documenting the experience and expectations of households in completing clean energy projects and contractors interacting with the locally-based organizations.</li> </ul> <p>These surveys/interviews will be used to provide real-time insights and support systematic evaluation of the intervention, including its effectiveness for participating households and communities and in other households and communities that may replicate pilot projects and other efforts implemented through the initiative.</p> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>• Impact evaluation for projects that overlap with other clean energy programs, savings (both direct and indirect) will be evaluated as part of the clean energy initiative providing direct financial support (incentives and/or loans).</li> </ul>
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<sup>29</sup> Participants include all single-family residential customers that are assisted by LBOs with clean energy applications (audit, grant, and finance applications). Metrics are on a commitment basis; however, it is anticipated that actual participation will occur through 2020.

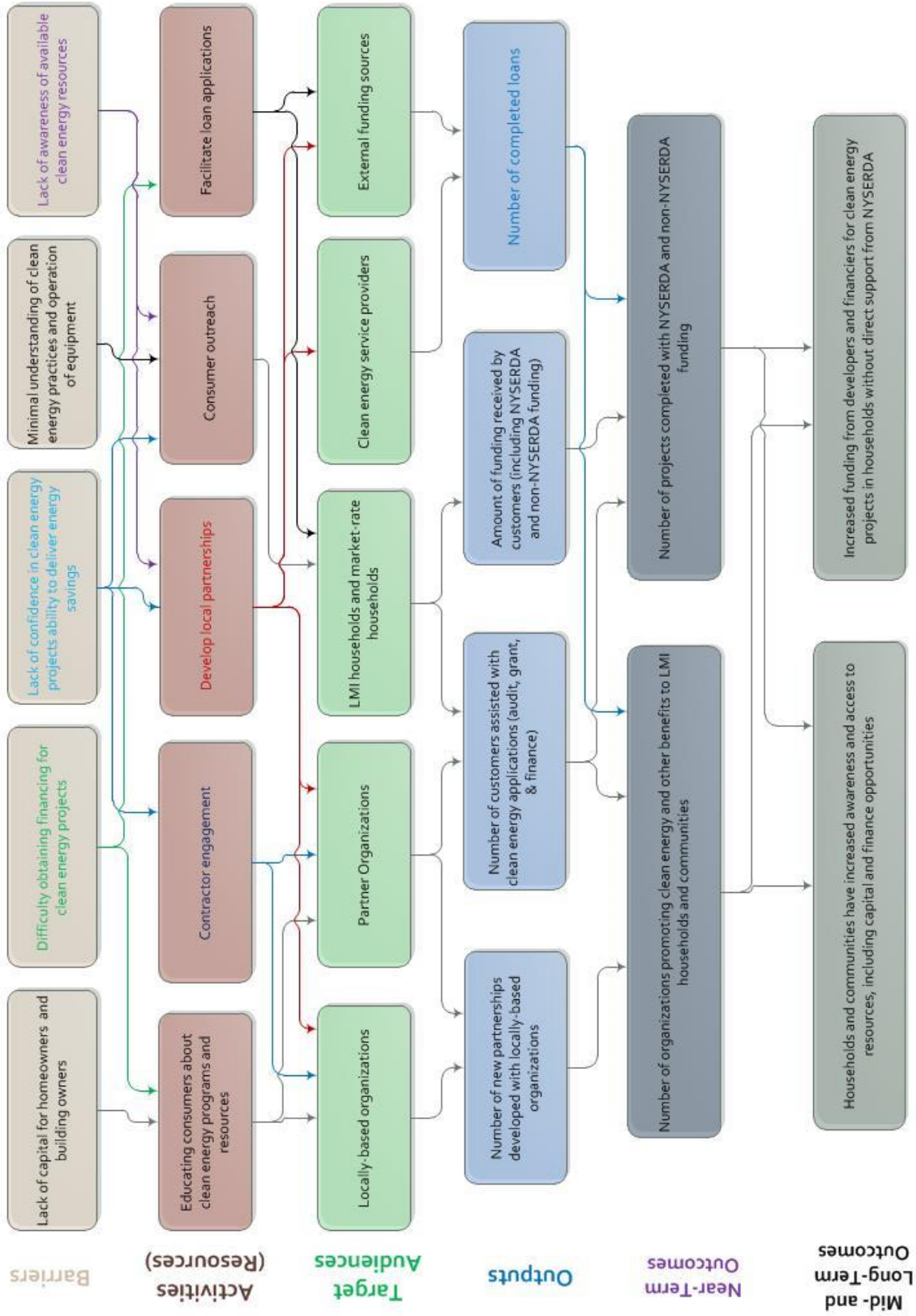
	<ul style="list-style-type: none"><li>• Impact evaluation for projects that do not overlap with other clean energy programs will involve measurement and verification (M&amp;V) of the energy impacts of clean energy projects that are supported through this initiative but do not receive direct financial support from NYSERDA or other utility clean energy program.</li><li>• Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</li></ul>
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# Appendix A – Logic Models

## LOGIC MODEL: Clean Energy Communities



# LOGIC MODEL: Community Energy Engagement Program





# Appendix B – Investment Plan Review Supplement

## Clean Energy Communities

### Results to Date – Metrics

All benefit metrics for Clean Energy Communities are currently lagging behind their cumulative current targets through Q2 2017, with progress toward targets ranging from 36% to 79%. This lag is primarily due to timing of contracting with communities; performance is expected to better align with targets by the end of the calendar year 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	8,428	1,264	9,693	-	9,693	12,300	79%	118,700	8%
	MWh Lifetime	126,427	18,967	145,395	-	145,395	184,000	79%	1,780,000	8%
	MMBtu Annual	25,614	9,011	34,624	-	34,624	69,000	50%	667,000	5%
	MMBtu Lifetime	384,204	135,158	519,362	-	519,362	1,035,000	50%	10,000,000	5%
Renewable Energy	MW	-	-	-	-	-	-	-	-	-
	MWh Annual	2,966	333	3,300	-	3,300	13,050	25%	125,900	3%
	MWh Lifetime	44,496	5,001	49,497	-	49,497	195,500	25%	1,889,000	3%
CO2e Emission Reduction (metric tons)	MW	3	0.3	3	-	3	11	26%	107	3%
	Annual Tons	7,443	1,372	8,816	-	8,816	17,250	51%	166,800	5%
Customer Bill Savings (millions)	Lifetime Tons	111,647	20,587	132,233	-	132,233	259,000	51%	2,502,000	5%
	Annual Dollars	\$1.74	\$0.31	\$2.05	-	\$2.05	\$4.01	51%	\$38.75	5%
Private Investment (millions)	Lifetime Dollars	\$26.08	\$4.72	\$30.80	-	\$30.80	\$60.00	51%	\$580.30	5%
	Dollars	\$2.59	\$0.43	\$3.03	-	\$3.03	\$8.35	36%	\$80.78	4%
Participants	Participants	9	4	13	-	13	20	65%	171	8%

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline <sup>1</sup>	2019 Target	June 2017 Actual <sup>2</sup>
			(Cumulative)	(Cumulative)
Activity/ Outputs	Number of communities that are aware of the Clean Energy Communities Program	0	800	TBD
	Number of Communities that have joined the Clean Energy Communities Program	0	400	521

<sup>1</sup> Baseline numbers updated from the Clean Energy Communities Baseline Metrics Memorandum 8/24/17

<sup>2</sup> Outputs with “TBD” in the June 2017 Actual column were not yet measured as of the end of June but will have progress included in future reporting.

<i>Number of communities that have completed</i>				
1 or more High-Impact Action	467	800 (333 since initiative began)	666 (199 since initiative began)	
2 or more High-Impact Actions	248	498 (250 since initiative began)	405 (157 since initiative began)	
3 or more High-Impact Actions	128	353 (225 since initiative began)	248 (120 since initiative began)	
4 or more High-Impact Actions (minimum for designation)	10	173 (163 since initiative began)	107 (97 since initiative began)	
Number of Designated Clean Energy Communities	0	163	80	
Number of registered Climate Smart Communities (Indicates interest in going beyond High-Impact Actions)	175	219	207	
Partner engagement: Number of organizations helping to promote High-Impact Actions without NYSERDA contracts	0	3	TBD	

**Performance Against Key Milestones**

The Clean Energy Communities initiative has made good progress toward its current milestones. Current milestones that are not yet complete are in progress. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

<b>Complete</b> ✓	<b>Time Frame</b>	<b>Milestone</b>
✓	2016–2019	Eighty communities complete and demonstrate replicability of four out of ten High-Impact Actions and submit successful grant applications to the Clean Energy Communities Program to complete innovative clean energy projects.
✓	2016–2019	After realizing the benefits associated with completing High-Impact Actions, many communities go on to pursue the more rigorous Climate Smart Communities (CSC) Certification. The number of Certified CSCs doubles, from 6 currently certified to 12 certified.
	2016–2019	NYSERDA has conducted market research on impact of initial uptake of High-Impact Actions and has adjusted the Clean Energy Communities Program accordingly. NYSERDA will continuously compile feedback from communities on High-Impact Actions and associated tools and resources, and adjust accordingly.

### Plan for Continuation/Modification/Termination

The Clean Energy Communities initiative was updated in July 2017 to reflect a timing shift in when budgets, benefits, and participants will be committed. Following program launch, NYSERDA acquired additional data from applications that were submitted in the initial months of the program, which were utilized to calculate savings estimates. The estimates have been updated accordingly based on factors such as preliminary program participation rates, participant attributes, and some verified project savings. The initiative budget was also revised to adjust the RGGI budget down slightly, due to a technical assistance contract being executed for less than originally anticipated. Additionally, the CEF Only share of the carbon savings metric was adjusted down slightly, while the emission reduction value for the overall program (CEF + RGGI) increased. This change is due to CEF Only savings originally being more heavily weighted on anticipated savings from grant projects, which were also more heavily weighted in fossil fuel savings. After revising the grant project savings estimates to more accurately reflect the expected variety of projects, the overall savings associated with fossil fuels were reduced by a larger percentage than electric, disproportionately affecting the CEF Only emission reductions. Following these modifications, the initiative will continue as planned.

## Community Energy Engagement

### Results to Date – Metrics

Private investment and participant enrollment metrics have yet been attained as potential contracts under the Community Energy Engagement Initiative RFP 3588 will be reviewed in Q3 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2021)	% of Total Target through Initiative Completion (2021)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	*	-	*	-
	Lifetime Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	*	-	*	-
	Lifetime Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Dollars	-	-	-	-	-	\$0.87	-	\$1.73	-
Participants	Participants	-	-	-	-	-	1,680	-	3,355	-

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2020 Target	June 2017 Actual <sup>3</sup>
			(Cumulative)	(Cumulative)
Activity/Outputs	Amount of funding received by customers (including NYSERDA and non-NYSERDA funding)	\$5,190,000	\$9,750,000	n/a
	Number of new partnerships developed with other locally-based organizations	0	10	n/a
	Number of customers assisted with clean energy applications (audit, grant, and finance applications)	5,230	9,650	n/a
	Number of completed (closed) loans	726	2,020	n/a

### Performance Against Key Milestones

<sup>3</sup> Outputs with “n/a” in the June 2017 Actual column indicate that the initiative had not launched as of June 2017.

The Clean Energy Engagement Initiative is early in its development but is making progress toward its current milestones. Current milestones that are not yet complete are or will soon be in progress. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓		
✓	2017	NYSERDA issues competitive “base-activities” solicitation.
	2017	Awards from base-activity solicitation are contracted.
	2017	Commencement of local outreach and support to households and communities (with the focus on LMI).

Plan for Continuation/Modification/Termination

The Community Energy Engagement initiative has been progressing following the activities and timeline laid out in the investment plan. There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

Case 14-M-0094, Proceeding on Motion of the Commission to  
Consider a Clean Energy Fund

# Clean Energy Fund Investment Plan: Large-Scale Renewables Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

April 29, 2016

# 7 Large-Scale Renewables

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NYSERDA seeks to bolster the development of Large Scale Renewables (LSR), including on-land renewable resources and offshore wind (OSW), to bolsters progress toward Governor Cuomo's Clean Energy Standard mandating that 50 percent of all electricity consumed in New York by 2030 result from clean and renewable energy sources. NYSERDA's approach to promote the development of these valuable resources focuses on enabling additional penetration of technologies currently installed in New York while also supporting the development of new renewable resources and projects.

NYSERDA aims to build on the success of nearly 2,000 MW achieved through the Renewable Portfolio Standard by implementing critical market development activities to enable the development of further large scale resources. This work will be designed to help New York achieve its Clean Energy Standard.

The first initiatives described in this Chapter will focus on reducing the cost of OSW in New York, as New York has stated its intention to work toward a meaningful long-term commitment to develop the OSW resource to maximize the energy, climate, and economic value. Progress overseas and current market conditions make this an optimal time to advance the development an OSW industry and generation projects in New York State. OSW is a significant source of renewable energy in Europe with over 11,000 MW installed as of the end of 2015. The OSW industry in Europe is also making progress in reducing the costs. Further significant cost reductions can be achieved for New York if planning and pre-development activities commence in the near term.

The first initiative is to develop an OSW Master Plan as called for by Governor Cuomo in his 2016 State of State. The plan will provide a comprehensive State roadmap to advance OSW in a manner that is sensitive to environmental, maritime and social issues. The plan will also prioritize in-field pre-development activities that the State may undertake that will reduce the costs of OSW development. A complementary second initiative for the implementation of the pre-development activities includes collecting and analyzing field data and other site assessment work that will reduce risks and costs for this important resource.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 7.1 Offshore Wind Master Plan

### 7.1.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"><li>• Governor Andrew M. Cuomo, in his 2016 State of the State address called for the creation of a New York Offshore Wind Master Plan.</li><li>• Market conditions and international progress makes it an optimal time to develop an Offshore Wind (OSW) Master Plan for NYS as requested by Governor Cuomo which can ensure that New York is prepared for OSW development in a timely manner.</li></ul>
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	<ul style="list-style-type: none"> <li>• OSW represents an essential renewable energy resource for New York State toward achieving its State Energy Plan targets and Clean Energy Standard (CES) mandate that half of New York State’s electricity will come from renewable resources.</li> <li>• New York is leading a regional collaboration funded by the Department of Energy, which includes Maine, Massachusetts, New York, and Rhode Island, with a goal to explore the potential for mutual action to develop offshore wind at the scale necessary to reduce costs by achieving economies of scale and establishing a regional supply chain.</li> <li>• According to the National Renewable Energy Laboratory, New York State (NYS) has 39 GW of gross offshore wind capacity potential between 12 and 50 nautical miles from its shores and in waters less than 200 feet deep, where the turbines would have minimal visual impact and can utilize proven bottom-fixed technology.<sup>1</sup></li> <li>• Despite a strong level of interest and multiple leases for OSW areas, there are no OSW farms in New York or the US, except for a 30 MW project under construction in Rhode Island.</li> <li>• To date, BOEM has awarded eleven commercial offshore wind leases, including nine through its competitive lease sale process (two offshore Rhode Island-Massachusetts, two offshore Massachusetts, two offshore Maryland, two offshore New Jersey and one offshore Virginia).</li> <li>• On March 16, 2016, the Department of Interior announced that the Bureau of Ocean Energy Management had identified New York’s first offshore Wind Energy Area (WEA). The proposed lease area is south of Long Island, approximately 12 nautical miles from the closest point of land and will be able to accommodate up to 1 gigawatt of offshore wind generating capacity, enough to power over 500,000 homes.<sup>2</sup> BOEM has publically stated it intends to hold a lease auction for the NY WEA before the end of calendar year 2016.</li> <li>• While large amounts of OSW have been built in Europe and OSW suppliers, contractors and developers in Europe are making excellent progress in reducing costs, the costs of OSW have limited the development of OSW in the US.</li> <li>• For OSW to be a viable solution for New York at scale, market barriers including costs must be reduced.</li> </ul>
<b>Intervention Strategy</b>	<p>NYSERDA in conjunction with the NYS Department of State and other state agencies will engage community members, environmental advocates, the maritime community, industry, tribes and government partners at all levels to develop a New York Offshore Wind Master Plan (Plan) that will provide a comprehensive state roadmap to advance Atlantic offshore wind in a manner that is sensitive to environmental, maritime and social issues in a cost effective manner that maximizes environmental and economic benefits. Elements of the Master Plan will include the identification and publication of: (1) site identification and leasing strategies; (2) site assessment and site characterization pre-development activities; (3) cost, benefit, interconnection and other studies; (4) analysis and recommended mechanisms for energy offtake agreements; and (5) outreach and educational efforts.</p> <p>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Offshore Wind Master Plan,” which can be found in Appendix A.</p>
<b>Goals</b>	<p>Provide a comprehensive State roadmap for advancing development of offshore wind in a cost effective and responsible manner, providing New York with a new renewable generation resource that can make a significant contribution to the state’s clean energy</p>

<sup>1</sup> NREL. *Assessment of Offshore Wind Energy Resources for the United States*. Golden, Colorado: National Renewable Energy Laboratory, 2010.

<sup>2</sup> <http://www.boem.gov/New-York/>



	goals and the CES mandate and provide related economic development opportunities for New York.
<b>State Energy Plan/Clean Energy Standard Link</b>	This work is an essential and timely pre-cursor to developing OSW in NYS and meeting the State Energy Plan and CES goals for 2030 that mandate that half of New York State's electricity will come from renewable resources. The Offshore Wind Master Plan will identify and prioritize pre-development activities including resource assessment, baseline environment studies and site characterization that will reduce OSW project risks and costs in New York.

7.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market is OSW developers, suppliers, contractors and market participants for large-scale renewable electricity generation in NYS.
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• Wind and OSW Industry Representatives</li> <li>• Government (Federal, State, Regional and Local)</li> <li>• Environmental Community</li> <li>• Tribes</li> <li>• Utilities</li> <li>• Economic Development Representatives</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• Offshore wind is a significant source of renewable energy in Europe. In the United Kingdom, OSW currently provides approximately 5% of the country's annual electricity requirements and expects this to grow to 10% by 2020.<sup>3</sup></li> <li>• The OSW industry in Europe is making significant progress in reducing the costs of offshore wind and expects further cost reductions over the next few years due to advances in turbines, foundations, grid connections, energy production, operations and maintenance and logistics. With targeted investments to reduce the costs further, OSW cost-competitiveness for NYS will be expedited, leading to earlier availability of this resource to meet the state's objectives.</li> <li>• Previous studies and analyses by NYS agencies and authorities in the OSW market serve as a logical starting point for this new effort; the market is prepared for further work to advance OSW for NYS.</li> <li>• The specific state, federal and industry responsibilities in advancing the development of OSW energy resources are at the discretion of each entity. The extent to which NYS chooses to accept a larger share of the responsibility in consultation with other involved agencies, the more refined the eventual development proposals and lower power contract pricing can be expected to be. Ultimately, modest and well-targeted NYS efforts and resources designed to reduce soft costs, hard costs and uncertainty will be recouped through a lower cost of renewable energy to ratepayers.</li> <li>• Complementary near term actions expected on the part of both State and Federal authorities include the following: <ul style="list-style-type: none"> <li>○ NYSERDA and New York Department of Environmental Conservation (DEC): Two new multi-year wildlife projects are scheduled to begin in 2016 that will help to inform the orderly siting of offshore wind energy. In the first the New York State DEC is undertaking a marine mammal and sea turtle monitoring program to better document and understand the occurrence and distribution of large whales and sea turtles in the New York Bight. This work will be coordinated with another effort supported by NYSERDA which will collect spatial data on birds, mammals, and turtles in the same region using high-definition digital aerial surveys. Together, these two approaches</li> </ul> </li> </ul>

<sup>3</sup> The Crown Estate, <http://www.thecrownestate.co.uk/energy-and-infrastructure/offshore-wind-energy/>

	<p>will provide the high quality baseline wildlife data, helping policy makers to define specific Wind Energy Areas, and helping to reduce the time and costs necessary for developers to conduct surveys required for OSW development, reducing the cost of OSW energy.</p> <ul style="list-style-type: none"> <li>○ New York Department of State (DOS): DOS will expand upon the DOS-initiated stakeholder engagement process addressing public and private interests in New York State Atlantic Ocean waters that consider multiple uses of the ocean for the development of an appropriate siting policy. DOS will therefore follow previous efforts with targeted infrastructure research and outreach initiatives coordinated among NYS entities.</li> <li>○ NYSERDA: In addition to the DEC marine mammal monitoring program and NYSERDA aerial surveys described above, further pre-development activities including in-field resource assessments, site characterization and other environmental assessments will be executed under a complementary Investment Plan, Offshore Wind Pre-Development Activities. These activities will primarily consist of collecting and analyzing field data that will reduce OSW project risks and costs in New York. The Offshore Wind Master Plan will prioritize these pre-development activities. The confluence and interactions between these two Plans are depicted in Appendix B.</li> </ul>
<b>Customer Value</b>	<p>An OSW Master Plan developed with input from NYS and Federal agencies as well as other stakeholders and rigorous analysis will provide consumers with the most cost effective, beneficial and responsible path for taking advantage of New York’s large, untapped OSW resource; 39 GW of gross offshore wind capacity according to the National Renewable Energy Laboratory.</p> <p>The Offshore Wind Master Plan will identify and prioritize pre-development activities that will reduce OSW project risks and costs in New York. According to the February 2015 New York Offshore Wind Cost Reduction Study prepared for NYSERDA by the University of Delaware Special Initiative on Offshore Wind, a \$10M investment in pre-development work can reduce the LCOE of NYS OSW projects by 1.3% or \$2.6/MWh<sup>4</sup>. For a 600 MW of offshore wind farm off NYS with a 46% capacity factor, \$10M of pre-development work will reduce the cost of energy by \$6.4M/year or \$160M over a project’s 25-year lifetime resulting in a return on investment of over 16 times for the customer.</p>

7.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA’s team has engaged with OSW developers and suppliers, environmental organizations and other stakeholders, state agencies, Federal agencies such as BOEM and other regional states, to inform and optimize this investment plan to ensure its success. As part of this plan, NYSERDA will continue to work with these groups and others to develop the OSW Master Plan in a timely and cohesive manner.</li> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) as a way to engage with stakeholders, as appropriate.<sup>5</sup></li> </ul>
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<sup>4</sup> <http://www.nyserda.ny.gov/-/media/Files/EERP/Renewables/New-York-Offshore-Wind-Cost-Reduction-Study-2014.pdf>

<sup>5</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

### 7.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Environmental impacts</li> <li>• Maritime impacts including navigation and fishing</li> <li>• Socio-economic impacts</li> <li>• Grid interconnection</li> <li>• High project costs resulting in high customer costs</li> <li>• Minimal public familiarity with and understanding of OSW</li> <li>• Risk in developing OSW projects with respect to actual wind, wave and sea-bottom conditions as well as potential physical, biological and social impact factors</li> <li>• Project pipeline visibility (scale is critical to building a supply chain and reducing costs)</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• For OSW to be deployed in New York, stakeholders must be engaged so that they understand the benefits and impacts of OSW and their concerns are addressed, where possible. If NYSERDA successfully conveys to stakeholders why developing offshore wind is necessary and how their needs and perspectives will be incorporated in future development through the development of an OSW Master Plan, OSW will be able to move forward in New York when the economics are improved.</li> <li>• For OSW to be deployed in New York, costs must be reduced. If NYSERDA reduces project risk and timelines by developing and executing an OSW Master Plan, the cost of OSW projects in New York can be reduced.</li> </ul>
<b>Activities</b>	<ol style="list-style-type: none"> <li>1. <b><u>Develop a Blueprint for the Offshore Wind Master Plan</u></b>  NYSERDA, in collaboration with DOS, DPS, other state agencies and interested stakeholders, will develop a Blueprint for the OSW Master Plan that outlines the objectives, major elements, initial steps and schedule for creating and implementing an OSW Master Plan. Elements of the plan will include, but are not limited to: (1) site identification, OSW leasing and development strategy; (2) site assessment and site characterization pre-development activities; (3) cost, benefit, interconnection and other studies; (4) analysis and recommended mechanisms for energy offtake agreements; and (5) outreach and educational efforts. The Blueprint will facilitate discussion and stakeholder engagement.</li> <li>2. <b><u>Stakeholder Engagement</u></b>  Multiple meetings with stakeholders will be organized and held to review the Blueprint and receive input in the development and execution of the Master Plan. Stakeholder meetings will include coastal residents, the maritime community including the commercial fishing and shipping industries, the environmental community, the ocean sciences community, economic development representatives, utilities, OSW industry representatives, tribes and state, local and federal government representatives. A Market Advisory group will be created to provide input on pre-development field work and other activities.</li> <li>3. <b><u>Studies</u></b>  Multiple studies will be undertaken to understand the costs, benefits and impacts of OSW in New York. Studies to be undertaken will include, but are not limited to: <ul style="list-style-type: none"> <li>• Marine, aviation &amp; safety/security risk assessments – probabilistic risk analysis for vessels and aircraft operating in vicinity of potential offshore wind energy areas and determination of mitigation actions such as turbine placement and lighting to reduce identified risks.</li> <li>• Commercial &amp; recreational fisheries assessments – evaluate fishing areas, potential displacement and changes in fishing effort and potential economic impacts.</li> <li>• Essential fish habitat studies – identify essential fish habitats and habitat areas of particular concern for managed species, threats posed by development to habitats and possible conservation efforts.</li> </ul> </li> </ol>

	<ul style="list-style-type: none"> <li>• Visual resource assessments – Demonstrate the visibility of wind turbines in offshore areas considered for development under different lighting and visibility scenarios.</li> <li>• Historic &amp; cultural resource assessments – study of potential submerged resources, mitigation actions and impacts on potential OSW sites.</li> <li>• Cost reduction pathways – Analysis of impact on costs due to new and emerging technologies, new and improved installation methods and potential state actions that can reduce costs.</li> <li>• Electric load, grid and interconnection requirements – detailed analysis to identify challenges, options and costs of injecting a large amount of OSW into zones J and K of the NY grid.</li> <li>• Regional activity impacts – consider the interaction of New York’s actions with those of other Northeastern and Mid-Atlantic states.</li> <li>• Supply chain assessments – Determine supply chain and infrastructure suitability along with possible actions that reduce costs and increase value, including port facility improvements and workforce training.</li> <li>• Offtake mechanisms and value modeling – analyze options for contractual mechanisms for New York to support energy offtake agreements for OSW projects and the value to ratepayers.</li> </ul> <p><b>4. <u>Drafting of Offshore Wind Master Plan</u></b>  With the results of stakeholder engagement, studies and any completed pre-development activities, an OSW Master Plan will be drafted in collaboration with other state agencies and interested stakeholders. The OSW Master Plan will identify additional potential areas for OSW development, pre-development activities that can lower the risks and costs of projects, transmission and interconnection strategies, and potential offtake mechanisms and their value.</p> <p><b>5. <u>Outreach</u></b>  Throughout the process of developing the OSW Master Plan and after publication, NYSERDA, working with the New York Department of State (DOS) and others, will engage the public to increase public understanding of OSW and any associated consideration. NYSERDA, with the assistance of DOS and others will also seek to engage new participants including New York colleges and universities.</p>
<b>Key Milestones</b>	<p><u>Milestone 1</u></p> <ul style="list-style-type: none"> <li>• Publish an OSW Master Plan Blueprint to facilitate discussion and stakeholder engagement in the summer of 2016.</li> </ul> <p><u>Milestone 2</u></p> <ul style="list-style-type: none"> <li>• Engage stakeholders in multiple meetings in 2016 and 2017 to review OSW Master Plan Blueprint and receive input for the OSW Master Plan.</li> </ul> <p><u>Milestone 3</u></p> <ul style="list-style-type: none"> <li>• Publish the final OSW Master Plan, after completion of studies and no later than end of 2017.</li> </ul> <p>All plans, reports and data to be available to stakeholders via web platform and/or other dissemination methods.</p>
<b>Goals Prior to Exit</b>	Provide a comprehensive State roadmap in the form of an OSW Master Plan for advancing development of offshore wind in a cost effective and responsible way that will facilitate the creation of a large, robust OSW industry in NYS that can make a significant contribution to achieving the State Energy Plan renewable energy targets and the CES mandate. Increase public and ratepayer understanding and support of OSW.

### 7.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• Key utility coordination points will be with PSEG-Long Island (LIPA), Con Edison, and the New York Power Authority (NYPA), as these entities have the most impactful connection with OSW for New York State. These utilities will be engaged to identify preferred locations where OSW projects can provide grid support and other details relevant to utility planning including ongoing collaboration with DPS staff on interconnection studies.</li> <li>• NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• Pre-development assessments have been completed for the site of the Long Island-New York City Offshore Wind Collaborative Project.<sup>6 7</sup></li> <li>• Additionally, feasibility studies were completed for OSW in the Great Lakes.<sup>8</sup></li> </ul>

### 7.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Research and Technology Studies/Development/Demos	\$5,000,000	-	-	\$5,000,000
Total	\$5,000,000	-	-	\$5,000,000

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>Total</b>
<b>Total</b>	50%	50%	100%

### 7.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are

<sup>6</sup> <http://www.nyscrda.ny.gov/Cleantech-and-Innovation/Power-Generation/Wind/Offshore-Wind>

<sup>7</sup> <http://www.linycoffshorewind.com/>

<sup>8</sup> <http://www.nyscrda.ny.gov/-/media/Files/Publications/Research/Biomass-Solar-Wind/offshore-wind-energy-development.pdf>

measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will and progress will be measured periodically.

**Table 3. Initiative Specific Metrics**

Indicators <sup>9</sup>		Baseline (Before/Current)	2019 (Cumulative)
Activity/Outputs	OSW Master Plan Blueprint published	0	1
	Stakeholder meetings to review Blueprint and solicit input for OSW Master Plan	0	3
	OSW Master Plan published, providing a comprehensive roadmap to reduce the costs of OSW and accelerate the development of OSW for New York and identifies additional potential offshore wind energy areas.	0	1

This investment will not have any direct, near-term benefits in energy efficiency, renewable energy generation or CO2 emission reductions. This investment in offshore wind planning will increase stakeholder engagement and understanding of OSW, private investment and competition and reduce the costs of future NYS offshore wind projects resulting in customer savings.

#### 7.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	This initiative is not being delivered on a fuel neutral basis.
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#### 7.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>Tracking of standard activity metrics including: number of stakeholder meetings, published Blueprint and published Master Plan.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>Market Evaluation is not planned for this initiative, beyond aspects addressed in the Test-Measure-Adjust Strategy.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>Impact evaluation/field verification is not planned for this initiative.</li> </ul>
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<sup>9</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

## 7.2 Offshore Wind Pre-Development Activities

### 7.2.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Governor Andrew M. Cuomo, in his 2016 State of the State address called for the creation of a New York Offshore Wind Master Plan. This investment plan is for the execution of the pre-development activities called for in the Master Plan. These pre-development activities will include collecting and analyzing field data and other site assessment work that will reduce Offshore Wind (OSW) project risks and costs in New York.</li> <li>• OSW represents an essential renewable energy resource for New York State toward achieving its State Energy Plan targets and Clean Energy Standard (CES) mandate that half of New York State’s electricity will come from renewable resources.</li> <li>• According to the National Renewable Energy Laboratory, New York State (NYS) has 39 GW of gross offshore wind capacity potential between 12 and 50 nautical miles from its shores and in waters less than 200 feet deep, where the turbines would have minimal visual impact and can utilize proven bottom-fixed technology.<sup>10</sup></li> <li>• Despite a strong level of interest and multiple leases for OSW areas, there are no OSW farms in New York or the US, except for a 30 MW project under construction in Rhode Island.</li> <li>• While large amounts of OSW have been built in Europe, the costs of OSW have limited the development of OSW in the US.</li> <li>• To date, BOEM has awarded eleven commercial offshore wind leases, including nine through its competitive lease sale process (two offshore Rhode Island-Massachusetts, two offshore Massachusetts, two offshore Maryland, two offshore New Jersey and one offshore Virginia).</li> <li>• On March 16, 2016, the Department of Interior announced that the Bureau of Ocean Energy Management had identified New York’s first offshore Wind Energy Area (WEA). The proposed lease area is south of Long Island, approximately 12 nautical miles from the closest point of land and will be able to accommodate up to 1 gigawatt of offshore wind generating capacity, enough to power over 500,000 homes.<sup>11</sup> BOEM has publically stated it intends to hold a lease auction for the NY WEA before the end of calendar year 2016.</li> <li>• While large amounts of OSW have been built in Europe and OSW suppliers, contractors and developers in Europe are making excellent progress in reducing costs, the costs of OSW have limited the development of OSW in the US.</li> <li>• For OSW to be a viable solution for New York at scale, market barriers including costs must be reduced.</li> </ul>
<p><b>Intervention Strategy</b></p>	<p>As described in a separate initiative to execute the Offshore Wind Master Plan, NYSERDA will develop and execute an OSW Master Plan that will include undertaking targeted pre-development initiatives including resource assessment, baseline environment studies and site characterization. This investment plan includes the execution of the pre-development activities called for in the OSW Master Plan including in-field resource assessments, site characterization and other environmental assessments. These activities will primarily consist of collecting and</p>

<sup>10</sup> NREL. *Assessment of Offshore Wind Energy Resources for the United States*. Golden, Colorado: National Renewable Energy Laboratory, 2010.

<sup>11</sup> <http://www.boem.gov/New-York/>

	<p>analyzing field data that will reduce OSW project risks and costs in New York. The data from this pre-development work will be disseminated to the market in order to reduce project risks and overall development costs and increase interest and competition to develop NYS OSW sites at the lowest possible price. Initial data from this pre-development work will also be used to assist in identifying additional Wind Energy Areas in the Offshore Wind Master Plan. The confluence and interactions between the Offshore Wind Master Plan and this Pre-Development Activities plan are depicted in the “Offshore Wind Master Plan and Pre-Development Activities Schedule,” which can be found in Appendix B.</p> <p>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Offshore Wind (OSW) Pre-Development Activities,” which can be found in Appendix A.</p>
<b>Goals</b>	To reduce overall project and ratepayer costs by undertaking pre-development work for NYS OSW sites that reduce the amount of expensive development capital required by private developers, reduce developer risk by providing site data, reduce required development timelines and ultimately enhance competition between developers.
<b>State Energy Plan/Clean Energy Standard Link</b>	This work is an essential and timely pre-cursor to developing OSW in NYS and meeting the State Energy Plan and CES goals for 2030 that mandates that half of New York State’s electricity will come from renewable resources. This pre-development effort aligns with NYSEERDA’s market development role in the CEF, while the ongoing CES Public Service Commission proceeding may ultimately provide a contractual mechanism for NYS to support an energy offtake agreement for these projects..

7.2.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market is OSW developers, suppliers, contractors and market participants for large-scale renewable electricity generation in NYS.
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• Wind and OSW Industry Representatives,</li> <li>• Government (Federal, State, Regional and Local),</li> <li>• Environmental Community,</li> <li>• Tribes,</li> <li>• Utilities, and</li> <li>• Economic Development Representatives.</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• Offshore wind is a significant source of renewable energy in Europe. In the United Kingdom, OSW currently provides approximately 5% of the country’s annual electricity requirements and expects this to grow to 10% by 2020<sup>12</sup>.</li> <li>• The OSW industry in Europe is making significant progress in reducing the costs of offshore wind and expects further cost reductions over the next few years due to advances in turbines, foundations, grid connections, energy production, operations and maintenance and logistics. With targeted investments to reduce the costs further, OSW cost competitiveness for NYS will be expedited, leading to earlier availability of this resource to meet the state’s objectives.</li> <li>• Previous studies and analyses by NYS agencies and authorities in the OSW market serve as a logical starting point for this new effort; the market is prepared for further work to advance OSW for NYS.</li> <li>• The specific state, federal and industry responsibilities in advancing the development of OSW energy resources are unclear, and often overlap. The</li> </ul>

<sup>12</sup> The Crown Estate, <http://www.thecrownestate.co.uk/energy-and-infrastructure/offshore-wind-energy/>



	<p>extent to which NYS chooses to accept a larger share of the responsibility in consultation with other involved agencies, the more refined the eventual development proposals and aggressive power contract pricing can be expected to be. Ultimately, modest and well-targeted NYS efforts and resources designed to reduce soft costs, hard costs and uncertainty will be recouped through a lower cost of renewable energy to ratepayers.</p> <ul style="list-style-type: none"> <li>• Complementary near term actions expected on the part of both State and Federal authorities include the following: <ul style="list-style-type: none"> <li>○ NYSERDA and New York Department of Environmental Conservation (DEC): Two new multi-year wildlife projects are scheduled to begin in 2016 that will help to inform the orderly siting of offshore wind energy. In the first the New York State DEC is undertaking a marine mammal and sea turtle monitoring program to better document and understand the occurrence and distribution of large whales and sea turtles in the New York Bight. This work will be coordinated with another effort supported by NYSERDA which will collect spatial data on birds, mammals, and turtles in the same region using high-definition digital aerial surveys. Together, these two approaches will provide the high quality baseline wildlife data, helping policy makers to define specific Wind Energy Areas, and helping to reduce the time and costs necessary for developers to conduct surveys required for OSW development, reducing the cost of OSW energy.</li> <li>○ New York Department of State (DOS): DOS will expand upon the DOS-initiated stakeholder engagement process addressing public and private interests in New York State Atlantic Ocean waters that consider multiple uses of the ocean for the development of an appropriate siting policy. DOS will therefore follow previous efforts with targeted infrastructure research and outreach initiatives coordinated among NYS entities.</li> </ul> </li> </ul>
<b>Customer Value</b>	<p>Pre-development activities that have been prioritized by the OSW Master Plan activities will provide New York energy consumers with the most cost effective, beneficial and responsible path for taking advantage of New York's large, untapped OSW resource; 39 GW of gross offshore wind capacity according to the National Renewable Energy Laboratory.</p> <p>The pre-development activities will reduce OSW project risks and costs in New York. According to the February 2015 New York Offshore Wind Cost Reduction Study prepared for NYSERDA by the University of Delaware Special Initiative on Offshore Wind, a \$10M investment in pre-development work can reduce the LCOE of NYS OSW projects by 1.3% or \$2.6/MWh<sup>13</sup>. For a 600 MW of offshore wind farm off NYS with a 46% capacity factor, \$10M of pre-development work will reduce the cost of energy by \$6.4M/year or \$160M over a project's 25-year lifetime resulting in a return on investment of over 16 times for the customer.</p>

7.2.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA's team has engaged with OSW developers and suppliers, environmental organizations and other stakeholders, state agencies, Federal agencies such as BOEM and other regional states, to inform and optimize this investment plan to ensure its success. As part of this plan, and the OSW Master Plan, NYSERDA will continue to work with these groups and others to</li> </ul>
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<sup>13</sup> <http://www.nyserdera.ny.gov/-/media/Files/EERP/Renewables/New-York-Offshore-Wind-Cost-Reduction-Study-2014.pdf>

	<p>optimize the scope and timing of the pre-development activities that occur in parallel with and follow the OSW Master Plan.</p> <ul style="list-style-type: none"> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) as a way to engage with stakeholders, as appropriate.<sup>14</sup></li> </ul>
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## 7.2.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• High project development costs for potential project developers</li> <li>• High project costs resulting in high customer costs</li> <li>• Risk in developing OSW projects with respect to actual wind, wave and sea-bottom conditions as well as potential physical, biological and social impact factors</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• For OSW to be deployed in New York, costs must be reduced. If NYSERDA reduces project risk and timelines through targeted pre-development initiatives, the cost of OSW projects in New York can be reduced.</li> </ul>
<b>Activities</b>	<p><b>1. Support OSW siting and development activity</b></p> <p>This activity will support OSW siting and development activity by providing relevant and timely information to key stakeholders regarding the OSW resource, including an offshore area currently being considered by BOEM for leasing as well as potential future offshore wind development areas.</p> <p>Pre-development measurement programs, studies and other activities that advance the state’s interests in developing OSW in suitable sites will be undertaken. While theoretical and introductory studies have been completed in some areas of the New York Bight, a collection of site-specific data measurements, analysis and reporting is required to support detailed siting, design and permitting offshore wind projects. This work will include instituting studies, in collaboration with other State agencies and interested stakeholders, to characterize the meteorological and oceanographic conditions as well as the environmental and potential impact producing factors related to the applicable physical, biological, and social resources of possible project areas. This effort will follow the priorities set forth in the OSW Master Plan and proceed by intelligently selecting and executing in-field measurement programs and studies; a subset of these studies will commence before the OSW Master Plan is complete due to long lead times and/or near term clarity regarding their necessity.<sup>15</sup> Such programs and studies will include:</p> <ul style="list-style-type: none"> <li>• Metocean data measurements and analysis including, but not limited to, turbine hub-height wind speed and direction, wave and current measurements using met tower and/or floating buoy-mounted Light Detection and Ranging (LIDAR) technology deployed in one or more locations in the New York Bight</li> <li>• Acoustic surveys and studies – Buoy mounted sensors will measure and record above and under water acoustics to define baseline noise levels and to listen for birds, bats and marine mammals. Acoustic data will be used to determine effects of construction operations.</li> </ul>

<sup>14</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

<sup>15</sup> The confluence and interactions between the two OSW Investment Plans are depicted in Appendix B.

	<ul style="list-style-type: none"> <li>• Oceanographic surveys and analysis –Data in the NY Bight will be collected regarding depth, currents, sediment transport, turbidity, sea surface temperature, etc.</li> <li>• Geophysical and geotechnical surveys and analysis – Geophysical surveys will be undertaken by a survey vessel towing sonar equipment and other sensors to map seabed and sub-seabed conditions, detect geohazards and locate existing cables and underwater structures. Geophysical surveys include seabed soil sampling, penetration testing and coring using specialized vessels and offshore drill rigs. Geotechnical surveys will be completed once WEAs are established as this information is highly site-specific.</li> <li>• Electromagnetic surveys – Sensors are towed behind a survey vessel to measure the earth magnetic field to determine sediment properties and sub-seabed structure.</li> <li>• Onshore surveys and land use studies for areas of potential cable shore landings, onshore transmission and onshore substations – Surveys include utility surveys, soil measurements and borings as required.</li> <li>• Marine and terrestrial biological resource assessments – Ship and airborne visual and digital surveys to determine the distribution and abundance of fish, marine mammals, sea turtles, birds and bats.</li> <li>• Avian, bat, threatened and endangered species assessments</li> <li>• Archeological surveys, historic site and cultural resource assessments of potential offshore and onshore sites</li> <li>• Land use and existing infrastructure assessments</li> <li>• Socioeconomic resource, recreational resource, public health and safety assessments</li> <li>• Wetland, waterbodies and land-use assessments</li> <li>• Cumulative effects assessments</li> </ul> <p>This activity may also include the preparation and submittal of site assessment plans and all federal, state and local permits, approvals and consultations required for the work to be performed.</p> <p>A market advisory group will be convened to review the scope and timing of the pre-development activities. All pre-development activities considered in this investment plan will be screened to make certain they serve the needs of multiple developers, suppliers, state and federal agencies and other stakeholders, will not ultimately have to be repeated by developers or others when an OSW project proceeds. This consultation will also ensure that the CEF efforts will reduce the overall costs of OSW in NYS.</p> <p>The final deliverable of all surveys and analysis will be a series of reports for public consumption including downloadable data available on the web and/or other dissemination methods.</p> <p><b>2. <u>Collaboration efforts to reduce costs</u></b>  All of these initiatives may be co-funded to the extent possible by utilizing state, federal and private funding to leverage the program’s impact. NYSERDA will collaborate with other state agencies, states, industry and others to undertake baseline environmental studies, benefits analyses and other research or supply chain/workforce efforts focused on reducing OSW costs. A joint industry RD&amp;D program to reduce costs and accelerate deployment, similar to what has been used successfully in Europe, will be explored and created if warranted. This work</p>
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	will reduce the cost of developing OSW sites and provide details to additional methods to reduce costs.
<b>Key Milestones</b>	<p><u>Milestone 1</u></p> <ul style="list-style-type: none"> <li>• Reports resulting from pre-development work validating NYS OSW resource and proposing potential additional wind energy areas for development.</li> </ul> <p><u>Milestone 2</u></p> <ul style="list-style-type: none"> <li>• Reports providing site-specific data needed to support detailed siting, design, and permitting of offshore wind project(s).</li> </ul> <p>All reports and data to be available to stakeholders via web platform and/or other dissemination methods.</p>
<b>Goals Prior to Exit</b>	The development of a significant, public data set that will facilitate the creation of a large, robust OSW industry in NYS that can make a significant contribution to achieving the State Energy Plan renewable energy targets and the CES mandate.

7.2.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• Key utility coordination points will be with PSEG-Long Island (LIPA), Con Edison, and NYPA, as these entities have the most impactful connection with OSW for New York State. These utilities will be engaged to identify preferred locations where OSW projects can provide grid support and other details relevant to utility planning including ongoing collaboration with DPS staff.</li> <li>• NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• Pre-development assessments have been completed for the site of the Long Island-New York City Offshore Wind Collaborative Project.<sup>16 17</sup></li> <li>• Additionally, feasibility studies were completed for OSW in the Great Lakes.<sup>18</sup></li> </ul>

7.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 4. The annual expenditure projection is included in Table 5. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

<sup>16</sup> <http://www.nyserda.ny.gov/Cleantech-and-Innovation/Power-Generation/Wind/Offshore-Wind>

<sup>17</sup> <http://www.linycoffshorewind.com/>

<sup>18</sup> <http://www.nyserda.ny.gov/-/media/Files/Publications/Research/Biomass-Solar-Wind/offshore-wind-energy-development.pdf>

**Table 4: Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Research and Technology Studies/Development/Demos	\$9,250,000	-	-	\$9,250,000
Implementation Support	\$750,000	-	-	\$750,000
<b>Total</b>	<b>\$10,000,000</b>	<b>-</b>	<b>-</b>	<b>\$10,000,000</b>

**Table 5: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
<b>Total</b>	20%	40%	40%	100%

### 7.2.7 Progress and Performance Metrics

Table 6 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators and progress will be measured periodically.

**Table 6. Initiative Specific Metrics**

<b>Indicators<sup>19</sup></b>		<b>Baseline (Before/Current)</b>	<b>2019 (Cumulative)</b>
<b>Activity/Outputs</b>	Report validating NYS OSW wind resource	0	1
	Reports providing site-specific data needed to support detailed siting, design, and permitting of an offshore wind project	0	3
<b>Outcomes</b>	Reduction of site assessment time required for a developer (the Site Assessment Term in BOEM’s typical Commercial Leases for Renewable Energy Development on the Outer Continental Shelf).	5 years	4 years

This investment will not have any direct, near-term benefits in energy efficiency, renewable energy generation or CO2 emission reductions. This investment in offshore wind pre-development and collaboration work will increase private investment and competition and reduce the costs of future NYS offshore wind projects resulting in customer savings.

Benefits shown in Table 7 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market

<sup>19</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

This investment will advance the development of NYS OSW sites and lower the costs of OSW for the state. This will enable developers to ultimately construct and operate OSW farms on these sites at competitive rates which will lead to benefits to NYS consumers in terms of renewable energy generation and reduced CO2 emissions.

**Table 7. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	4,275 MWh / MW installed capacity
	MW	-	-	1,000
CO2e Emission Reduction (metric tons) Cumulative Annual		-	-	2,249 metric tons CO2 / MW installed capacity

### 7.2.8 Fuel Neutrality

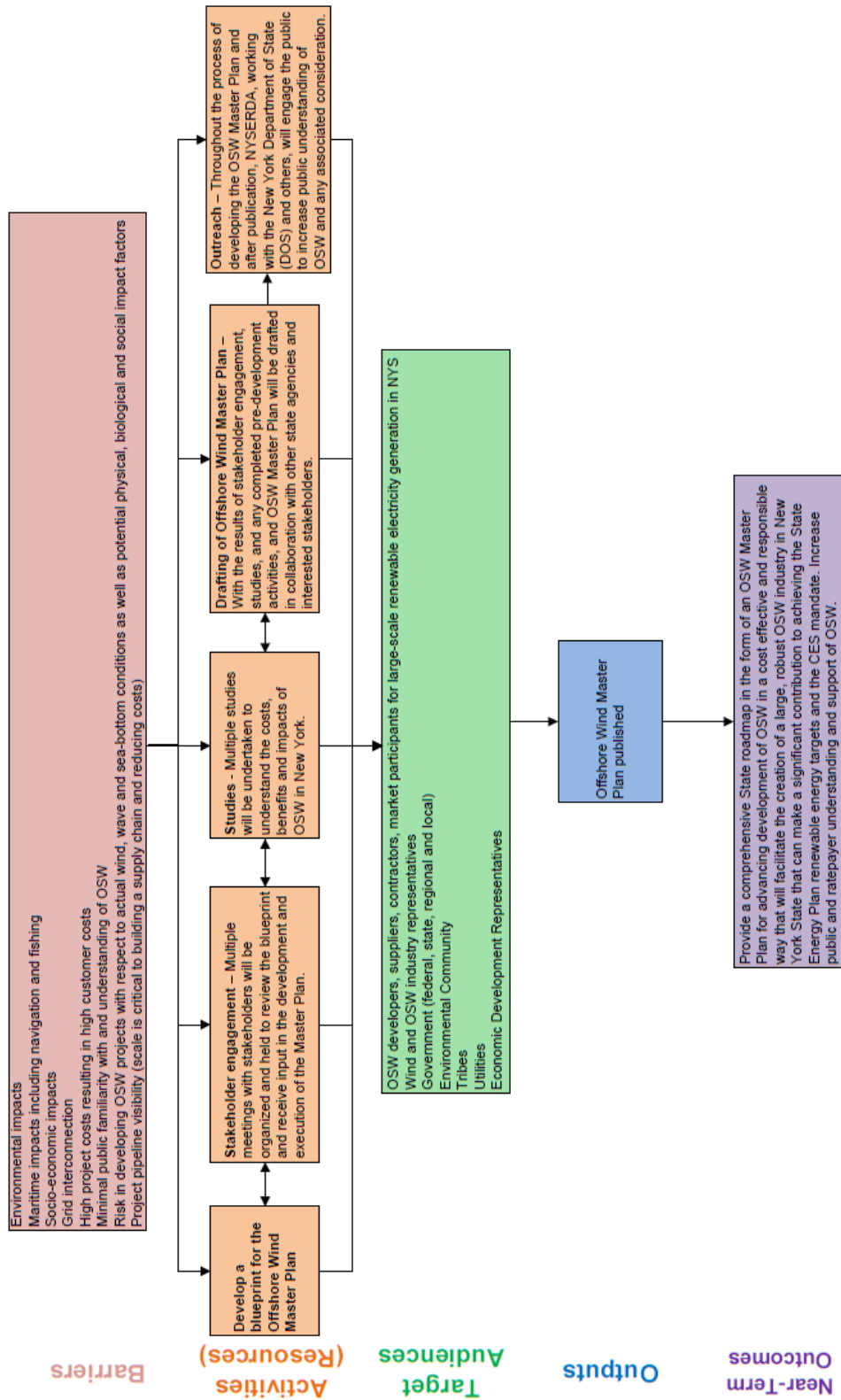
<b>Fuel Neutrality</b>	This initiative is not being delivered on a fuel neutral basis.
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### 7.2.9 Performance Monitoring and Evaluation Plans

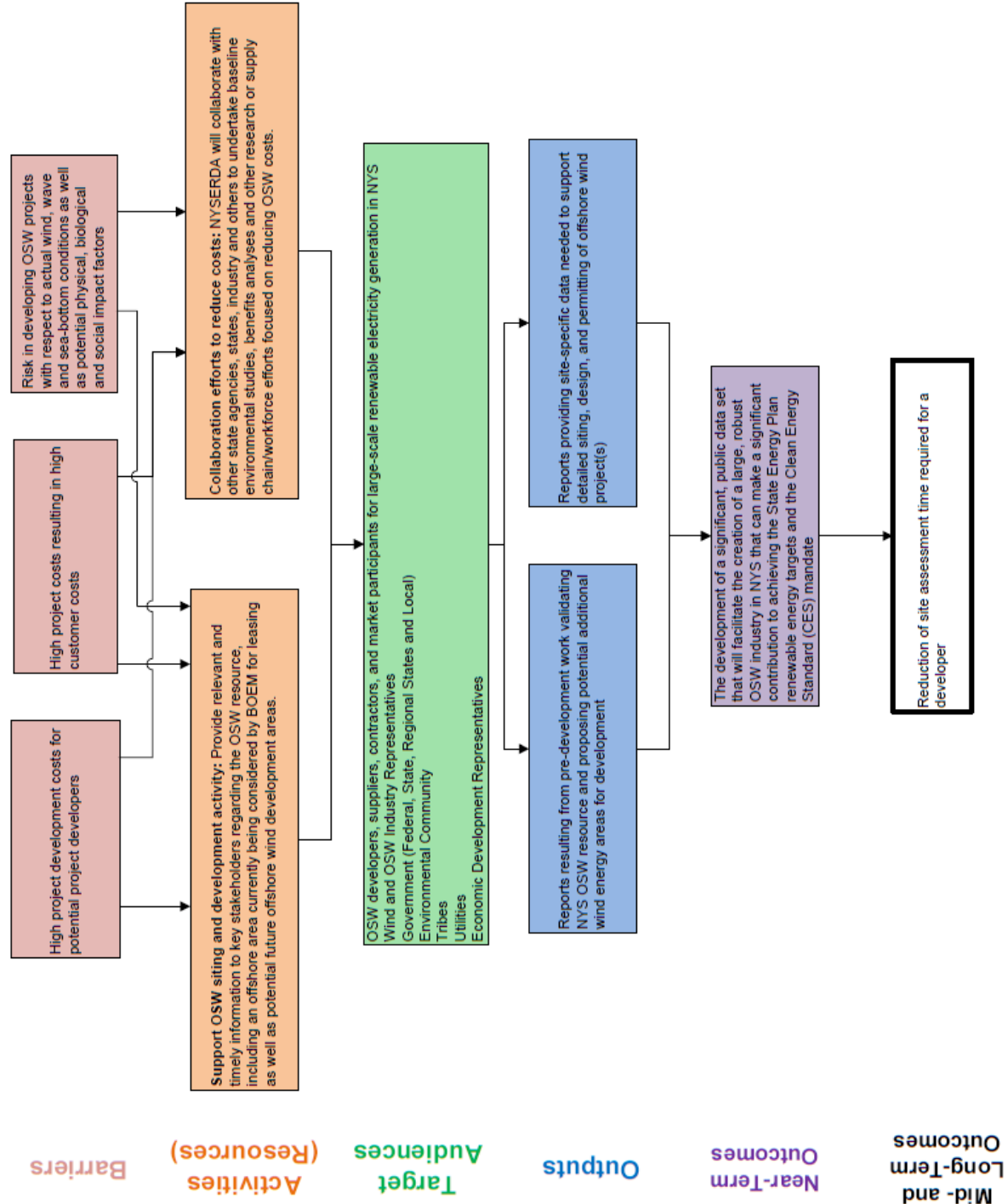
<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• Routine reporting on progress including measurement of campaigns, analysis, studies and results publication. Redirecting (as needed) to ensure continued progress against goals.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• A formal Market Evaluation is not planned for this specific initiative, beyond aspects addressed in the Test-Measure-Adjust Strategy.</li> <li>• NYSERDA will more broadly address overall wind market development progress using available data from BOEM and other sources, and potentially survey developers to identify outcomes associated with NYSERDA’s strategy to support this market.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <p>Impact evaluation/field verification is not planned for this initiative.</p>
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# Appendix A – Logic Models

## LOGIC MODEL: Offshore Wind Master Plan



# LOGIC MODEL: Offshore Wind (OSW) Pre-Development Activities







# Appendix C – Investment Plan Review Supplement

## Offshore Wind Master Plan

### Results to Date – Metrics

Not applicable. There were no energy related metrics in this investment plan.

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	June 2017 Actual
			(Cumulative)	(Cumulative)
Activity/ Outputs	OSW Master Plan Blueprint published	0	1	1
	Stakeholder meetings to review Blueprint and solicit input for OSW Master Plan	0	3	3
	OSW Master Plan published, providing a comprehensive roadmap to reduce the costs of OSW and accelerate the development of OSW for New York and identifies additional potential offshore wind energy areas.	0	1	0

### Performance Against Key Milestones

The Offshore Wind Master Plan initiative has made good progress toward its current milestones. Current milestones that are not yet complete are in progress and are expected to be completed by the end of 2017. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓		
✓	2016	Publish an Offshore Wind Master Plan Blueprint to facilitate discussion and stakeholder engagement in the summer of 2016.
	2016–2017	Engage stakeholders in multiple meetings in 2016 and 2017 to review Offshore Wind Master Plan Blueprint and receive input for the Offshore Wind Master Plan.
	2016–2017	Publish the final Offshore Wind Master Plan, after completion of studies and no later than end of 2017.

### Plan for Continuation/Modification/Termination

The Offshore Wind Master Plan initiative has been progressing following the activities and timeline laid out in the investment plan. There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

## Offshore Wind Pre-Development Activities

### Results to Date – Metrics

Not applicable. There were no energy related metrics in this investment plan.

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	June 2017 Actual
			(Cumulative)	(Cumulative)
Activity/Outputs	Report validating NYS OSW wind resource	0	1	0
	Reports providing site-specific data needed to support detailed siting, design, and permitting of an offshore wind project	0	3	0

### Performance Against Key Milestones

The initiative has made good progress toward its milestones. Studies and stakeholder outreach are underway which will be used to propose additional wind energy areas to the federal government later in 2017. Studies and surveys are also underway for site-specific environmental, sea floor, and other physical characteristics needed for siting and permitting. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete ✓	Milestone
	Reports resulting from predevelopment work validating New York State Offshore Wind resource and proposing potential additional wind energy areas for development.
	Reports providing site-specific data needed to support detailed siting, design, and permitting of offshore wind project(s).

### Plan for Continuation/Modification/Termination

The Offshore Wind Pre-Development Activities initiative has been progressing following the activities and timeline laid out in the investment plan. There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: REV Technical Assistance Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan: REV Technical Assistance Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
May 15, 2016	Original Issue	Original Issue
June 23, 2017	Revised to refine the target market and certain metrics to better align with initial market uptake and stakeholder feedback. Text and Tables 2 and 3 have been revised to reflect these changes and a shift in timing of budget and benefits.	Multiple
November 1, 2017	Edited wording of outcomes in Table 3 to clarify it is measuring outcomes since initiative began.	8

## 8 REV Technical Assistance

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New York's Reforming the Energy Vision (REV) seeks to promote more efficient use of energy, deeper penetration of renewable energy resources such as wind and solar, and wider deployment of distributed energy resources (DER), such as micro grids, roof-top solar, other on-site power supplies, and storage. By introducing more competitive market incentives, New York seeks to unlock innovative solutions and business models and attract more private capital to modernize its energy system. To facilitate such innovation, NYSERDA will invest to enable utilities, communities, and other market participants to receive guidance, technical support, and other assistance.

The initial initiative described in this Chapter is REV Connect, a means of: informing third parties of new opportunities for innovation throughout the State, helping utilities define their needs and identify solutions to meet those needs in the changing REV landscape, and offering customized technical assistance to help move solutions from idea to impact. Updates to this initiative include refining the target market segments for REV Connect based on initial stakeholder interviews, updating the expected timeframe for achieving key milestones, and clarifying certain metrics to better align with the REV Connect facilitation process. The changes also include a reduction in the target number of utility business models to be identified and executed with REV Connect support (from 18 to 14 over the 2017-2018 period) to reflect a more accurate view of what the market can support, based on more recent stakeholder feedback.

### 8.1 REV Connect

#### 8.1.1 Overview

<b>Present Situation</b>	<p>As the utilities move beyond the first round of REV Demonstration (REV Demo) projects, the utilities, DER providers<sup>1</sup> and the State have identified a number of barriers and impediments to innovation and collaboration among all market participants that, if eliminated, will lead to more efficient development, implementation and replication of project ideas that advance REV including both REV Demo projects and others. Some of these barriers include:</p> <ul style="list-style-type: none"><li>• The mismatch between the large volume of inbound project ideas and limited bandwidth within the utilities for assessing technical readiness</li><li>• Lack of awareness of the points of contact for each utility</li><li>• Insufficient or untimely feedback to DER providers on proposal concepts</li><li>• Lack of easy access to information about the numerous opportunities within each utility and throughout the State</li><li>• Insufficient process for sharing of learning from current projects as they progress as well as sharing learning from other States and countries and introductions to potential partners</li></ul>
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<sup>1</sup> In this Investment Plan, DER provider encompasses companies that offer smart grid services and advanced distributed energy solutions, including energy efficiency, demand response, energy storage, electric vehicles, and distributed generation.

<p><b>Intervention Strategy</b></p>	<p>“REV Connect” is a structure to advance New York State’s Reforming the Energy Vision<sup>2</sup> goals by facilitating the deployment of new technologies and business models in the New York market. REV Connect will help DER providers connect with New York State electric utilities to advance high quality REV demonstrations, non-wire alternatives, and other innovative projects. For companies with a technology, product, service or business model innovation that creates value for energy customers in partnership with the utility, REV Connect will offer a channel to submit project ideas and to receive expert guidance, feedback, facilitation, and matchmaking with New York utilities and other potential market partners. REV Connect also will publicize opportunities, share good practices and convene market participants to enhance the culture of innovation and collaboration in NY State.</p> <p>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: REV Connect,” which can be found in Appendix A.</p>
<p><b>Goals</b></p>	<p>REV Connect is envisioned as a structure that will evolve as the innovation ecosystem in the state energy system gains traction and grows. REV Connect will be a proactive catalyst of innovation in New York. It will provide a central venue to engage DER providers around new opportunities for applying innovation throughout the State, with emphasis on New York’s electric distribution utilities. REV Connect will help utilities define their needs and identify solutions to meet those needs in the changing REV landscape, as well as provide customized interventions to help move solutions from idea to impact. It will offer DER providers a transparent, efficient path for identifying potential partners and work with all parties in an effort to develop their ideas into actionable projects that solve real problems for customers. REV Connect will also facilitate “match-making” services to connect DER providers with each other and with utilities and identify particular areas of focus for brainstorming workshops to engage broad input from technology, business, and policy interests on how to meet challenges as they arise.</p>
<p><b>State Energy Plan/Clean Energy Standard Link</b></p>	<p>By facilitating innovative business models and new partnerships between electric utilities and DER providers, REV Connect has a role to play in helping achieve energy savings goals and greenhouse gas reductions as outlined in the New York State Energy Plan (SEP). Innovative projects ushered in with the help of REV Connect may reduce the need for capital investment in grid infrastructure, and help improve affordability. Innovation will also promote increased customer engagement in energy markets including enabling the development of community-based energy systems and on-site energy systems that both improve environmental performance of utility distribution systems and improve choice and value for New York customers.</p> <ul style="list-style-type: none"> <li>• One of the primary challenges and opportunities cited in the SEP is the need to update the utility business model: “Today’s utility business model is not well aligned for the transition to a more distributed energy future; as more consumers adopt distributed energy solutions, utilities’ revenue requirements are concentrated on fewer customers, at the same time that load is flattening. This situation has resulted in a need to reform the current utility business model to ensure that it can accommodate, adapt to, and prosper through the integration of advanced technologies and greater levels of distributed energy resources.” REV Connect is designed to help utilities evolve by taking advantage of new technologies and market trends to fulfill the new role REV and the State Energy Plan envisions for them.</li> </ul>

<sup>2</sup> Case 14-M-0101. See <http://www.ny.gov/programs/reforming-energy-vision-rev>



	<ul style="list-style-type: none"> <li>• One of the SEP Guiding Principles is Market Transformation. The SEP notes “In order to accelerate market transformation, REV initiatives will focus on identifying, mitigating, and removing common market barriers to clean energy deployment.” REV Connect is designed to remove market barriers for clean energy providers and utilities to help innovative solutions and business models plug into New York’s energy system.</li> <li>• Another SEP Guiding Principle is “Innovation and Technology: REV Connect will align energy innovation with market demand.</li> </ul>
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### 8.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	Targeted utility actors include Con Edison, Orange and Rockland, National Grid, Avangrid, Central Hudson Gas and Electric, PSEG-Long Island. Targeted DER providers include privately- and publicly-held entities providing grid services and advanced energy solutions.
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• Investor owned electric utilities looking to partner with DER providers in new ways to meet customer goals and regulatory mandates.</li> <li>• Small, medium and large software solutions providers and original equipment manufacturers with a corporate strategic interest, balance-sheet capability, and human capital to support deployments of broad based distributed energy resources.</li> <li>• Startup companies introducing cutting edge products and services for the electric grid.</li> <li>• Grid-technology and distributed energy resource deployment companies</li> <li>• New York State (NYS) Regulators</li> </ul>
<b>Market Readiness</b>	With 13 existing REV Demonstration projects and significant market interest in additional REV Demonstration projects and non-wires alternatives projects, DER providers and utilities are ready to move forward with this initiative (as evidenced by inbound ideas and presence at NYS energy events).
<b>Customer Value</b>	Projected benefits to the various customers include: <ul style="list-style-type: none"> <li>• Higher quality of inbound projects for utilities</li> <li>• Streamlined process for DER providers interested in partnering with utilities other DER providers, and market participants. Improved understanding of needs and market solutions combined with a facilitated process to match the two</li> </ul>

### 8.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• Program focus and research activities have been informed by REV proceedings and participating stakeholder viewpoints. Routine engagement with PSC staff will continue to align program focus with current public policy goals.</li> <li>• Multiple rounds of customer interviews with DER providers and utilities has been concluded and feedback incorporated into this plan. The investor owned utilities have submitted direct feedback on this investment plan and have helped to craft the RFP and evaluate proposals to select the REV Connect partner.</li> <li>• NYSERDA will hold no less than one stakeholder workshop annually to share successes and reveal market “pain points” and pressing research needs.</li> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) as a way to engage with stakeholders, as appropriate.<sup>3</sup></li> </ul>
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<sup>3</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

### 8.1.4 Theory of Change

<p><b>Technology Opportunities and Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• Degree of technical innovation being tested and/or applied is variable across the utilities. Sharing of knowledge and lessons learned is not institutionalized, and resultant pace of innovation and mechanisms to partner with DER providers can be streamlined.</li> <li>• Funding and research at individual utilities varies widely, and the volume of new ideas and the speed at which these ideas are validated or invalidated is not sufficient to meet the ambitions of REV today.</li> <li>• Validation of technology performance is critical to obtain acceptance by an engineering and standards-based utility culture focused on safety and reliability.</li> <li>• A connection to complementary efforts like AGILE<sup>4</sup>, or other REV-related R&amp;D approaches, would ensure an integrated approach to new technology alongside new business models that would deliver maximum value to the State.</li> <li>• Many DER providers have one part of a broader solution but may have difficulty finding partners and complementary solution providers to deliver the full value required by a customer.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If new utility business models are to be identified and executed, then DER providers and utilities will need policy signals that are transparent, certain, and long-term.</li> <li>• If electric utilities are able to promote their needs / problems via both a digital and physical channel then adoption of innovation with respect to new utility business models can be accelerated.</li> <li>• If there is leveraging of shared learnings and a common screening mechanism then there will be accelerated adoption of promising grid modernization technologies/practices.</li> <li>• If DER provider solution providers believe the process of connecting to customers is efficient, effective, and transparent then they will invest in a sustained presence in New York.</li> </ul>
<p><b>Activities (Resources)</b></p>	<p><b>Identify a partner to operate REV Connect.</b> The program will identify a partner to initially operate REV Connect.</p> <p><b>Establish platform, structure, and processes for REV Connect.</b> In pursuit of the overall objective, the partner will be expected to establish a platform and structure and processes to deliver the REV Connect functions in an expedited manner (that may be phased) within a two-year funding window. These functions should include:</p> <ul style="list-style-type: none"> <li>• Help develop “areas of interest”; create and maintain information resources; coach DER providers on ideas; host workshops on interest areas; summarize best practices.</li> <li>• Design, implement and maintain a central mechanism for submitting project ideas; develop evaluation criteria; evaluate and screen ideas on a regular basis; deliver feedback to all DER providers on stage of their proposal; share best practices.</li> <li>• Develop innovation plan for after two-year timeframe.</li> </ul>

<sup>4</sup> The proposed New York Power Authority (NYPA) Advanced Grid Innovation Lab for Energy (AGILE) is slated to be a versatile research and development (R&D) center oriented towards applied research in the areas of next-generation advanced energy management systems, electric power systems protection and control, smart grid technologies, and power electronics applications. The lab’s goal is to promote industry and university collaboration, both from the public and private sector, in the area of electric energy. EPRI has teamed with NYPA in a requirements exercise to develop specifications for the AGILE.

<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (Q3 2016)</u></p> <ul style="list-style-type: none"> <li>• Execute contract with partner to operate REV Connect.</li> </ul> <p><u>Milestone 2 (Q2 2017)</u></p> <ul style="list-style-type: none"> <li>• Create information resources and summarize best practices.</li> </ul> <p><u>Milestone 3 (Q3 2017)</u></p> <ul style="list-style-type: none"> <li>• Launch initial REV Connect platform to allow submission of project ideas.</li> </ul> <p><u>Milestone 4 (Q2 2017)</u></p> <ul style="list-style-type: none"> <li>• Develop project evaluation criteria and process.</li> </ul> <p><u>Milestone 5 (Q4 2017)</u></p> <ul style="list-style-type: none"> <li>• Draft Innovation Plan completed.</li> </ul>
<p><b>Goals Prior to Exit</b></p>	<p>The potential impact of this initiative includes:</p> <ul style="list-style-type: none"> <li>• Increased quality and impact of REV demonstration projects or other partnerships and collaborations facilitated by REV Connect.</li> <li>• A process and format to report on the pipeline of project suggestions and the evolution to implemented projects.</li> <li>• Value to the utilities, DER providers, and State via ongoing feedback and surveys will define impact and shape future evolution of the model.</li> <li>• Entrance of non-traditional, forward-thinking DER providers into the NY energy system.</li> <li>• Facilitation of partnerships among third parties that may individually offer parts of broader, collective solutions</li> <li>• Integration of DER via new market based earnings opportunities for utilities</li> <li>• Increased system asset utilization via solutions coming through REV Connect platform</li> <li>• Expanded capabilities of DER to provide grid benefits via solutions coming through REV Connect platform</li> <li>• Increased community-scale solutions and energy literacy via solutions coming through REV Connect platform</li> <li>• Easy to use and widely-used tools to connect utility solutions providers with utility points of contact</li> <li>• New ideas developed to address the technical, financial and regulatory issues that will have a bearing on the success of REV demonstration projects and REV overall objectives</li> <li>• Well thought out approach to addressing the challenges involved in advancing innovative, high-quality, REV-aligned proposals in the complex institutional and regulatory environment of the current energy system in New York</li> <li>• Opportunities to convene groups to focus on critical energy product and service issues and then communicate outcomes in a compelling format</li> </ul> <p>Goals prior to exit include:</p> <ul style="list-style-type: none"> <li>• REV Connect functionality operates on a self-sustaining financial basis, based on value generated and paid for by utilities, DER providers, communities and others</li> <li>• Greater utility coordination and collaboration around shared problems and opportunities, including REV demonstrations, non-wires alternatives, and other innovative programs</li> <li>• DER providers have a clear and efficient path to work with each other and the utilities to bring new solutions to market</li> </ul>

### 8.1.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>• The NYS Department of Public Service (DPS) approved REV Demonstration projects involve all utilities with the exception of PSEG-Long Island.</li> <li>• Regular interface with utilities on plans for non-wires alternatives and areas of interest for future Demonstration projects.</li> <li>• In some cases, it is anticipated that the utility will serve as a “round-a-bout” and the counter-party to an engagement with a DER provider will instead be the energy consumer, not the utility.</li> <li>• Program activity has direct correlation with REV success. Program will seek ongoing counsel and guidance from DPS Staff for the purposes of program planning and program execution in order to meet and align with REV-related policy objectives.</li> <li>• Program staff will actively participate on internal, cross-functional NYSEERDA teams that interface with utility programming to ensure optimal leverage of time and resources.</li> <li>• NYSEERDA will also take advantage of the CEAC to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<p>Not applicable. With the exception of Con Edison (who is actively conceiving of and issuing RFIs for their next round of REV Demonstration projects), other utilities have been slow to prioritize their areas of interests for Demonstration projects, and identifying the relevant utility point of contact is still a challenge for DER providers.</p>

### 8.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Tools, Training, and Replication	\$2,500,000	-	-	\$2,500,000
Total	\$2,500,000	-	-	\$2,500,000

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Total	16%	44%	40%	100%

### 8.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking

progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

Indicators <sup>5</sup>		Baseline (Before/Current)	2017	2018
Activity/Outputs	Central mechanism for submitting project ideas is designed, implemented and maintained	0	1 (completed)	0
	Evaluation criteria and process are developed and published	0	1 (completed)	0
	“Areas of interest” for future REV demo projects are developed	0	1 (completed)	0
	Information resources including web links, reports, white papers and potentially videos and workshops to help DER providers navigate and engage with REV are created/maintained	0	1 (completed)	0
	Time from project idea submission to execution of business agreement between a utility and DER provider(s)	8 months	6 months	5 months
	Number of best practices sharing “events”, e.g., publishing analysis, webcasts	0	2x/year	4x/year
	Number of presentations/workshops focused on interest areas (LMI, EV etc.) or emerging potential	0	2x/year	4x/year
Outcomes	New utility business models identified and executed in a business agreement between a utility and DER provider(s) since initiative began	12	3 <sup>6</sup>	11
	New DER provider proposals and solutions via both digital and physical channel	0	60	80

Benefits shown in Table 4 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

<sup>5</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>6</sup> Metric based on the expectation that in 2017, REV Connect will intake project idea submissions for approximately half of the year (i.e., in Q3 and Q4 2017).

**Table 4. Direct Impacts**

Primary Metrics <sup>7</sup>		2016	2017	2018	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MMBTU Annual	-	-	-	-
	MMBTU Lifetime	-	-	-	-
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-
Customer Bill Savings Annual (\$ million)		-	-	-	-
Customer Bill Savings Lifetime (\$ million)		-	-	-	-
Private Investment (\$ million) <sup>8</sup>		\$0	\$0.25	\$0.25	\$0.5

### 8.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	To date, REV Demonstration projects have been funded by and focused on electric customers. However REV Connect is envisioned to be technology agnostic in response to utility and community needs and could potentially provide solutions for gas customers as well where there is potential for economic benefits or in the context of a total-energy solution.
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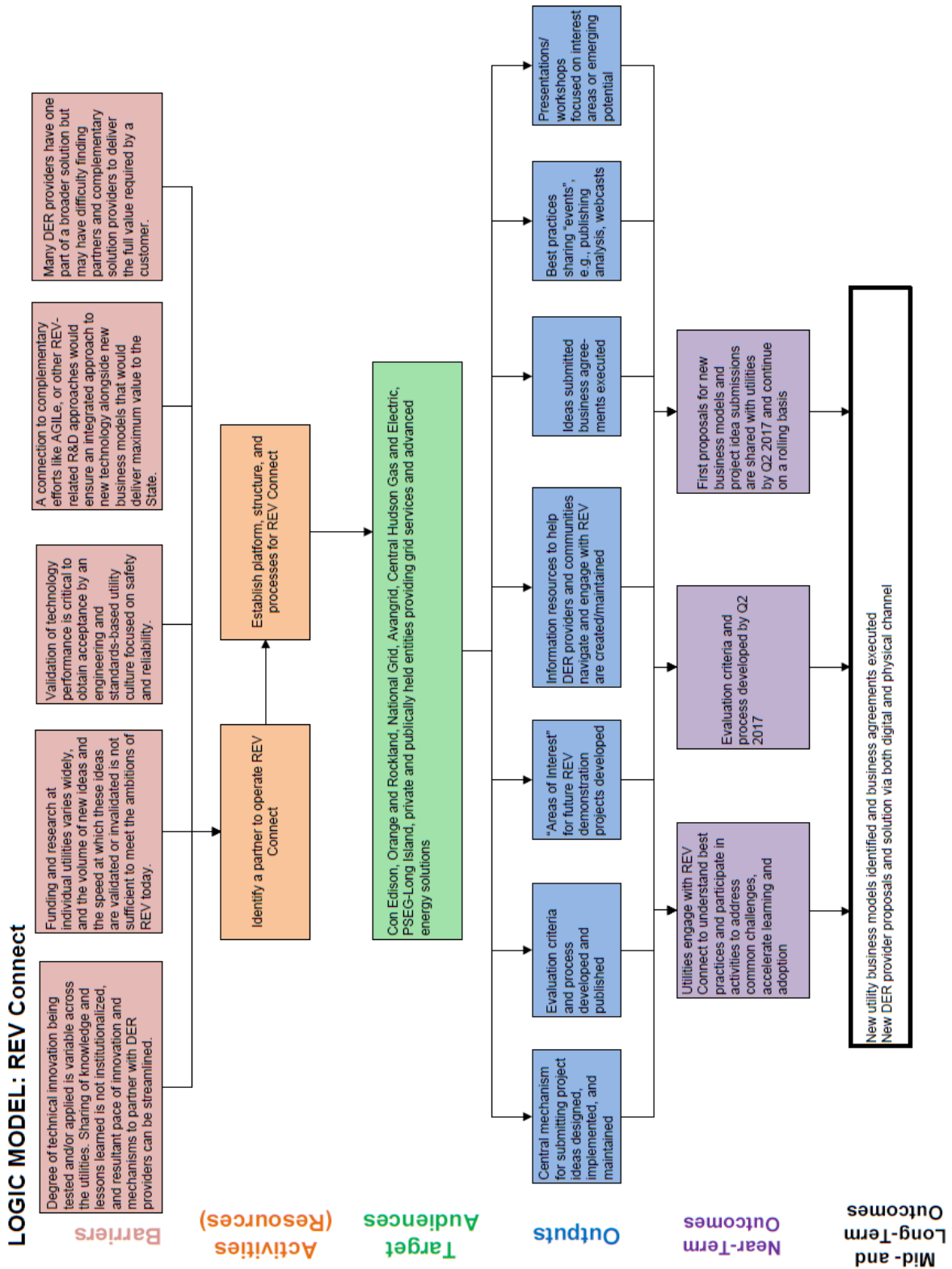
### 8.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>Tracking of standard activity metrics including: number of project submissions, completion of business agreements, private sector leverage.</li> <li>Conducting an annual customer survey to gauge effectiveness of the REV Connect process and platform.</li> <li>Conducting reviews of certain projects in the process to define timing, technical impasse, pivot point, critical milestones.</li> <li>Assessing the portfolio of projects annually with regard to goals, metrics, outputs and outcomes.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>Market Evaluation is not planned for this initiative, beyond aspects addressed in the Test-Measure-Adjust Strategy.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>Impact evaluation/field verification is not planned for this initiative.</li> </ul>
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<sup>7</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Benefits are rounded to three significant figures. Totals may not sum due to rounding.

<sup>8</sup> Private investment is the level of expected investment and financial support from utilities and private sector companies for REV Connect platform or functionality.

# Appendix A – Logic Models



## Appendix B – Investment Plan Review Supplement

### REV Connect

#### Results to Date – Metrics

No private investment benefits have yet been attained for REV Connect as the platform website was just published during Summer 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2018)	% of Total Target through Initiative Completion (2018)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	*	-	*	-
	Lifetime Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	*	-	*	-
	Lifetime Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Dollars	-	-	-	-	-	\$0.13	-	\$0.50	-
Participants	Participants	-	-	-	-	-	*	-	*	-

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2017 Target	2018 Target	June 2017 Actual
<b>Activity/Outputs</b>	Central mechanism for submitting project ideas is designed, implemented and maintained	0	1 (completed)	0	0
	Evaluation criteria and process are developed and published	0	1 (completed)	0	1 (completed)
	“Areas of interest” for future REV demo projects are developed	0	1 (completed)	0	1 (completed)
	Information resources including web links, reports, white papers and potentially videos and workshops to help DER providers and communities navigate and engage with REV are created/maintained	0	1 (completed)	0	1 (completed)



	Time from project idea submission to execution of business agreement between a utility and DER provider(s)	8 months	6 months	5 months	TBD <sup>1</sup>
	Number of best practices sharing “events”, e.g., publishing analysis, webcasts	0	2x/year	4x/year	0
	Number of presentations/workshops focused on interest areas (LMI, EV etc.) or emerging potential	0	2x/year	4x/year	0

### Performance Against Key Milestones

REV Connect has made good progress toward its current milestones. Current milestones that are not yet complete are in progress. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete ✓	Time Frame	Milestone
✓	Q3 2016	Execute contract with partner to operate REV Connect.
✓	Q2 2017	Create information resources and summarize best practices.
✓	Q2 2017	Develop project evaluation criteria and process.
	Q3 2017	Launch initial REV Connect platform to allow submission of project ideas.
	Q4 2017	Draft Innovation Plan completed.

### Plan for Continuation/Modification/Termination

The REV Connect initiative was updated in June 2017 to refine the target market segments for REV Connect based on initial stakeholder interviews, update the expected timeframe for achieving key milestones, and clarify certain metrics to better align with the REV Connect facilitation process. The changes also included a reduction in the target number of utility business models to be identified and executed with REV Connect support (from 18 to 14 over the 2017-2018 period) to reflect a more accurate view of what the market can support, based on more recent stakeholder feedback. The budget and benefit commitments have been updated to align with these changes. Following these modifications, the initiative will continue as planned.

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<sup>1</sup> Outputs with “TBD” in the June 2017 Actual column were not yet measured as of the end of June but will have progress included in future reporting.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Grid Modernization Chapter

Portfolio: Innovation & Research

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised June 23, 2017

Clean Energy Fund Investment Plan: Grid Modernization Chapter		
Revision Date	Description of Changes	Revision on Page(s)
August 1, 2016	Original Issue	Original Issue
June 23, 2017	<u>Power Electronics Manufacturing Consortium</u> : Added initiative <u>High Performing Grid</u> : Tables 7 and 9 have been updated to reflect 2016 actuals, and to provide updated private investment estimates. Milestone 6 has also been updated to correct the stage of NY Prize evaluations referenced.	Multiple

## 9 Grid Modernization

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NYSERDA will focus on enhanced grid visualization (advanced sensing, communications, diagnostics and controls), planning processes and advanced materials that accelerate realization of an advanced, digitally enhanced and dynamically managed “high-performing” electric grid. Initiatives will aim to build the capacity to integrate and dynamically manage loads, clean distributed energy resources (DER), and electric vehicles, thereby lowering the carbon intensity of energy usage and increasing customer engagement in energy markets including enabling the development of community-based energy systems such as microgrids. Such a grid will enable more efficient asset utilization (e.g., reduced operating margins, reduced power demands, reduced energy losses), reduced energy costs, improved reliability and resiliency to climate change induced weather events.

The first initiative described in this Chapter is the DER Interconnection initiative, due to the current processes and methods for interconnecting DER which are unable to keep pace with applications, as evidenced by the growing backlog of projects in interconnection queues across the state. The knowledge, techniques, and devices stemming from activity under this initiative will be key to addressing the current DER application backlog, avoiding future backlogs stemming from continued adoption of DER, and accelerating technology innovation that reduces the time, cost, and complexity of interconnecting DER.

The second initiative described in this Chapter is High Performing Grid which will investment in innovation focused on developing a digitally enhanced and dynamically managed or “high-performing” electric grid. This more comprehensive initiative moves beyond the singular and less complex question of DER interconnection to include innovation that focuses on dynamically integrating DER into the electric power system. The High Performing Grid initiative has been updated to revise the expenditures to reflect 2016 actuals, and to provide updated private investment estimates. The private investment estimates now consider initial program data, which indicated that the initial projections were greatly underestimating market contributions. Milestone 6 has also been updated to reflect that NY Prize Stage 2 evaluations will be used to inform technology gaps, as the Stage 1 evaluations did not provide this information.

The third initiative described in this Chapter is Next Generation Power Electronics, NYSERDA is also supporting critical enabling technologies, including improving the efficiency of power electronics, devices that are used for the control and conversion of electric power, and semiconductors more generally.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 9.1 DER Integration

### 9.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>Recent trends show continued growth in the number, size, and complexity of DER interconnection projects in NY. It is expected that this trend will continue based on distributed energy resources as an outgrowth of Reforming the Energy Vision (REV), the State Energy Plan, Clean Energy Fund, and NY-Sun activities.</li> <li>The electric distribution system to which these DER will interconnect is operated using older planning tools/algorithms that do not utilize real time data and computational capacities of advanced technologies. Much of the system is operated using relatively passive electro-mechanical devices that do not dynamically communicate with themselves and concern themselves with managing one-way flow of power. Systematic improvements to grid investments and operations are possible at all levels of the grid. In particular, the adoption of new technologies will help maximize the integration of large quantities of DER.</li> <li>As alternatives are developed, validation of technology performance is critical to obtain acceptance by an engineering and standards-based utility culture focused on safety and reliability. Under-utilized and emerging interconnection technologies need to be validated before they will be accepted for use in the electric grid.</li> </ul>
<p><b>Intervention Strategy</b></p>	<p>An Innovation Program is envisioned to support modernizing NY’s electric grid. The overall Grid Modernization Innovation Program will be discussed in two investment plans (two Phases). This investment plan represents Phase I focusing on interconnection of distributed energy resources (DER). Phase II, to be filed later, focuses on the broader range of grid modernization topics including innovation in sensing, communications, and diagnostics.</p> <p>This Phase I DER Interconnection investment plan focuses on innovation to support the interconnection of DER projects in the near term. The DER Interconnection Program strategy is to:</p> <ul style="list-style-type: none"> <li>Advance the methods, technology, and industry knowledge that will reduce the cost, complexity, and time to interconnect DER.</li> <li>Advance the methods, technology, and industry knowledge required to enable accelerated interconnection of DER in areas of high DER penetration on NY’s electric grid.</li> </ul> <p>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Grid Modernization – Phase 1: DER Integration,” which can be found in Appendix A.</p>
<p><b>Goals</b></p>	<p>This Program is focused on supporting technical advances that will facilitate interconnection of DER projects that are currently seeking interconnection in NY. The knowledge, techniques, and devices stemming from this work will also contribute to managing these types of applications in the future as DER markets develop.</p>
<p><b>State Energy Plan/Clean Energy Standard Link</b></p>	<p>Innovation that increases grid capacity to interconnect and expand the use of clean distributed energy resources (DER) is a necessary component of a comprehensive strategy to achieve:</p> <ul style="list-style-type: none"> <li>New York State Energy Plan greenhouse gas reduction goals</li> </ul>

	<ul style="list-style-type: none"> <li>• Improved affordability (by reducing need for capital investment in grid infrastructure)</li> <li>• Clean distributed energy resource deployment targets</li> </ul> <p>DER is expected to be a critical element of the Clean Energy Standard</p>
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9.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	Target market segment is NYS electric distribution utilities, DER developers, and grid technology companies developing DER interconnection/integration solutions.
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• NY electric utilities</li> <li>• DER project developers</li> <li>• Grid-technology companies introducing interconnection/integration products and services</li> <li>• Regulators</li> <li>• National Labs / Department of Energy (DOE)</li> </ul>
<b>Market Readiness</b>	Market participants have signaled their readiness, through the NYS Interconnection Technical Working Group, to work collaboratively towards solutions but to truly achieve success will require coordination, collaboration, and technology innovation which NYSERDA is well positioned to lead.
<b>Customer Value</b>	<p>The Reforming the Energy Vision (REV) proceeding acknowledges that interconnection of DER is both fundamental to REV and continues to be a barrier to widespread DER adoption. From Case 14-M-0101, Reforming the Energy Vision, Order Adopting Regulatory Policy Framework and Implementation Plan (issued February 26, 2015):</p> <p><i>“Staff Recognizes that burdensome, costly and time-consuming interconnection requirements or procedures are a barrier to penetration of DER. The proposal also recognizes that safety and system reliability require appropriate interconnection requirements and that an appropriate balance between streamlining and protecting safety and reliability must be found.” (pg.88)</i></p> <p><i>“In order for distributed generation to compete on an equal footing, interconnection with the grid must be enabled through technical rules and processes that are not only safe but also efficient and expeditious. New York has been a leader in this area, initially adopting Standardized Interconnection Requirements in 1999. Much progress remains to be made, however.” (pg.91)</i></p> <p>Innovation supporting DER interconnection is not occurring passively in the scope or scale needed to support the market growth currently occurring. If not directly addressed, interconnection challenges could present a large enough barrier to stall the solar market in NY much like what happened in Hawaii in 2014<sup>12</sup>.</p> <p>This intervention will support REV and accelerate customer value by supporting the resolution of technical and cost barriers to DER interconnection, thereby allowing</p>

<sup>1</sup> <http://www.renewableenergyworld.com/articles/2014/02/the-interconnection-nightmare-in-hawaii-and-why-it-matters-to-the-u-s-residential-pv-industry.html>

<sup>2</sup> [http://files.hawaii.gov/puc/4\\_Book%201%20%28transmittal%20ltr\\_DGIP\\_Attachments%20A-1%20to%20A-5%29.pdf](http://files.hawaii.gov/puc/4_Book%201%20%28transmittal%20ltr_DGIP_Attachments%20A-1%20to%20A-5%29.pdf)

	<p>greater deployment and lower interconnection costs. By supporting achievement of NY-Sun goals and State Energy Policy, these activities will contribute to:</p> <ul style="list-style-type: none"> <li>• Interconnection of 3,000 MW by 2023</li> <li>• Nearly 4,000,000 MWH of PV production by 2020 and approximately 2 million tons of GHG reduction annually.</li> </ul>
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9.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement and Customer Discovery</b>	<p>Recent / Ongoing Activities</p> <ul style="list-style-type: none"> <li>• Program focus and research activities will be informed by participation in the NYS Technical Interconnection Working Group (NYSERDA is currently co-Chair with DPS).</li> <li>• 2015 NYSEIDA study, completed in partnership with DPS and EPRI, entitled <i>Interconnection of Distributed Generation in New York State: A Utility Readiness Assessment</i></li> <li>• NYSEIDA Staff has engaged in numerous interconnection conversations with DER trade associations (i.e. NYSEIA), individual project developers, the Joint Utilities, and research organizations studying interconnection.</li> <li>• Program focus and research activities will be informed by REV proceedings and participating stakeholder viewpoints. Routine engagement with Public Service Commission (PSC) staff will continue to align program focus with current public policy goals.</li> </ul>
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9.1.4 Theory of Change

<b>Technology Opportunities and Barriers Addressed</b>	<p><b>Technology Opportunities</b></p> <p>Advance the methods, technology, and industry knowledge that will reduce the cost, complexity, and time to interconnect DER including:</p> <ul style="list-style-type: none"> <li>• Identification and adoption of innovative technologies to support DER interconnection</li> <li>• Adoption of smart inverters in NY</li> <li>• Development and deployment of new technologies and analysis methods to support optimization of available distribution system capacity</li> </ul> <p><b>Barriers Addressed</b></p> <ul style="list-style-type: none"> <li>• Current grid is unable to support the increase and effective use of DER at the level necessary to support meaningful reduction in greenhouse gas (GHG) emissions (i.e. State Energy Plan (SEP) emissions reduction goals). <ul style="list-style-type: none"> <li>○ System limitations and technical uncertainties have contributed to a significant backlog of DER (photovoltaic) applications pending with the utilities</li> </ul> </li> <li>• Validation of technology performance is critical to obtain acceptance by an engineering and standards-based utility culture focused on safety and reliability.</li> <li>• Degree of innovation being tested and/or applied is insufficient across the utilities and sharing of knowledge is not yet sufficient to accelerate pace of innovation.</li> </ul>
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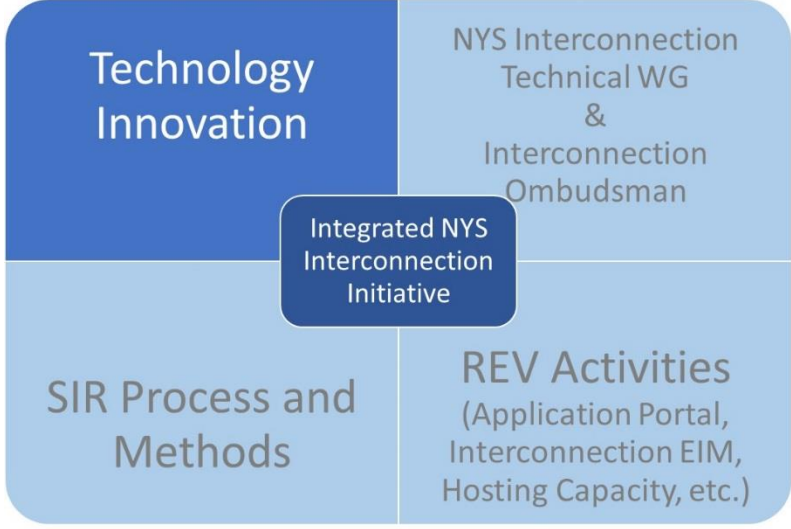
	<ul style="list-style-type: none"> <li>• Achievement of public policy goals for distributed resources (e.g., NY-SUN, combined heat and power (CHP), energy storage) is severely constrained by the long timelines, complexity, and cost of the present interconnection process.</li> <li>• Analysis of the gaps in technologies/tools for developing advanced grid systems is incomplete.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If support is provided for validation and performance testing, then new DER technology and interconnection methods will be more readily accepted by the engineering and standards-based utility culture focusing on safety and reliability.</li> <li>• If research and product development are focused on problems common to all electric utilities, then adoption of innovation with respect to DER integration can be accelerated.</li> </ul>
<b>Activities (Resources)</b>	<ul style="list-style-type: none"> <li>• <i>Grid Modernization Roadmap</i> - Retain services of a consultant(s) to conduct a comprehensive analysis of gaps and roadmap for advancement of technology and tools necessary to support an advanced, integrated, high-performing grid that enables seamless valuation and control of non-wires alternatives. <ul style="list-style-type: none"> <li>○ Use gaps assessment to guide program research (priorities/work streams/use cases, budget, and schedule) necessary to accelerate pace of development of technologies, applications and utility capabilities.</li> <li>○ Using the gaps assessment, collaborate with NYPA and the utilities, as necessary, on the development of a laboratory (AGILe) in New York to support grid modernization research that compliments plans and capabilities of the Grid Modernization Laboratory Consortium Testing Network.</li> </ul> </li> <li>• <i>Interconnection Support</i> - Engage leading research/consulting organizations, in consultation with DPS and NYSERDA, to support the work of the NYS Interconnection Technical Working Group and the activities of the NYS Interconnection Ombudsmen at DPS and NYSERDA.</li> <li>• <i>Technology Innovation Funding Opportunities</i> - Provide funding opportunities in support of leading-edge utilities and grid technology companies to leverage existing capabilities and validate distribution system technologies and practices that support increased penetration of DER. <ul style="list-style-type: none"> <li>○ Issue competitive solicitations for project proposals across the continuum of technology development (early stage research/ proof of concept, product engineering and testing, and product demonstration) guided by needs assessment(s).</li> <li>○ Issue RFPs or other calls for proposals jointly with utilities and DPS to addresses interconnection challenges common across the system.</li> </ul> </li> <li>• <i>Fostering Coordination</i> - Develop a model for collaboration between NYSERDA, NYPA, DPS, NY utilities, and grid tech companies to ensure the Grid Modernization road mapping work is compatible with and complimentary to the development of Distribution System Implementation Plans (DSIP) consistent with PSC rules. Include in such process a mechanism to ensure various REV (REV Connects), NY Prize and CEF initiatives are integrated/aligned to make optimal use of time and resources.</li> <li>• Continue weekly meetings with DPS and NYPA regarding DER interconnection challenges in NY and continued leadership in the NYS Interconnection Technical Working Group.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (Q3 2016)</u></p> <ul style="list-style-type: none"> <li>• Contract with a consultant to conduct a comprehensive analysis of technology gaps and create a roadmap for advancement of the technology and tools necessary to support an advanced, integrated, high-performing grid in New York.</li> </ul>



	<p><u>Milestone 2 (Q2 2017)</u></p> <ul style="list-style-type: none"> <li>• Grid Modernization Roadmap complete.</li> </ul> <p><u>Milestone 3 (Q3 2016)</u></p> <ul style="list-style-type: none"> <li>• Contract with one or more research/consulting organizations to provide technical knowledge and support for DER interconnection improvements in New York.</li> </ul> <p><u>Milestone 4 (Q3 2016)</u></p> <ul style="list-style-type: none"> <li>• Launch a competitive program funding opportunity focused on innovation to reduce DER interconnection burdens in New York State.</li> </ul> <p><u>Milestone 5 (Q1 2017)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees selected under the funding opportunity focused on innovation to reduce DER interconnection burdens in New York State.</li> </ul> <p><u>Milestone 6 (Q3 2016)</u></p> <ul style="list-style-type: none"> <li>• Implement a model for collaboration between NYSERDA, NYPA, DPS, NY utilities, and grid tech companies to ensure the Grid Modernization road mapping work is compatible with and complimentary to the development of DSIPs consistent with PSC rules.</li> </ul>
<b>Goals Prior to Exit</b>	<p>The potential impact of this initiative includes faster, less costly, and less restrictive DER interconnection process and requirements that support DER deployment while maintaining the safety and reliability of NY’s electric grid.</p> <p>Goals prior to exit include lower cost and increased certainty in the DER interconnection process and requirements that support DER deployment while maintaining the safety and reliability of NY’s electric grid as evidenced by:</p> <ul style="list-style-type: none"> <li>• Statewide technical standards applicable to DER interconnection that utilize leading-edge processes, study methods, and innovative technical solutions</li> <li>• DER interconnection framework that addresses all DER applications in a timely manner which does not present a barrier to project deployment</li> <li>• Reduction of the frequency and magnitude of utility infrastructure upgrade costs</li> </ul>

9.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<p>This Program is an integral part of the single coordinated endeavor by NY State to address DER interconnection. As such, it is synchronized with manifold other activities both internal and external to NYSERDA. [see figure below]</p> <ul style="list-style-type: none"> <li>• Many program funded activities involve one or more utilities.</li> <li>• Program activities are closely integrated with the NYS Interconnection Technical Working Group (including representation from DPS, NYPA, PSEG-LI, all NY investor owned utilities, and from the DER development community).</li> <li>• Program activities are closely integrated with the work of NY’s Interconnection Ombudspersons.</li> <li>• Program activities are closely integrated with NY Department of Public Service interconnection policy and activities.</li> <li>• Program activity has direct correlation with REV success. Program will leverage its relationship with PSC staff for the purposes of program planning and execution with the regulated utilities.</li> </ul>
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	<ul style="list-style-type: none"> <li>Program activities will consider and support related key policy imperatives, including REV Connects, REV Pilots, and NY Prize to ensure optimal leverage of time and resources.</li> </ul> 
<p><b>Utility Interventions in Target Market</b></p>	<p>Utilities are, to a great extent, a customer of the program. Interventions are being driven by REV proceeding as well as increasing DER interconnection applications. Program activity with utility collaboration is expected to focus on accelerating development and use of technologies to accelerate DER interconnection and facilitate DER integration into the electric grid.</p>

9.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Innovation & Research Budget Allocation – Commitment Basis**

Commitment Budget	2016	2017	2018	Total
Direct Incentives and Services	\$3,800,000	\$2,500,000	-	\$6,300,000
Total	\$3,800,000	\$2,500,000	-	\$6,300,000

**Table 2: Annual Expenditures Projection**

Expenditures	2016	2017	2018	2019	Total
Total	6%	42%	44%	8%	100%

### 9.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

Indicators <sup>3</sup>		Baseline (Before/Current)	2019 (Cumulative)	2022 (Cumulative)
Activity/Outputs	Number of studies, demonstrations, and product development projects initiated	0	8	8
	Number of studies, demonstrations, and product development projects completed	0	8	8
	Number of companies or other partnerships with established manufacturers or grid technology companies supported	0	8	8
Outcomes	Adoption of lower cost methods and devices <sup>4</sup> to reduce DER interconnection costs	0	4	8
	Reduction in average cost to achieve interconnection for DG projects larger than 500 kW <sup>5</sup>	TBD	15%	25%
	DER deployment cost savings (via reduced interconnection costs)	TBD	\$18,000,000	\$30,000,000

In addition to the above outcomes, NYSERDA will also assess the following broad outcome:

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<sup>3</sup> TBD denotes that NYSERDA requires more data to quantify baseline/market metrics to the degree needed to measure against in the future. Baseline measurements of key market indicators are anticipated to occur soon following initiative approval and NYSERDA will update the information in this table as the information becomes available, which is anticipated within 9-12 months of initiative approval. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>4</sup> Lower cost methods and devices are advances such as alternatives to direct transfer trip, less expensive grounding bank configurations, and less restrictive flicker mitigation criteria.

<sup>5</sup> Progress and Performance Outcome data related to DER interconnection cost and is anticipated to be collected by NY-Sun, the NYS Department of Public Service, and the NY Joint Utilities. Collection of this data began in late 2015 and early 2016, depending on the source. The accuracy and completeness of this data are key to enabling assessment of this metric.

- Faster, less costly, and less restrictive DER interconnection process

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 4. Direct Impacts**

Primary Metrics <sup>6</sup>		2016	2017	2018	2019	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MMBtu Annual	-	-	-	-	-
	MMBtu Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-	-
Customer Bill Savings Annual (\$ million)		-	-	-	-	-
Customer Bill Savings Lifetime (\$ million)		-	-	-	-	-
Private Investment <sup>7</sup> (\$ million)		\$3.35	\$2.48	-	-	\$5.825

**Table 5. Annual Projected Initiative Participation**

	2016	2017	2018	2019	Total
Participants <sup>8</sup>	3	5	5	-	13

### 9.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	This initiative is not being delivered on a fuel neutral basis.
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<sup>6</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Benefits are rounded to three significant figures. Totals may not sum due to rounding.

<sup>7</sup> This investment strategy is focused on facilitating DER interconnection and the nature of the projects anticipated to be undertaken is likely to yield modest direct private investment. Additional indirect private investment is anticipated from increased DER deployment as a result of reduced interconnection burdens.

<sup>8</sup> Note that total number of participants is greater than the number of companies supported as shown in Table 3. It is anticipated that some projects funded in this investment plan will involve project teams consisting of more than one organization (i.e. a grid technology company, DER project developer, and utility).

9.1.9 Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• NYSERDA will monitor standard activity/output metrics including number of projects initiated and completed by type, private investment, etc.</li> <li>• For any new technology developments launched under the program, on a yearly basis, NYSERDA staff and contractor will reassess the Technology and Commercialization Readiness Levels for each project in the portfolio.</li> <li>• NYSERDA will conduct peer reviews of certain projects based on need. Examples – technical impasse, pivot point, critical milestone.</li> <li>• NYSERDA will assess the portfolio of projects annually regarding goals, metrics, outputs and outcomes.</li> </ul> <p><b><u>Market Evaluation/Impact Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of market success.</li> <li>• Baseline measurements of key performance indicators will occur soon following initiative approval and will address indicators including DER interconnection and deployment costs. In these areas, NYSERDA will first utilize existing information (e.g., solar balance of system cost study data including interconnection cost) and will fill gaps in information as needed and feasible for appropriate baselining.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change will occur once the initiative is underway. Sources of data include public and commercially available data, and primary data collection through surveys of key market actors.</li> <li>• A broad demonstration project impact evaluation will include projects from this area and will examine benefits of demonstration projects, rate of and success factors associated with replication, and benefits of replication projects. Cost savings will be quantified as part of this study.</li> </ul>
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## 9.2 High Performing Grid

### 9.2.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• The electric distribution system is operated using older planning tools/algorithms that do not utilize real time data and computational capacities of advanced technologies. Much of the system is operated using relatively passive electro-mechanical devices that do not dynamically communicate with themselves and concern themselves with managing one-way flow of power.</li> <li>• Per the U.S. Department of Energy’s (DOE’s) Grid Modernization Multi-Year Program Plan (MYPP), “The current business-as-usual trajectory for the electricity industry will not result in a timely transition to a modern grid.” Just as the MYPP recognizes a need for additional grid modernization activities, there is a further need for New-York specific research, development, and deployment to accelerate the realization of benefits for all New Yorkers.</li> <li>• Systematic improvements to grid investments and operations are possible at all levels of the grid and are an essential element of the transformation of the grid and related market development envisioned by the Reforming the Energy Vision (REV) initiative. In particular, the adoption of new technologies will:             <ul style="list-style-type: none"> <li>○ help maximize the integration of distributed energy resources (DER), including electric vehicles (facilitating de-carbonization of the transportation sector over time)</li> <li>○ improve overall system-wide efficiency in electricity delivery and use</li> <li>○ enable the development of community-based energy systems such as microgrids, that can improve environmental performance while building energy system resiliency to climate change induced weather-events</li> </ul> </li> <li>• As alternatives are developed, validation of technology performance is critical to obtain acceptance by an engineering and standards-based utility culture focused on safety and reliability. Under-utilized and emerging interconnection technologies need to be validated before they will be accepted for use in the electric grid.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• An Innovation Program is envisioned to support and accelerate modernizing NY’s electric grid. The overall Grid Modernization Innovation Program is comprised of two investment plans (two Phases), each guided by the goals for reforming the electric system under REV. Under the Phase I, DER Interconnection investment plan<sup>9</sup>, investments are being targeted at technical advances to facilitate interconnection of DER that are currently seeking interconnection in NY.</li> <li>• This investment plan represents Phase II of the Grid Modernization Innovation Program, which targets investments on a broader range of grid modernization topics including innovation in: sensing, communications, controls and diagnostics, advanced materials and dynamic management of the grid and its interconnected elements, notably DER. In Phase II, the program expects to support innovation in:             <ul style="list-style-type: none"> <li>○ sensing, communications, diagnostics and controls that optimizes the coordination of system elements in performing essential system management functions</li> <li>○ development of advanced/improved products and materials that address physical asset protection and improved functionality</li> <li>○ grid visualization, communication and control systems associated with the interoperability of DER in a manner that can be commonly applied across the utilities and promote consumer-based 3rd party engagement in the energy system that is sought through REV.</li> </ul> </li> </ul>

<sup>9</sup> The DER Interconnection investment plan received approval from the NYS Department of Public Service on May 23, 2016.

	<ul style="list-style-type: none"> <li>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: High Performing Grid” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>The program will make investments in research that accelerates realization of an advanced, digitally enhanced and dynamically managed electric grid that results in more efficient asset utilization (e.g., reduced operating margins, reduced power demands, reduced energy losses) and improved reliability, and resiliency to climate change induced weather-events. Such investments are also expected to build the capacity to integrate and expand the use of clean distributed energy resources thereby increasing customer engagement in energy markets on a customer-by-customer basis, as well as enabling the development of community-based energy systems such as microgrids.</li> <li>Program activity will focus on de-risking technologies by sharing in the costs of developing and testing technologies and new products, demonstrating their value to the utility system and supporting the development of standards for their application<sup>10</sup>. This will enable accelerated adoption and use by utility and non-utility market actors. The program will: <ul style="list-style-type: none"> <li>Invest across the full continuum of the innovation chain including research, proof of concept, product engineering, prototyping, modeling/simulation, and field testing.</li> <li>Develop tools that can be used by multiple market participants to accelerate the build out of a modern and dynamically operated electric grid.</li> <li>Leverage expertise residing across all innovation programs and apply rigor to all decisions on project funding at all stages in the continuum emphasizing acceleration of technological readiness and commercialization.</li> <li>Involve stakeholders to the fullest extent practical in the planning and execution of the investment plan. This includes executing efficient mechanisms to sharing learnings with utilities and other critical stakeholders for the purpose of driving adoption.</li> </ul> </li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<p>The attributes of an advanced, dynamically managed electric grid are all essential components of any comprehensive strategy to achieve the goals of the New York State Energy Plan, Clean Energy Standard, and REV initiative:</p> <ul style="list-style-type: none"> <li>greenhouse gas (GHG) reduction (by integrating clean distributed energy resources and reducing system losses)</li> <li>improved affordability (by reducing needed capital investment in grid infrastructure)</li> <li>greater use of clean distributed energy resources, including renewables (by creating a more flexible grid that can better integrate clean DER)</li> <li>Improved service quality and resiliency (by increased outage avoidance and faster restoration times via advanced fault location, isolation, and service restoration)</li> </ul>

9.2.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market is electric transmission and distribution systems.
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<sup>10</sup> Smart grid cyber security issues are not a specific focus area in this Investment Plan because there are existing considerable research efforts addressing this topic by the National Institute of Science and Technology and U.S. Department of Energy’s Grid Modernization Multi-Year Program Plan.

<p><b>Market Participants</b></p>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Electric utilities (investor-owned(IOU), municipals, cooperatives and authorities)</li> <li>• Grid-technology companies</li> <li>• Medium to large original equipment manufacturers (OEM) with a corporate strategic interest in renewable and/or distributed energy resources</li> <li>• DOE/National Laboratories</li> <li>• Universities and contract research organizations (e.g., Electric Power Research Institute (EPRI))</li> <li>• New York State Smart Grid Consortium</li> <li>• DER project developers</li> <li>• Startup companies introducing cutting edge products and services.</li> <li>• New York Independent System Operator (NYISO)/New York Reliability Council</li> <li>• Standards setting committees</li> </ul>
<p><b>Market Readiness</b></p>	<ul style="list-style-type: none"> <li>• As a result of REV, utility investments in the grid are shifting to more clean, resilient, and affordable energy technologies and solutions which require performance validation to gain acceptance prior to widespread deployment by the utilities. Some of these technologies and solutions are likely common to multiple utilities and therefore offer the opportunity for collaboration to accelerate learnings and ultimately deployment.</li> <li>• New York is home to several leading higher-learning institutions with faculty and curriculum focused on electric power systems and renewable energy. Involvement of these types of institutions can support early stage/proof-of-concept research in smart grid technologies, as well as build workforce capabilities.</li> <li>• The DOE is engaging in similar research, development, and demonstration activities consistent with its Grid Modernization-MYPP. Robust engagement with DOE, additional research institutions, and other leading states in the area of grid modernization will be necessary to promote the setting of reasonable expectations with respect to goals, technology readiness and timing to adoption. Such engagement is also anticipated to result in better leverage of funding.</li> </ul>
<p><b>Customer Value</b></p>	<ul style="list-style-type: none"> <li>• Full realization of the potential benefits from grid modernization will require investment of large sums of capital over many years. NYSERDA intervention is expected to contribute to acceleration of these investments by de-risking research with utilities and product innovators and through varied technology transfer mechanisms, stimulating changes in public policy and regulation.</li> <li>• Estimates have the benefits from overall grid modernization in New York approaching \$13 billion net of around \$7 billion in costs. While not all of these benefits will be solely and directly attributed to advances in grid modernization (some will require additional policy interventions such as monetization of environmental externalities), the realization of most of these benefits will be highly correlated with the development and adoption of advanced grid technologies and systems. An example of some of the potential benefits that could be realized through NYSERDA interventions include: <ul style="list-style-type: none"> <li>○ Increased system-wide efficiency could result in a 3-5% reduction in electric delivery system losses or savings of 5-10m tons of carbon over 25 years (at a \$20/ton value, benefits could be as high as \$0.2 billion over 25 years). This same reduction in electric deliveries produces consumer savings on the order of \$40m annually in avoided purchases.</li> <li>○ Use of advanced distribution system management tools can improve avoidance of customer outages and facilitate more rapid restoration resulting in customer savings ranging between \$1to 2 billion including reduced costs for utilities to respond to major storms.</li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>○ Nearly 4,000,000 MWH of PV production by 2020 and approximately 2 million tons of GHG reduction annually. If valued at \$20/ton this equates to about \$40M annually in GHG reductions. Based on a 20-year device life, approx. 40 million tons of reduced GHG is achievable.</li> <li>○ Advanced technologies allow existing bulk power system assets to be better utilized increasing system deliverability of clean energy resources on the order of 1,000 MW resulting in reduction of 2m tons of GHG annually.</li> <li>○ Cumulative GHG reductions associated with increased renewable energy deliverability measured in tens of millions of tons.</li> </ul>
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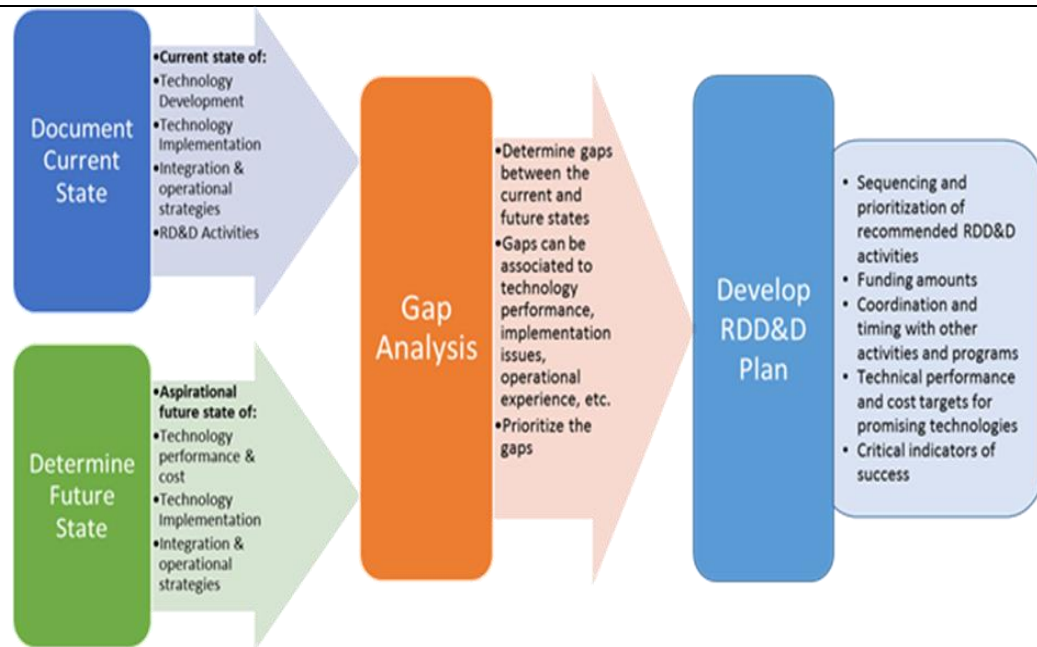
9.2.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement</b></p>	<ul style="list-style-type: none"> <li>● Program focus and research activities included within this initiative have been, and will continue to be informed by REV proceedings and participating stakeholder viewpoints. Routine engagement with the New York State Department of Public Service (DPS) will continue to align program focus with current public policy goals.</li> <li>● NYSERDA will participate on working groups and advisory groups organized under the REV proceeding, as necessary, use subject matter experts and consultants to gain insights on gaps in grid innovation and build program offerings that are sharply focused on high priority research.</li> <li>● NYSERDA conducted interviews with utilities and academia in late 2015 and completed a market characterization assessment of its Grid Modernization program in early 2016 using industry expert panelists that provided insight into developing program priorities contained in this plan. NYSERDA has commenced outreach to grid-technology companies to gather intelligence on priority research and will gather additional intelligence on research priorities via direct participation in the formal utility-led Distribution System Implementation Planning (DSIP) stakeholder engagement process, including the Road Mapping project (see Activities below).</li> <li>● NYSERDA will continue to refine an approach for collaboration between NYSERDA, the New York Power Authority (NYPA), DPS, New York utilities, NYISO, and grid tech companies to ensure the Grid Modernization work is compatible with and complimentary to the development of DSIPs, consistent with New York State Public Service Commission (PSC) rules, and focused on needs specific to New York utilities. Collaboration will continue to build mechanisms ensuring various REV (REV Connects), NY Prize and CEF initiatives are integrated/aligned to make optimal use of time and resources.</li> </ul>
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9.2.4 Theory of Change

<p><b>Technology Opportunities and Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>● Achievement of public policy goals for distributed resources including microgrids (e.g., NY SUN, combined heat and power, energy storage), and for improving overall electric grid system investment and operating efficiencies is constrained by the lack of real-time intelligence on system conditions, device and integrated system control functions, power quality concerns, and limitations in physical properties of existing system equipment. Validation of technology performance is critical to obtain acceptance by an engineering and standards-based utility culture focused on safety and reliability. These challenges will be addressed by exploring technology development in areas such as, but not limited to, the following:</li> </ul>
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	<ul style="list-style-type: none"> <li>○ Research, development, and demonstration of lower cost sensors, higher-speed, lower cost processing of condition monitoring data to facilitate accurate power system state estimation, optimized power flow management, and real-time verification and control functions that are essential to multi-party transactions envisioned under REV.</li> <li>○ Advancement of high-resolution aerial imaging technologies and advanced diagnostics of weather and other data relevant to outage prediction and recovery operations to accelerate outage predictions, damage assessments and restoration and improve vegetation management practices.</li> <li>○ Enhancing the physical properties of materials and advanced engineering of equipment and component systems such as through scaling of superconducting technologies to distribution system applications and developing conductor coatings that mitigate environmental degradation to cable performance to develop more resilient, energy-efficient and higher-performing system components.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>● If real-time data acquisition and computational capacities become commonplace, and DER control technologies meet performance goals, then: <ul style="list-style-type: none"> <li>○ distribution systems could be designed and operated more intelligently and less conservatively, delivering energy more efficiently while maintaining high levels of reliability and increasing resiliency</li> <li>○ the capability of determining the optimal locations for, and usable magnitude of DER on the distribution system will no longer be an impediment to increased clean DER and improvements in utilization of the power system.</li> </ul> </li> <li>● If research and product development can focus on problems common to all electric utilities, then adoption of innovation can be accelerated.</li> <li>● If capabilities of DOE and federal laboratories (and possibly complimentary in-state laboratory capability currently under development) can be leveraged, then development and adoption of promising grid modernization technologies/practices will be accelerated.</li> <li>● If validation and performance testing is completed, then acceptance of new technology and methods can be accelerated within the engineering and standards-based utility culture focused on safety and reliability.</li> </ul>
<b>Activities</b>	<p><b><i>Apply Results of Grid Modernization Roadmap</i></b> – Apply the results of the Grid Modernization Roadmap work, expected to be completed mid-2017 through Phase I of the Grid Modernization Investment Plan (DER Interconnection Investment Plan), to the design of program funding opportunities aimed at developing an advanced, integrated, high-performing grid as follows:</p> <ul style="list-style-type: none"> <li>● Use gaps assessment to guide program research (priorities/work streams/use cases, budget, and schedule) necessary to accelerate pace of development of technologies, applications and utility capabilities.</li> <li>● Using the assessment, collaborate with NYPA and the utilities, as necessary, on the development of the Advanced Grid Innovation Laboratory for Energy (AGILE) in New York to support grid modernization research that compliments plans and capabilities of the DOE’s Grid Modernization Laboratory Consortium Testing Network.</li> </ul>



Source (Electric Power Research Institute)

**Technology Innovation Funding Opportunities** - Provide funding opportunities in support of New York utilities and technology companies to leverage existing capabilities, validate distribution system technologies and practices, create innovative products and applications and otherwise facilitate the development of an advanced high performing integrated electric grid. Begin work as early as 3rd quarter 2016 or as guided by outcomes from the road mapping exercise, voice of customer research, and the DSIP process. This work will compliment, and not be duplicative of, the funding opportunities provided under the Phase I DER Interconnection Investment Plan which focus specifically on facilitating DER interconnection.

- Issue broad competitive solicitations for project proposals across the continuum of technology development (early stage research/ proof of concept, product engineering and testing, and product demonstration).
- Issue requests for proposals (RFPs) or other targeted calls for proposals, potentially in collaboration with New York utilities and DPS, to addresses challenges common across the system (e.g., large smart grid system/REV pilots).
- Specific tech-to-market support will be provided to technology developers to help drive the commercialization of new innovations. Support will be tailored specifically to help early-stage companies navigate the typical channels to market. As applicable, projects will be required to involve no less than one utility; in most cases, multiple utility involvement will be incentivized.

**Securing Technical Services Assistance**- Issue a solicitation to a field of subject matter experts and/or consultants covering areas of key interest to the program; or leverage applicable expertise acquired through other NYSERDA procurement processes for securing technical assistance to support program activities.

**Technology Transfer Mechanisms**- Develop more formalized mechanisms (e.g., platforms, periodic workshops, symposia) to transfer best practices/lesson learned from technology development activities. Technology transfer activities will be two-way conduits for information flow thereby providing ongoing “voice of customer” information

	<p>back to the Program. Communicate these use cases to influence policy makers/regulators/utilities on the technical merits of such innovation and the business models such innovation can enable while pushing adoption/uptake by other utilities. Showcase the benefits of advanced grid management systems in managing and enabling increased DER integration using “best-in-class” utility smart grid applications. Begin work in 3rd quarter 2016.</p>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue broad competitive solicitation #1 guided by utility DSIP baseline filings and completed stakeholder market research (e.g., demonstrations, product development, engineering analyses and studies) in technology, tools and methods aimed at dynamic management of the electric grid.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the broad competitive solicitation #1.</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>• Identify near-term opportunities for applied research that are aligned with utility supplemental DSIPs and the NY Grid Modernization Roadmap.</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue targeted competitive solicitation #2 guided by utility supplemental DSIPs and the NY Grid Modernization Roadmap.</li> </ul> <p><u>Milestone 5 (2017)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the targeted competitive solicitation #2.</li> </ul> <p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>• Identify technology gaps necessary to support community grid operation based on completed NY Prize Stage 2 evaluations.</li> </ul> <p><u>Milestone 7 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue broad competitive solicitation #3.</li> </ul> <p><u>Milestone 8 (2018)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the broad competitive solicitation #3.</li> </ul> <p><u>Milestone 9 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue targeted competitive solicitation #4.</li> </ul> <p><u>Milestone 10 (2019)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the targeted competitive solicitation #4.</li> </ul> <p><u>Milestone 11 (2019)</u></p> <ul style="list-style-type: none"> <li>• Issue broad competitive solicitation #5.</li> </ul> <p><u>Milestone 12 (2019)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the broad competitive solicitation #5.</li> </ul> <p><u>Milestone 13 (2020)</u></p>

	<ul style="list-style-type: none"> <li>• Issue targeted competitive solicitation #6.</li> </ul> <p><u>Milestone 14 (2020)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the targeted competitive solicitation #6.</li> </ul> <p><u>Milestone 15 (2020)</u></p> <ul style="list-style-type: none"> <li>• Issue broad competitive solicitation #7.</li> </ul> <p><u>Milestone 16 (2021)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the broad competitive solicitation #7.</li> </ul> <p><u>Milestone 17 (2021)</u></p> <ul style="list-style-type: none"> <li>• Issue targeted competitive solicitation #8.</li> </ul> <p><u>Milestone 18 (2021)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the targeted competitive solicitation #8.</li> </ul> <p><u>Milestone 19 (2022)</u></p> <ul style="list-style-type: none"> <li>• Issue broad competitive solicitation #9.</li> </ul> <p><u>Milestone 20 (202621)</u></p> <ul style="list-style-type: none"> <li>• Enter into contracts for projects awarded under the broad competitive solicitation #9.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• Due to the nature of this work, the long lead time associated with adoption, and society’s fundamental need for an efficient and reliable electric grid, NYSERDA envisions continuing to pursue innovation this space for many years. Research priorities will shift as various High Performing Grid functionality are realized and new or improved grid functionalities are identified.</li> <li>• By accomplishing the following, NYSERDA aims to accelerate the realization of customer benefits: <ul style="list-style-type: none"> <li>○ Demonstrated capability of advanced technologies, materials, tools and methods to dynamically manage the electric grid through several larger-scale pilot projects and/or through coordinated but disaggregated innovation pilots across the incumbent utilities.</li> <li>○ Product development and demonstration projects linked to technology gaps impeding realization of the REV future state and advancing industry standard setting processes to facilitate regulator and industry acceptance, promote support for utility research, development, and demonstration (RD&amp;D) investment and accelerate adoption/application.</li> </ul> </li> <li>• NYSERDA will exit or cease funding specific areas of technology development and shift focus once scalability is confirmed and a value proposition to customers, regulators and policy makers can be validated/demonstrated.</li> </ul>

9.2.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• NYSERDA will participate on working groups and advisory groups organized under the REV proceeding, as necessary, use subject matter experts and consultants to gain insights on gaps in grid innovation, and build program offerings that are sharply focused on utility-centric, high priority research.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Most program offerings require the engagement/support by at least one utility; NYSERDA funding for product field demonstration or pilot projects almost always require the formal engagement by at least one utility and preferably more. NYSERDA has solid working relationships with each utility, meet regularly with their utility RD&amp;D counterparts and will continue to use this discovery process to design program offerings and technology transfer mechanisms that are of most value to this customer base. NYSERDA expects to develop and implement more effective technology transfer processes collaboratively with the utilities to accelerate technology innovation/adoption (see Activities/Resources).</li> <li>• Program activities will be designed and executed to compliment REV development activities. NYSERDA will continue to regularly engage with counterparties at DPS for the purposes of program planning and execution with the regulated utilities (see Activities/Resources). DPS will be able to review draft competitive offerings, and participate directly in the evaluation and ranking of proposals for funding to support project investment recommendations that are reasonably aligned with REV and State Energy Plan objectives.</li> <li>• NYSERDA will leverage its activities with those under REV (e.g., REVConnect), NY Prize and other Innovation program activity (e.g., Building Innovations) to preclude duplication of services making effective use of resources.</li> </ul>
<p><b>Utility Interventions in Target Market</b></p>	<ul style="list-style-type: none"> <li>• New York utilities do not have offerings to the market in this area. Furthermore, utilities are a key direct customer of this initiative and therefore are considered part of the target market.</li> <li>• New York utilities currently have modest internally funded research and development activities related to grid modernization.</li> <li>• New York utilities are routinely solicited by vendors looking to test and/or deploy new technology. Much of this new technology is not sufficiently field tested or de-risked to allow for widespread application on the utility grid.</li> <li>• New York utilities participate to varying degrees in broader grid modernization research programs with the DOE (Grid Modernization Lab Consortium) and the EPRI that often are designed to serve a multitude of utility interests across differing jurisdictions and markets; so, unique interests of concern to New York may not be entirely addressed.</li> </ul>

9.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 6. The annual expenditure projection is included in Table 7. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

The budget presented below cannot be viewed in isolation from planning and regulatory actions that will be undertaken by the utilities and other market actors as the industry transformation called on by REV proceeds. Research priorities are expected to evolve with and be supportive of utility grid modernization plans as such become defined more formally via the REV proceeding. The budget shown below is representative of a long-term view of needed investment in grid

modernization that is characterized by long-lead times to develop, test and deploy REV enabling technologies. Specific research initiatives and associated costs will be identified and informed by the Roadmap; by needs outlined in the initial DSIPs and biennial updates to the DSIPs; and by progress in rolling out REV-enabling technology. Decisions on research priorities, types of investments, and timing and funding levels will be subject to revision accordingly.

**Table 6: Annual Innovation & Research Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
Research and Technology Studies/Development/Demos	\$5,000,000	\$18,350,000	\$20,350,000	\$16,700,000	\$16,700,000	\$16,700,000	\$16,700,000	\$110,500,000
<b>Total</b>	\$5,000,000	\$18,350,000	\$20,350,000	\$16,700,000	\$16,700,000	\$16,700,000	\$16,700,000	\$110,500,000

**Table 7: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
<b>Total</b>	0%	5%	13%	14%	16%	16%	16%	11%	6%	2%	100%

### 9.2.7 Progress and Performance Metrics

Table 8 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 8. Initiative Specific Metrics**

Indicators <sup>11</sup>		Baseline	2019 <sup>12</sup> (Cumulative)	2022 (Cumulative)
Activity/ Outputs	# of studies, demonstrations, and product development projects initiated	0	52	109
	# of studies, demonstrations, and product development projects completed	0	19	67
	# of companies supported, # utility touchpoints/ partnerships, other partnerships with established manufacturers or grid technology companies <sup>13</sup>	0	31	64
Outcomes	Increased system (enterprise level) intelligence used to predict failures, disruptions and support self-healing (reduced outages).	Partial application of model centric-advanced distribution management system (ADMS) controls at two NY utilities.	Complete/nearly complete use of model centric-ADMS controls at one NY utility.	Use of model centric-ADMS controls at two or more NY utilities.
	Number of technologies/systems that enable system condition prediction and restoration being tested	Early stage products available; no noteworthy pilots underway in NY.	One new condition monitoring technology and restoration process management product/service being piloted or in use at a utility.	Multiple condition monitoring and restoration process services in use.
	Data collected through advanced sensing devices used to dynamically manage power flow and other system elements.	Partial functionality in existing / planned near-term pilot.	Full functionality power flow optimization pilot at one utility.	Full functionality power flow optimization in use at one or more NY utilities.
	Advanced control/integration of DER in the electric grid	Few research projects of modest scope in NY.	One full functionality pilot project with integration of multiple DER sources.	Integration of DER as standard practice at one or more NY utilities.

<sup>11</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>12</sup> Number of expected projects supported is based on historical mix of project type and cost sharing requirements. Should it be decided to fund one or more large demonstration projects with higher NYSERDA cost sharing, the mix of project types supported would likely change materially reducing the number of projects.

<sup>13</sup> Participants are duplicative (utilities and academia participate concurrently on different projects) so number attempts to identify the number of unique project participants.



The benefits shown in Table 9 and Table 10 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Due to the nature of these activities, estimating energy savings impacts at this stage is difficult because the specific technologies that will be support are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

**Table 9. Direct Impacts**

Primary Metrics <sup>14</sup>		2016	2017	2018	2019	2020	2021	2022	TOTAL
Energy Efficiency	MWh Annual								
	MWh Lifetime								
	MMBtu Annual								
	MMBtu Lifetime								
	MW								
Renewable Energy	MWh Annual								
	MWh Lifetime								
	MW								
CO2e Emission Reduction (metric tons) Annual									
CO2e Emission Reduction (metric tons) Lifetime									
Customer Bill Savings Annual (\$ million)									
Customer Bill Savings Lifetime (\$ million)									
Private Investment (\$ million) <sup>15,16</sup>		\$13	\$53	\$59	\$52	\$44	\$44	\$44	\$309

**Table 10. Annual Projected Initiative Participation**

	2016	2017	2018	2019	2020	2021	2022	Total
Participants <sup>17</sup>	6	9	9	7	11	11	11	64

<sup>15</sup> This reflects direct project co-funding and does not reflect private investments associated with full deployment of new solutions by the utility industry. Such private investment could be substantial.

<sup>16</sup> Historically, this area of investment has had several successful product development-to-commercialization ventures resulting in leveraging private sector funding at 4 or 5 times public sector funding. While it is possible for this to continue into the future, predicting such leverage is speculative; particularly in a capital-intensive industry like the electric utility industry. Companies that can effectively participate in product development in this capital intensive, engineering and standards driven market space are typically well capitalized and have internally developed intellectual property needing only demonstration to the utilities. The leveraging depicted in Table 4 reflects recent trends in funding a greater share of engineering studies and demonstration projects and less product development projects, biasing the private leverage expectations lower. This mix of projects can change and a single large product development project success could result in greater private sector leverage.

<sup>17</sup> Participants are duplicative (utilities and academia participate concurrently on different projects) so number attempts to identify the number of unique project participants

## 9.2.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>This initiative is not being delivered on a fuel neutral basis.</li> </ul>
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## 9.2.9 Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>NYSERDA will monitor standard activity/output metrics including number of projects initiated and completed by type, private investment, etc.</li> <li>For any new technology developments launched under the program, on a yearly basis, NYSERDA staff and contractors will reassess the Technology and Commercialization Readiness Levels for each project in the portfolio.</li> <li>NYSERDA will conduct peer reviews of certain projects based on need. Examples – technical impasse, pivot point, critical milestone.</li> <li>NYSERDA will assess the portfolio of projects annually with an advisory panel and with senior NYSERDA management regarding goals, metrics, outputs and outcomes.</li> </ul> <p><b><u>Market Evaluation/Impact Evaluation</u></b></p> <ul style="list-style-type: none"> <li>Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of market success.</li> <li>Baseline measurements of key performance indicators will occur within one year of initiative approval and will address key progress indicators such as the technologies/systems available that enable system condition prediction and restoration. In these areas, NYSERDA will first utilize existing information and will fill gaps in information as needed for appropriate baselining.</li> <li>Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change will occur once the initiative is underway. Sources of data include public and commercially available data, and primary data collection through surveys of key market actors.</li> <li>NYSERDA will also examine benefits and impacts of product development and demonstration projects.</li> </ul>
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## 9.3 Power Electronics Manufacturing Consortium

### 9.3.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• The field of power electronics has been in a vibrant state of change driven by the introduction of new wide-bandgap<sup>18</sup> semiconductor materials that can operate at higher voltages, frequencies and temperatures.</li> <li>• These materials, including silicon carbide (SiC), have unique properties that, when deployed in a variety of end-use products, can deliver significant performance improvements at the device level, and thus yield more energy savings than their counterparts manufactured on silicon (Si).</li> <li>• These materials are already used in the production of a variety of devices and components and have been for many years. However, existing manufacturing is limited to 3" (75mm) to 4" (100mm) wafers, which are expensive and therefore have limited market adoption.</li> <li>• An important piece of the economic equation for all semiconductor manufacturing involve fabricating on increasingly larger wafer diameters. Such scaling allows for substantial drops in cost, thus driving market adoption.</li> <li>• Given the unique skill sets required to manage the manufacturing on SiC, historically the manufacturing lines (known in the industry as a "fabs") in existence have been "captive" to the device maker, meaning they are not open for use by other device makers.</li> <li>• Part of the market maturation involves the creation of open fabs to support the emergence of new products from new entrants to the market, which in turn fosters greater competition and speeds up market adoption.</li> <li>• To facilitate this maturation, in 2014, the Governor announced the PEMC as an innovative consortium that would leverage industry and government investments to demonstrate the next generation of advanced power electronic semiconductor process capabilities and manufacturing. This is a unique collaboration comprised of GE Global Research working with SUNY Poly CNSE.</li> <li>• The PEMC has established a SiC foundry with equipment capable of manufacturing devices on either 6" (150mm) or 8" (200mm) wafers based on GE's baseline metal-oxide-semiconductor field-effect transistor (MOSFET) flow. This dual wafer size capability enables necessary size scaling for lower cost while mitigating the technical risks of larger wafer availability.</li> <li>• The facility is currently in a prototype phase and PEMC recently celebrated the initial patterning of its first 150mm wafer. This initiative will progress the facility to full production capacity, and will require many additional wafers be run and the process be further developed to qualify the facility for full production.</li> <li>• PEMC is also actively engaging strategic partners to become corporate partners and have the option to use the processing capabilities of the power electronics process line for their own device design, the consortium's baseline MOSFET flow, or a hybrid design.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• This strategy will bring the PEMC facility from its current pilot state to full qualification as a state-of-the-art SiC fab while supporting the consortium's business planning and development activities. It is intended and expected that</li> </ul>

<sup>18</sup> "Band Gap" is a physical property of a semi-conductor material that determines, in part, the electrical performance of the material. "Wide band gap" materials (e.g. SiC) typically have higher electrical conductivity and thermal advantages than non-wide band gap materials (e.g. Silicon)

	<p>NYSERDA's investment in PEMC will further encourage funding from additional corporate members and sponsors across multiple disciplines.</p> <ul style="list-style-type: none"> <li>• Funding will be provided to PEMC via the SUNY Research Foundation for: <ul style="list-style-type: none"> <li>○ Converting all the individual tools currently onsite into a fully integrated and operational fabrication facility</li> <li>○ Procuring the requisite hardware and software needed to ensure that the facility adheres to the strict quality control standards (ISO-9001 compliance)</li> <li>○ Supporting labor costs associated with officially certifying the fabrication line to required industry standards (ACE-Q101)</li> <li>○ <u>Developing a business plan for the consortium to reach self-sufficiency</u></li> </ul> </li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Support the establishment of a state-of-the-art production capacity SiC power electronics process line that enables the industry to drive down the costs of technologies implemented with SiC materials and devices, and accelerate time to market and facilitate earlier technology adoption</li> <li>• Continue the engagement of SiC materials, device manufacturers and equipment suppliers and the consortium members in New York State.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The 2015 New York State Energy Plan calls out innovation and research and development (R&amp;D) to “enable New York to accelerate adoption of tomorrow’s energy solutions within the State’s energy system, while also attracting jobs and investments to New York as a global capital for clean tech.”</li> <li>• The Plan also calls on NYSERDA to continue its investments in energy innovation to help reduce greenhouse gas (GHG) emissions, improve energy affordability, system resiliency, and consumer choice. It also recognizes the value of “strategic investments in statewide multi-use assets”.</li> <li>• This research and development effort offers significant opportunity to advance the performance and efficiency of a wide variety of power electronics equipment for the power industry in general and specifically for smart grid, advanced buildings, and electric vehicle infrastructure which are key components of the advanced energy system of tomorrow.</li> </ul>

9.3.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market for this initiative is suppliers of materials, devices and equipment serving renewable energy and electric vehicle power electronics applications.
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Semiconductor related startups and entrepreneurs</li> <li>• Large semiconductor manufacturers</li> <li>• Established corporates that have a strategic focus on semiconductors and/or have a related intellectual property portfolio</li> <li>• Universities that have a known focus on advanced computing, materials science, power electronics, and semiconductors</li> <li>• Established original equipment manufacturers (OEMs) with an interest in new materials and techniques related to semiconductors</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• NY-PEMC is focusing on devices for medium to high voltage power electronics applications where SiC give significant advantages over present Si-based technology.<sup>19</sup></li> </ul>

<sup>19</sup> Power SiC 2016: Materials, Devices, Modules, and Applications licensed from Yole Développement

	<ul style="list-style-type: none"> <li>• Semiconductor devices built upon silicon are approaching performance and size limits. New materials are needed to continue improving these devices. Silicon Carbide materials are an alternative to traditional silicon and offer the potential for much greater performance. These materials have existed as an alternative for approximately 20 years, but because of reliability and cost issues they have captured a very small share of the semiconductor market. The total SiC device market is expected to grow rapidly from \$200M in 2015 to over \$600M in 2021 with a compound annual growth rate (CAGR) of 20%. The CAGR for transistor devices such as the MOSFETS that will be produced in the NY-PEMC facility is expected to be 42% during this period.</li> <li>• Market interest in the continued research and development of SiC materials and their applications is significant. Several very established leaders in the semiconductor industry have expressed interest or have already committed to participating in the PEMC.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Full implementation and qualification of the 200mm/150mm production line will allow the power electronics industry to achieve or surpass yield and manufacturability indices achieved on the previous 100mm platform. This will drive down the costs of technology implemented with SiC materials and devices, accelerating time to market and enabling earlier technology adoption.</li> <li>• High penetration of SiC technology in medium and high voltage applications has the potential to reduce power conversion losses by over 50% in end-use products such as inverters. Alternative power system designs utilizing SiC devices will also significantly reduce cost and weight of the other components in the system. This will in turn reduce the amount of energy needed to manufacture and transport these devices, providing additional benefits in mobile applications such as electric vehicles by reducing vehicle weight and extending drivable range.</li> <li>• The establishment of a Consortium provides a path for transferring the enabling SiC technology to its members, along with access to billions of dollars' worth of established investments in the Albany NanoTech complex including cleanrooms, analytical and testing services.</li> <li>• The NY-PEMC SiC foundry will support the educational and scientific mission of SUNY Polytech by giving faculty and students access to a commercially relevant, cutting-edge manufacturing facility.</li> <li>• This initiative will also provide an opportunity for regional economic impact through the continued work with industry, infrastructure suppliers, and equipment manufacturers in New York.</li> </ul>

9.3.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement and Customer Discovery</b>	<ul style="list-style-type: none"> <li>• NYSERDA, SUNY-POLY, GE have had ongoing engagement with stakeholders along the supply chain for semi-conductor devices. The reaction to the work envisioned has been universally positive and has reinforced the need for this type of work and this intervention.</li> <li>• Significant interest in participation and the resulting work has been expressed by system integrators, original equipment manufacturers, utilities, and other entities that could act both as supplier and customer of innovations developed at the center.</li> <li>• Ongoing stakeholder engagement has been identified as a specific task that will be undertaken as part of this effort, and the expectation is that those already involved will be leveraging their significant relationships with the market participants.</li> </ul>
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### 9.3.4 Theory of Change

<p><b>Technology Opportunities and Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Cost of SiC devices are too high due to wafer size limitations</b> Currently available SiC transistors made on 100mm or 150mm wafers is up to five times higher than silicon-based transistors. Qualifying and certifying 200mm process equipment will allow for substantial drops in cost, enabling greater market adoption and an associated energy savings.</li> <li>• <b>SiC manufacturing lines in existence are not open to other device manufacturers.</b> Management of the manufacturing requires unique skill sets and the cost to establish lines can be prohibitive to new market entrants. Creation of an open fab will support the emergence of new products and increase competition. Connecting the open fab with SUNY Poly will ensure that the facility will stay current with the latest developments in materials research and applied technology.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA invests in PEMC, then funding from additional corporate members and sponsors across multiple disciplines will be invested.</li> <li>• If NYSERDA supports the establishment of a state-of-the-art production capacity SiC power electronics process line, then the costs of technology implemented with SiC materials and devices will be reduced, time to market will be accelerated, and earlier technology adoption will be facilitated.</li> </ul>
<p><b>Activities</b></p>	<p>NYSERDA will contract with the SUNY Research Foundation to advance the PEMC. Upon doing so, NYSERDA will oversee the following PEMC activities:</p> <p><u>Fab Operations and High-Volume Manufacturing Readiness.</u> Prepare fab infrastructure to support process and module development, device manufacturing, and on technical operations of the SiC fab.</p> <ul style="list-style-type: none"> <li>• Complete procurement of the necessary spare parts, equipment upgrades or modifications, service and maintenance agreements, and insurance to meet the project objectives.</li> <li>• Complete procurement and setup of the necessary supplies and services, processes gases and chemicals, and other consumables to support process and module development and line qualification.</li> <li>• Operate the line with process and operational discipline for manufacturing, including establishing statistical process control of the equipment and processes.</li> <li>• Monitor and maintain a baseline for surface metal contamination, foreign material, and for critical unit processes supporting the health of the line.</li> </ul> <p><u>Design, Process Startup, and Qualification of the Baseline MOSFET Flow.</u> Plan, execute, and validate the technology transfer of the SiC MOSFET baseline.</p> <ul style="list-style-type: none"> <li>• Develop and demonstrate a SiC MOSFET process flow with device performance and on-wafer reliability specifications that meet or exceed industry standards.</li> <li>• Provide baseline flow documentation, including: detailed top-down and cross-section schematics with critical dimensions and permissible variation, identified materials, and quantitative metrics of key performance indicators.</li> <li>• Fabricate at least 3 successive batches of SiC MOSFET wafers to demonstrate that the line is ready for qualification.</li> <li>• Provide statistical process control data and in-line test electrical data validating and verifying the baseline.</li> </ul>

	<p><u>Manufacturing Qualification.</u> Implement a quality management system, complete ISO-9001 certification, and complete AEC-Q101 qualification.</p> <ul style="list-style-type: none"> <li>• Plan and implement a quality management system for the design and manufacture of power electronics devices that meets or exceeds the requirements for ISO-9001 certification.</li> <li>• Stress test the devices until they are shown to meet or exceed the requirements for automotive grade discrete semiconductors.</li> </ul> <p><u>Expand participation in PEMC.</u> Attract partner companies and customers, and sustain fabrication capacity demand required for the fab to be self-sufficient.</p> <ul style="list-style-type: none"> <li>• Develop a sustainable business plan to produce wafers at a competitive market price, including: mission, vision, structure and membership model, technical strategy, and business and marketing strategy.</li> <li>• Execute on business plan to secure increased participation in PEMC in the form of high value joint development projects and/or capacity allocations for early user hardware or manufacturing of parts.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Business plan completed and submitted to NYSERDA for review.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Consortium expanded to include at least 4 partner companies/customers.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with SUNY Research Foundation for the PEMC.</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• Production capacity fab infrastructure complete.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>• Three successive batches of SiC MOSFET wafers fabricated.</li> </ul> <p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>• Quality management system implemented.</li> </ul> <p><u>Milestone 7 (2018)</u></p> <ul style="list-style-type: none"> <li>• ISO-9001 certification complete.</li> </ul> <p><u>Milestone 8 (2018)</u></p> <ul style="list-style-type: none"> <li>• AEC-Q101 qualification complete.</li> </ul> <p><u>Milestone 9 (2018)</u></p> <ul style="list-style-type: none"> <li>• Consortium expanded to include at least 8 partner companies/customers.</li> </ul> <p><u>Milestone 10 (2019)</u></p> <ul style="list-style-type: none"> <li>• Consortium expanded to include at least 12 partner companies/customers.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• Complete the design, process startup, and qualification of the baseline SiC MOSFET flow for the SiC fab.</li> <li>• Implement a quality management system, complete ISO-9001 certification for design and manufacture of power electronics devices, and complete AEC-Q101 qualification of the SiC MOSFET device.</li> <li>• Develop the consortium and business model for PEMC, attract partner companies and customers, and sustain fabrication capacity demand required for the fab to be self-sufficient.</li> </ul>

### 9.3.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• The innovative devices that will be made possible through the work envisioned at the PEMC will directly contribute towards the ability of utilities to achieve innovation goals under REV and beyond. Power electronics is one application for SiC semi-conductors, and higher performance devices will enable a more flexible, responsive, and efficient grid.</li> <li>• As such, utilities will be an important stakeholder involved in the work being completed at the PEMC and it is envisioned that their involvement and contributions will be sought on an ongoing basis. As part of NYSERDA’s ongoing role with PEMC, staff will regularly engage utilities to identify performance requirements and other specifications for next generation devices. This intelligence will be provided to PEMC to ensure that the consortium is aware of and working toward meeting utility related requirements.</li> <li>• Once fully operational, PEMC will feature quick-prototyping capabilities. This will enable utilities (and other participating stakeholders) to quickly assess whether newly developed materials and devices will meet identified performance requirements. Given this ability, this should further increase the level of utility coordination and engagement.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• The New York utilities do not have any similar offering to this market</li> </ul>

### 9.3.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only. In addition to the budget outlined below, \$6.3 million in statutory funding is being used to supplement CEF funding for this initiative.

**Table 61: Annual Innovation & Research Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
Research and Technology Studies/Development/Demos	\$16,700,000	\$-	\$-	\$16,700,000
Total	\$16,700,000	\$-	\$-	\$16,700,000

**Table 12: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
<b>Total</b>	60%	40%	0%



### 9.3.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically.

While the PEMC initiative is being co-funded with CEF and statutory funding, the table below indicates the metrics associated with the CEF funding only, which were allocated proportionately to the CEF and statutory budgets being committed.

**Table 17. Initiative Specific Metrics**

Indicators <sup>20</sup>		Baseline (Before/Current)	2019 (Cumulative)	2022 (Cumulative)
Activity/Outputs	Number of consortium members	2	12	18
	Number of discrete development projects initiated <sup>21</sup>	0	5	9
Outcomes	In-field demonstrations of devices/systems developed at PEMC	0	3	8
	# of products commercialized	0	5	15
	Revenue for PEMC SiC Process Line	0	\$25M	\$45M
	Production Capacity <sup>22</sup>	0	4,500	11,000

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. Due to the nature of the activities of this initiative, estimating energy savings impacts at

<sup>20</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>21</sup> Development projects refer to development of SiC wafer and subsequent fabrication of full systems and/or projects to pursue new potential applications for SiC materials

<sup>22</sup> Production Capacity refers to the volume of wafers able to be produced at the facility. Full production capacity is expected to be 15,000 wafers per year by 2022, with additional capacity being added as market demand increases

this stage is difficult. However, energy savings supported by this initiative will be tracked and reported.

**Table 18. Direct Impacts**

Primary Metrics <sup>23</sup>		2017	2018	2019	TOTAL
Energy Efficiency	MWh Annual				
	MWh Lifetime				
	MMBtu Annual				
	MMBtu Lifetime				
	MW				
Renewable Energy	MWh Annual				
	MWh Lifetime				
	MW				
CO2e Emission Reduction (metric tons) Annual					
CO2e Emission Reduction (metric tons) Lifetime					
Customer Bill Savings Annual (\$ million)					
Customer Bill Savings Lifetime (\$ million)					
Private Investment (\$ million)		\$47.0	\$33.0	\$-	\$80.0

**Table 19. Annual Projected Initiative Participation**

	2017	2018	2019	Total
Participants <sup>24</sup>	4	4	4	12

### 9.3.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>This initiative is not being delivered on a fuel neutral basis.</li> </ul>
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### 9.3.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA's approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p>
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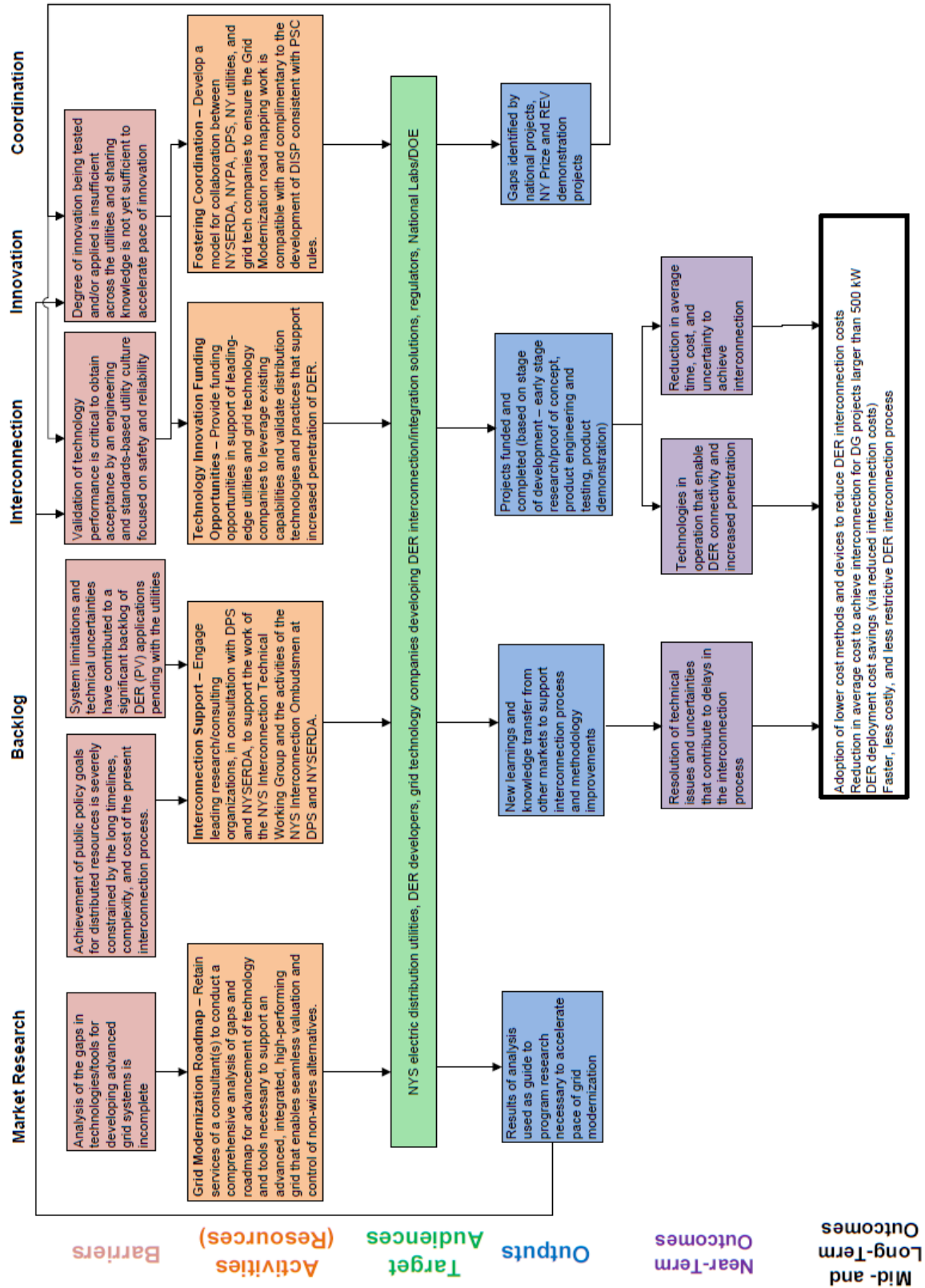
<sup>23</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Benefits are rounded to three significant figures. Totals may not sum due to rounding.

<sup>24</sup> Participants are defined as the number of consortium members.

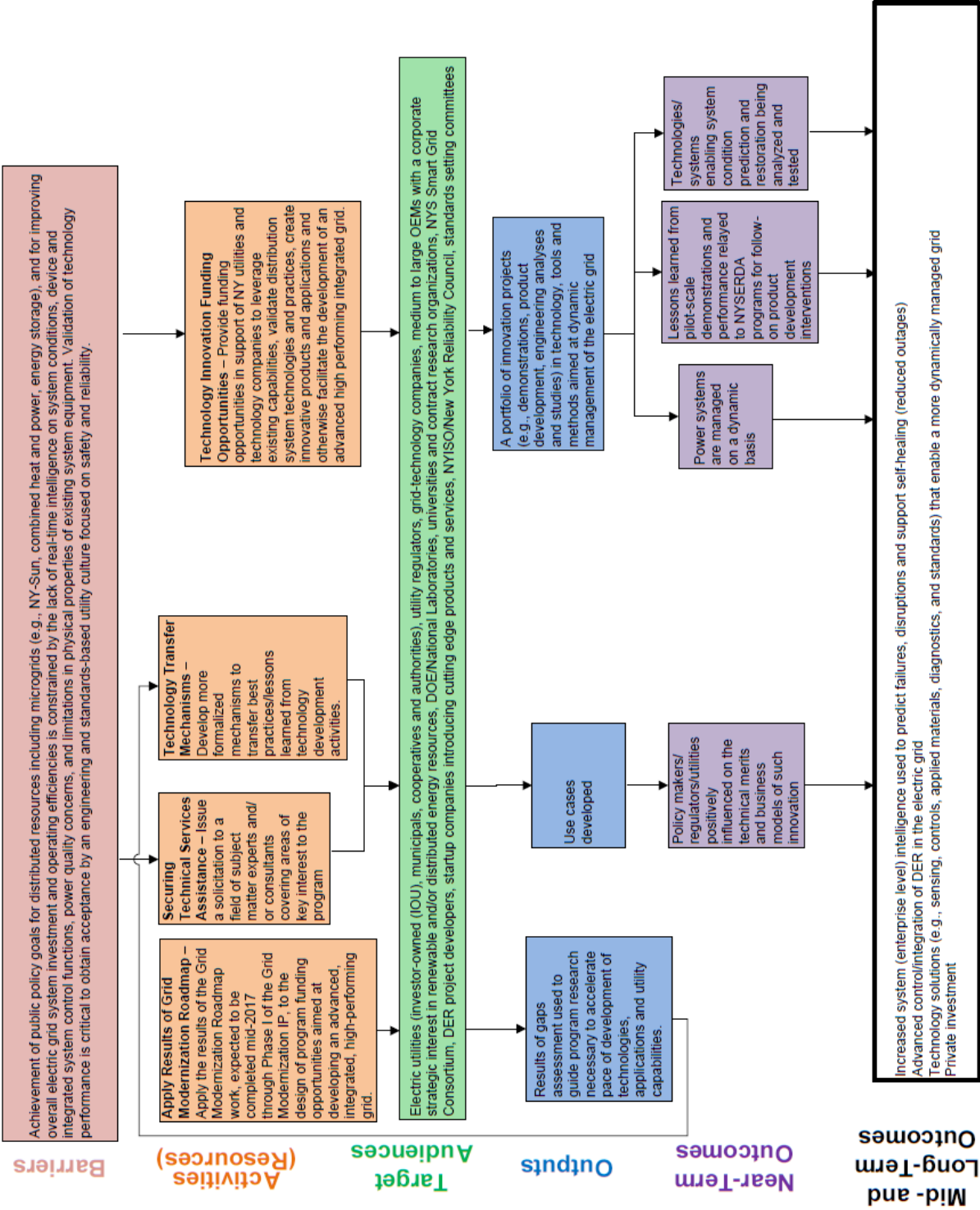
	<ul style="list-style-type: none"><li>• Tracking of standard activity metrics including, but not limited to: number of consortium members and number of products commercialized.</li><li>• In addition, NYSERDA will review progress towards specific contract milestones identified in the PEMC work scope to ensure initiative progresses as planned. Performance toward these contract milestones will be tracked and payments will be made upon completion.</li></ul>
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# Appendix A – Logic Models

## LOGIC MODEL: Grid Modernization – Phase I: DER Interconnection



# LOGIC MODEL: High Performing Grid



## Appendix B – Investment Plan Review Supplement<sup>1</sup>

### Distributed Energy Resource Interconnection

#### Results to Date – Metrics

The Distributed Energy Resource Interconnection Initiative is far exceeding its participant target, while falling somewhat short of its private investment cumulative current target through Q2 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	-	-	*	-	*	-
	Annual Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Lifetime Dollars	-	-	-	-	-	*	-	*	-
	Dollars	-	-	-	\$3.63	\$3.63	\$4.59	79%	\$5.83	62%
Participants	Participants	-	-	-	11	11	6	183%	13	85%

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA's current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	2022 Target	June 2017 Actual
		(Cumulative)	(Cumulative)	(Cumulative)
# of studies, demonstrations, and product development projects initiated	0	8	8	10
# of studies, demonstrations, and product development projects completed	0	8	8	0
# of companies or other partnerships with established manufacturers or grid technology companies supported	0	8	8	7

<sup>1</sup> As this report includes performance through Q2 2017 and the Power Electronics Manufacturing Consortium Initiative was not accepted until Q3 2017, that initiative is not included herein.

### Performance Against Key Milestones

The Distributed Energy Resource Interconnection Initiative has made good progress toward its current milestones and is working toward completing its one remaining 2017 milestone which is anticipated to be completed in Q3 2017. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
✓	Q3 2016	Contract with a consultant to conduct a comprehensive analysis of technology gaps and create a road map for advancement of the technology and tools necessary to support an advanced, integrated, high-performing grid in New York.
✓	Q3 2016	Contract with one or more research/consulting organizations to provide technical knowledge and support for DER interconnection improvements in New York.
✓	Q3 2016	Launch a competitive program funding opportunity focused on innovation to reduce DER interconnection burdens in New York State.
✓	Q3 2016	Implement a model for collaboration between NYSERDA, NYPA, DPS, NY utilities, and grid tech companies to ensure the grid modernization road mapping work is compatible with and complimentary to the development of DSIPs consistent with PSC rules.
✓	Q1 2017	Contract with awardees selected under the funding opportunity focused on innovation to reduce DER interconnection burdens in New York State.
	Q2 2017	Grid Modernization Roadmap complete.

### Plan for Continuation/Modification/Termination

The Distributed Energy Resource Interconnection initiative has been progressing following the activities and timeline laid out in the investment plan. There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

## High Performing Grid

### Results to Date – Metrics

The High Performing Grid Initiative is significantly exceeding its cumulative current target through Q2 2017 for participants but is, at this time, falling short of its target (57%) for private investment. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2022)	% of Total Target through Initiative Completion (2022)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	-	-	*	-	*	-
	Annual Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Lifetime Dollars	-	-	-	-	-	*	-	*	-
	Dollars	-	-	-	\$22.47	\$22.47	\$39.50	57%	\$309.00	7%
Participants	Participants	-	-	-	27	27	11	245%	64	42%

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA's current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	2022 Target	June 2017 Actual
		(Cumulative)	(Cumulative)	(Cumulative)
# of studies, demonstrations, and product development projects initiated	0	52	109	11
# of studies, demonstrations, and product development projects completed	0	19	67	0
# of companies supported, # utility touchpoints/ partnerships, other partnerships with established manufacturers or grid technology companies	0	31	64	8



### Performance Against Key Milestones

The High Performing Grid Initiative has made some progress toward its current milestones. However, completion of two current milestones associated with issuing the second targeted solicitation is likely to be delayed until 2018. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
✓	2017	Issue broad competitive solicitation #1, guided by utility Distributed System Implementation Plan (DSIP) baseline filings and completed stakeholder market research (e.g., demonstrations, product development, engineering analyses and studies) in technology, tools, and methods aimed at dynamic management of the electric grid.
✓	2017	Enter into contracts for projects awarded under the broad competitive solicitation #1.
	2017	Identify near-term opportunities for applied research that are aligned with utility supplemental DSIPs and the NY Grid Modernization Roadmap.
	2017	Issue targeted competitive solicitation #2, guided by utility supplemental DSIPs and the NY Grid Modernization Roadmap.
	2017	Enter into contracts for projects awarded under the targeted competitive solicitation #2.

### Plan for Continuation/Modification/Termination

The High Performing Grid initiative has been updated to reflect 2016 actual values for the committed budget and benefits, and to provide updated private investment estimates. Milestone 6 in the investment plan was also updated to correct the stage of NY Prize evaluations referenced. Following these modifications, the initiative will continue as planned. As noted above, the initiative is lagging in achieving the private investment target and milestones associated with the second solicitation. NYSERDA anticipates achieving this target and milestone in early 2018, and as such there are no plans to modify the investment plan at this time. NYSERDA will continue to monitor progress and assess if any changes are needed in the next annual review.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

Clean Energy Fund Investment Plan:  
Innovation Capacity and Business  
Development Chapter

Portfolio: Innovation & Research

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan:  
Innovation Capacity and Business Development Chapter

Revision Date	Description of Changes	Revision on Page(s)
May 20, 2016	Original Issue	Original Issue
January 26, 2017	Added Manufacturing Corps Initiative	Multiple
November 1, 2017	<p><u>Cleantech Startup Growth</u>: Added additional activities, and associated budget and benefit. Tables 1-5 were updated to reflect these changes. Updated the baseline values in Table 3 to reflect latest data available and adjusted cumulative targets accordingly to incorporate baseline findings.</p> <p><u>Manufacturing Corps</u>: Shifted timing of budget and benefits to reflect slower than anticipated start to the program and to remove milestone for a Request for Qualifications (RFQL) that is no longer applicable. Tables 6-10 have been updated accordingly. Updated baseline values in Table 3 to reflect latest data available and adjusted cumulative targets accordingly to incorporate baseline findings.</p> <p><u>Novel Business Models and Offerings</u>: Added initiative.</p>	Multiple

## 10 Innovation Capacity and Business Development

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NYSERDA seeks to support a vibrant, self-sustaining clean energy technology innovation ecosystem that will accelerate the growth and scale of new business ventures focused on serving the clean energy market in New York State. Activities are designed to catalyze innovative and entrepreneurial activity in the State from the ideation stage and accelerate it toward the development of solutions to meet market-defined clean energy technology needs and opportunities, while also providing the support infrastructure and mentorship to build the entrepreneurial and management skills necessary to increase the likelihood of the commercial success of the ventures. The broad objectives of the program include:

- Translate innovations from research institutions into market-validated and scalable businesses.
- Increase the number and success rate of early-stage clean energy technology companies in New York State.
- Improve the pool of human capital available to companies and grow the number of successful clean energy technology entrepreneurs in New York State.
- Stimulate and connect quality investment opportunities at New York State clean energy technology companies with the investment community.
- Mobilize the capital necessary to commercialize innovative clean energy technologies and bring them to market.
- Accelerate commercialization of clean energy technologies through the manufacturing stage and to a first customer.
- Facilitate strategic relationships between companies and investors, corporate partners, and customers.

The first initiative described in this Chapter is the Cleantech Startup Growth initiative, which is targeted at accelerating the time to market for early-stage clean energy technology companies by providing support and assistance across the State through this portfolio of complementary activities which address the largest market gaps facing the entrepreneurs that are looking to grow these companies. These gaps include, but are not limited to, access to capital, executive expertise, strategic relationships, and business support. This initiative has been updated to add new components to assist clean energy technology companies, with associated budget and benefits.

The second initiative described in this chapter, Manufacturing Corps, is aimed at increasing private capital investment in manufacturing build-out and scale-up activities through a series of offerings geared toward optimizing the manufacturability of clean energy technologies and supporting progression through early manufacturing activities. This initiative has been modified to provide additional clarity to the broad outcomes being tracked, update the logic model to more clearly align with the language in the investment plan, and shift the timing of the budget and benefits to reflect the current program schedule, as well as to remove a milestone that will no longer be completed. The milestone has been removed because its goal was achieved in a prior milestone so it was no longer necessary to pursue.

The third initiative described in this chapter, Novel Business Models and Offerings, will support promising companies in making business model investments to accelerate the deployment of these models. NYSERDA will provide these companies financial resources to assist with validation, implementation, and scaling of new business models and offerings

Program investments and activities will be informed via ongoing engagement with customers, subject matter experts, and other stakeholders.

# 10.1 Cleantech Startup Growth

## 10.1.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"><li>• Early stage companies and research institutions frequently face difficulty transferring technologies and research findings to the broader commercial market. Universities across New York State are conducting a significant amount of energy-related research and development that does not transition to the market through scalable business enterprises or corporate partnerships. Additionally, many early-stage companies commercializing clean energy technologies continue to face a difficult path to market due to the capital intensity and long lead times associated with the cleantech commercialization process, which makes fundraising increasingly difficult for these companies.</li><li>• Clean energy technology (cleantech<sup>1</sup>) companies are typically founded and managed by entrepreneurs who have superior technical skills, but lack the business and commercialization experience that is often necessary to successfully bring a new technology or product to market.</li><li>• Incubators, which are organizations that help entrepreneurs and new ventures develop and grow, can dramatically improve the success rate of these early-stage companies by providing access to executive mentoring and other resources. Proof-of-Concept Centers (POCC), can perform a similar function for universities, by helping to turn cleantech research into a successful business.</li><li>• Most early-stage cleantech companies do not have the resources to compete with entrenched players in the market. Rather than acting as competitors, these established companies can serve as potential corporate or strategic partners that help smaller companies get to market much more efficiently, both in terms of time and capital.</li><li>• Engaging customers and making the first commercial sale can be a challenge for early-stage companies because the firm and the product they are selling does not have a track record of performance.</li><li>• NYSERDA founded its incubator program in 2009 to foster the viability and growth of the state’s most promising cleantech startup companies by providing ready access to investors, mentors, development partners, and commercialization resources.</li><li>• Through the end of 2015, NYSERDA has invested \$13.8 million in six cleantech incubators from Buffalo to Long Island, which in turn have supported 141 cleantech companies that have attracted more than \$215 million in private capital and created 980 high-quality jobs.</li><li>• For example, Ephesus Lighting, a graduate of NYSERDA’s cleantech incubator in Central New York, has achieved great success with its light emitting diode (LED) arena and stadium lighting systems, which have been used in the Super Bowl and other high-profile sports and entertainment venues. The company was recently acquired by Eaton, a global Fortune 500 power management company, and continues to operate in Syracuse.</li><li>• In addition, United Wind, a graduate of NYSERDA’s cleantech incubator in New York City, has raised \$4 million from the NY Green Bank and secured an</li></ul>
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<sup>1</sup> Here, cleantech refers to hardware technologies, software technologies, services, or processes that broadly reduce energy consumption and greenhouse gas emissions and/or enable the transition to a sustainable and clean energy economy by increasing the supply of renewable energy and distributed energy resources, improving the efficiency of energy utilization at the consumer and industrial scale, improving the processes and systems that use energy, or more effectively enabling energy solutions to permeate the marketplace.

	<p>additional \$200 million in project equity capital to expand its small wind lease program for distributed wind projects throughout the United States.</p> <ul style="list-style-type: none"> <li>• NYSERDA’s six cleantech incubators continue to provide needed commercialization and business development support to startup companies across New York State.</li> <li>• A notable geographic gap in NYSERDA’s prior cleantech startup growth program offerings was in the Southern Tier, an 11-county, 8,605 square mile region which is largely unserved by NYSERDA’s existing cleantech incubators.</li> <li>• NYSERDA’s POCC initiative began in 2013. As of the second quarter of 2017, 33 new companies have been formed, over \$10 million in private investment has been raised, and around \$9 million in non-NYSERDA grant support has been awarded to these companies.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• This initiative is a continuation of NYSERDA’s successful cleantech incubator strategy and will continue the evolution of the existing incubator program by making additional, competitively awarded funding available for cleantech incubators and ignition grants.</li> <li>• NYSERDA will launch a suite of interventions targeting companies that have previously received direct investments and or commercialization support. NYSERDA will: <ul style="list-style-type: none"> <li>○ Augment its successful cleantech incubator strategy by continuing to support the State’s top incubators for cleantech ventures and making additional, competitively awarded funding available for incubator client companies through ignition grants.</li> <li>○ Launch a portfolio of programs to mentor and coach the management teams of early-stage companies in order to strengthen their business skills and address strategic or tactical needs on a company-by-company basis.</li> <li>○ Coordinate engagement and outreach to investors, corporate and strategic partners, and initial customers to drive relationships with early-stage cleantech companies in New York State.</li> <li>○ Develop programs to improve the commercial readiness of early-stage cleantech companies and their ability to engage larger, more complex counterparties, including investors, corporate and strategic partners, and customers.</li> <li>○ Through the experiences of company participants<sup>2</sup> in this initiative, develop and deploy a marketing and communications strategy to increase the awareness of opportunities to build cleantech businesses and promote the high-value services available within New York State that will help entrepreneurs succeed.</li> </ul> </li> <li>• NYSERDA will build on the initial success of the POCC initiative with the addition of activities that will: <ul style="list-style-type: none"> <li>○ Increase program awareness across New York State academic institutions.</li> <li>○ Leverage existing innovation and entrepreneurship programs.</li> <li>○ Provide a strategic connection to corporate partners and the broader investment community.</li> <li>○ Develop and implement programs to provide targeted support to POCC graduates.</li> </ul> </li> <li>• The individual activities that make up this initiative (listed in the Activities section) will focus on maximizing the flexibility of NYSERDA’s</li> </ul>

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<sup>2</sup> Here, company participants refer to any individual or entity that receives support from NYSERDA Innovation and Research activities.

	<p>commercialization resources and assets to meet the needs of entrepreneurs and companies in near real-time.</p> <ul style="list-style-type: none"> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Cleantech Startup Growth,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Increase the number of new cleantech businesses formed.</li> <li>• Accelerate the time to market for cleantech companies in New York State, which can range the full spectrum of hardware and software technologies in various stages of development.</li> <li>• Evolve the operations and programming of the cleantech incubators so they are more focused on client-driven milestones and quickly able to address client company needs.</li> <li>• Enhance the pool of human capital available to early-stage companies and increase the number of successful cleantech entrepreneurs.</li> <li>• Increase the ability of early-stage cleantech companies to raise seed and follow-on capital from investors, secure commercialization assistance from development partners, enter into strategic partnerships, and engage customers in New York State.</li> <li>• Provide greater visibility for NYSERDA-supported entrepreneurs and companies to potential investors, corporate and strategic partners, and customers.</li> <li>• Increase the awareness of NYSERDA’s program offerings and funding opportunities to drive more entrepreneurs, investors, corporate and strategic partners, and customers to the State.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The 2015 State Energy Plan indicates the need to accelerate market transformation via initiatives that identify, mitigate, and remove common barriers to clean energy technology deployment. This initiative directly impacts the State’s ability to deliver on these goals, which are unattainable without the innovative clean energy technologies being developed by early-stage companies that target the specific needs of customers in the State..</li> <li>• The 2015 State Energy Plan also calls for supporting the development of next-generation clean energy technology solutions and innovative business models. This initiative will increase the likelihood that technologies which can help New York State meet its energy and environmental goals will be commercialized. Examples of these that are currently being developed and commercialized by cleantech incubator client companies and graduates include LED lighting systems, advanced energy storage systems and components, energy efficiency solutions for buildings, smart grid and microgrid technologies, wind turbines and components, next-generation solar technologies, biofuels, and advanced transportation technologies.</li> <li>• The 2015 State Energy Plan also speaks to how research and development support will accelerate adoption of tomorrow’s energy solutions and attract jobs and investment in this area to New York State. In addition, it calls on use of this type of support to facilitate and reduce the cost of transitioning to a REV-based energy system. Going forward, the combination of the evolved cleantech incubators and ignition grants, as well as those focused on human capital and building relationships with investors, corporate and strategic partners, and customers, will have a foundational role to play in helping to achieve these goals.</li> </ul>



## 10.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<ul style="list-style-type: none"> <li>• The target market segment is entities working with and investing in seed-stage through growth-stage cleantech companies in New York State, as listed below.</li> <li>• The initiative is sector/technology agnostic for all areas of the clean energy and clean technology space.</li> </ul>
<b>Market Participants</b>	<p>Market Participants include:</p> <ul style="list-style-type: none"> <li>• Entrepreneurs and Early-Stage Companies, including incubator client companies</li> <li>• NYSERDA Innovation Program Partners, including but not limited to:             <ul style="list-style-type: none"> <li>○ NYSERDA Incubators                 <ul style="list-style-type: none"> <li>▪ Western New York – Directed Energy at University at Buffalo</li> <li>▪ Finger Lakes – Venture Creations at Rochester Institute of Technology</li> <li>▪ Central New York – Clean Tech Center at The Tech Garden</li> <li>▪ Capital Region – iClean at SUNY Polytechnic Institute</li> <li>▪ New York City – ACRE at New York University</li> <li>▪ Long Island – Clean Energy Business Incubator Program at Stony Brook University</li> <li>▪ Southern Tier – Southern Tier Clean Energy Incubator at Binghamton University</li> </ul> </li> <li>○ NYSERDA Proof-of-Concept Centers                 <ul style="list-style-type: none"> <li>▪ Upstate New York – NEXUS-NY at High Tech Rochester</li> <li>▪ Downstate New York – PowerBridgeNY at Columbia University</li> <li>▪ Downstate New York – PowerBridgeNY at New York University</li> </ul> </li> <li>○ NYSERDA Entrepreneurs-In-Residence Program</li> <li>○ NYSERDA Manufacturing Corps</li> <li>○ 76West</li> </ul> </li> <li>• Venture Development Organization Partners, including but not limited to:             <ul style="list-style-type: none"> <li>○ Advanced Research Projects Agency-Energy (ARPA-E)</li> <li>○ Empire State Development (ESD) Innovation Hot Spots and Certified Business Incubators</li> <li>○ ESD Centers of Excellence</li> <li>○ ESD Centers for Advanced Technology</li> <li>○ ESD Regional Technology Development Centers</li> <li>○ Launch NY</li> <li>○ Northeast Clean Energy Council</li> <li>○ Upstate Venture Association of New York</li> <li>○ Upstate Venture Connect</li> <li>○ Mentors, including but not limited to:</li> </ul> </li> <li>• Mentors, including but not limited to:             <ul style="list-style-type: none"> <li>○ Serial entrepreneurs</li> <li>○ Seasoned executives</li> <li>○ Subject matter experts</li> <li>○ Service providers, including but not limited to, attorneys, accounting and tax professionals, bankers, financial planning professionals, human resources professionals, and venture development professionals</li> </ul> </li> <li>• Investors, including but not limited to:             <ul style="list-style-type: none"> <li>○ Angel investors</li> <li>○ Venture capital funds</li> <li>○ Impact investors</li> <li>○ Family offices<sup>3</sup></li> </ul> </li> </ul>

<sup>3</sup> Family offices perform centralized management or oversight of investments, tax planning, estate planning, and philanthropic planning for high net worth individuals.

	<ul style="list-style-type: none"> <li>○ Foundations and philanthropic investors</li> <li>○ Government agencies</li> <li>○ Corporate and strategic investors</li> <li>● Corporate and Strategic Partners, including but not limited to: <ul style="list-style-type: none"> <li>○ Industrial companies</li> <li>○ Technology companies</li> <li>○ Utilities</li> <li>○ Suppliers</li> </ul> </li> <li>● Customers</li> <li>● Academic Institutions</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>● New York State’s clean energy market is steadily growing, especially given Reforming the Energy Vision (REV) and the aggressive energy and emissions goals that have been established. Early-stage cleantech companies have an important role to play in achieving the State’s clean energy goals and the investment community is essential to the continued growth of the sector and benefit greatly from the commercialization support and collaboration that is characteristic of incubators and venture development organizations.</li> <li>● Technical entrepreneurs develop technologies that support REV, but they frequently do not possess or have access to the business skills to turn technologies into products and products into companies to drive those products into the marketplace. Increasingly, entrepreneurs from all backgrounds recognize that they need additional support, as evidenced by the high demand for NYSERDA Innovation and Research programs such as incubators and entrepreneurs-in-residence. This commercialization support provided by NYSERDA significantly increases the probability of success for entrepreneurs, and leads to more early-stage companies deploying cleantech products in the State.</li> <li>● NYSERDA’s engagements with market actors indicate a strong need and opportunity for interventions that better connect NYSERDA-supported companies with investors, corporate and strategic partners, and customers. Corporate and strategic partners are particularly interested in business development opportunities with early-stage companies that NYSERDA and the greater investment community have validated.</li> <li>● As a result, the time is ripe for NYSERDA to continue and expand its investments in proof-of-concept centers, cleantech incubators, and ignition grants, through additional operational and programming support, including entrepreneur mentoring and activities that reduce risk for investors, corporate and strategic partners, and customers looking to engage cleantech entrepreneurs and early-stage companies in the State.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>● NYSERDA will continue to provide commercialization and business development support through the proof-of-concept centers, cleantech incubators, and ignition grants to entrepreneurs and early-stage companies in order to best position them to gain access to development partners and service providers, raise capital, commercialize new products, and generate revenue. The cleantech incubators do this by providing high-impact, targeted assistance that looks to improve the technical, market, and investor readiness of client companies.</li> <li>● This initiative will contribute towards the commercialization of cleantech products and mobilization of capital in a way that would most likely not occur in the absence of these programs.</li> <li>● For an entrepreneur or early-stage company who needs specific technical, commercialization, or management assistance, NYSERDA’s entrepreneurs-in-residence initiative provides specialized matchmaking to pre-screened, highly qualified mentors at no cost to the entrepreneur or company.</li> </ul>

	<ul style="list-style-type: none"> <li>• For an entrepreneur or early-stage company who has achieved initial success, this initiative provides an array of opportunities for them to identify, engage, and connect with investors, corporate and strategic partners, and customers.</li> <li>• For an investor who is looking for quality companies to invest in that can lead to profits, this initiative provides various formats for them to connect with entrepreneurs and companies that are validated by NYSERDA and others.</li> <li>• For an investor who is looking for other quality investment firms to potentially co-invest with in New York State, this initiative provides a series of different venues for them to meet and network with other investors with the same risk and return profiles.</li> <li>• For a corporate or strategic partner who is seeking companies in a specific technology vertical or stage of development, this initiative offers opportunities to identify and evaluate entrepreneurs and companies that fit its specifications.</li> <li>• For a customer who would like to assess new cleantech products or meet new potential vendors, this initiative provides the ability to find, meet, and engage qualified companies that meet their sourcing criteria.</li> <li>• It is expected that through the successful deployment of this set of initiatives, an investment leverage ratio of \$8<sup>4</sup> of outside investment secured by participant companies for every \$1 of NYSERDA funding will be achieved.</li> </ul>
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10.1.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement and Customer Discovery</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA has conducted extensive, ongoing customer discovery and market validation work to refine and evolve the activities that make up Cleantech Startup Growth. This has resulted in NYSERDA conducting more than 200 unique interviews with leading market actors, including entrepreneurs, investors, corporate and strategic partners, customers, and service providers.</li> <li>• The POCC initiative includes an external advisory board managed through third-party contractor. The advisory board is comprised of national leaders in energy research and entrepreneurship from corporate and academic institutions.</li> <li>• This set of initiatives has been designed to leverage best practices and lessons learned through a comprehensive customer discovery and market validation process with companies who have successfully scaled up their business, other leading public and private organizations across the country that support cleantech innovation and entrepreneurship, past NYSERDA programs, past and present Empire State Development programs, and the collective expertise of NYSERDA’s Innovation program partners and portfolio companies.</li> <li>• NYSERDA will continue to engage with market actors and stakeholders throughout the course of these initiatives. NYSERDA recognizes that ongoing customer discovery and market validation is needed to ensure the program adjusts to meet the dynamic needs of the marketplace.</li> <li>• Incubator directors report there are many entrepreneurs and startup companies that do not have the entrepreneurial and/or commercialization expertise necessary to successfully bring technologies to market, and that</li> </ul>
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<sup>4</sup> The investment leverage ratio of \$8 of outside investment secured by participant companies for every \$1 of NYSERDA funding represents a blended, weighted rate based on the expected investment leverage ratio of the various activities and the amount of funding allocated to each respective activity. Expected investment leverage ratios include: 15:1 for Incubators and Ignition Grants; 10:1 for Entrepreneurs-In-Residence; and 3:1 for Investor, Corporate, and Customer Engagement, and 1:1 for POCCs.

	<p>NYSERDA’s cleantech incubators fill a gap by providing commercialization and business development assistance.</p> <ul style="list-style-type: none"> <li>• Investors report the incubator program provides them with a direct pipeline of quality, curated cleantech deal flow and are in strong support of the addition of the ignition grants program.</li> </ul>
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10.1.4 Theory of Change

<p><b>Technology Opportunities and Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Entrepreneurs and early-stage companies often lack the commercialization and business development expertise necessary to successfully bring clean energy technologies to market.</b> The problem is even more prevalent for cleantech startup companies developing advanced hardware technologies that are located outside of metropolitan New York. This initiative will provide continued commercialization support to cleantech entrepreneurs and early-stage companies through incubators and executive mentoring programs, which will help equip entrepreneurs and companies with the management skills and business assets they need to be successful in the market.</li> <li>• <b>Many early-stage cleantech companies in New York State do not have active relationships or deep connections with the investment community, potential corporate and strategic partners, or customers.</b> This creates an opportunity for NYSERDA to continue to build networks and increase the potential for productive, meaningful interactions between early-stage companies and investors and development partners. This initiative will provide better, curated matchmaking and opportunities for cleantech entrepreneurs and early-stage companies in the State to connect with investors, corporate and strategic partners, and customers.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA provides additional commercialization and business development support to companies, then the private and follow-on capital raised by participant companies will result in \$8 of private capital being leveraged for every \$1 of NYSERDA’s investment in this set of initiatives.</li> <li>• <b>Incubators</b> – If incubators are performing successfully, then they will be able to attract funding from other sponsors to help sustain their operations and programs while retaining a focus on NYSERDA’s clean energy goals. Over time, this may allow NYSERDA to step down the level of its investment in cleantech incubators and ignition grants.</li> <li>• <b>Ignition Grants</b> – If there are highly targeted and timely infusions of capital through the introduction of ignition grants, then the incubator client companies will be in a better position to attract follow-on capital from investors and secure commercialization support from development partners.</li> <li>• <b>Geographic Coverage</b> – If NYSERDA provides business incubation and entrepreneurial support services to cleantech startup companies and potential entrepreneurs in the Southern Tier and southern Western New York regions through competitively selected organizations, then it will develop and grow the environment for innovation and entrepreneurship throughout the regions, leading to more startup activity, more investments secured, and more commercial products coming out of technology developed in the regions.</li> <li>• <b>Proof-of-Concept Centers</b> – If research teams developing technologies receive intensive cohort-based commercialization training and seed funding to help them better understand the value proposition and customer segments for their innovations, then more intellectual property will be transitioned from the laboratory to the market,</li> <li>• <b>Entrepreneurs-In-Residence</b> – If NYSERDA provides cleantech entrepreneurs and early-stage companies with expert advice at identified risk points in their</li> </ul>

	<p>lifecycle until these companies have the expertise required internally, then the companies will avoid many common startup mistakes, take advantage of opportunities, and require less capital on the path to becoming technically and commercially viable and ready for the market.</p> <ul style="list-style-type: none"> <li>• <b>Investor, Corporate, and Customer Engagement</b> – If high potential early-stage cleantech companies are better connected with qualified investors, corporate and strategic partners, and customers, then it will increase the attainment of key business development milestones, such as securing investments, joint development agreements, channel partnerships, joint ventures, and initial customers.</li> </ul>
<p><b>Activities (Resources)</b></p>	<ul style="list-style-type: none"> <li>• <b>Incubators</b> – NYSERDA’s six cleantech incubators will re-compete for funds through competitive solicitations, which will be open to other incubators and venture development organizations in New York State that are not currently supported by NYSERDA. Some or all of the existing cleantech incubators may be awarded funding and new cleantech incubators may be awarded through the competitive process. This process will capture the lessons and best practices from developing and growing the incubator program over the past six years and apply them to the next round of cleantech incubators. <ul style="list-style-type: none"> <li>○ <b>Operations</b> – Activities related to the operational administration of the incubator. For example, quarterly or annual reporting for NYSERDA.</li> <li>○ <b>Programs</b> – Activities related to the programming and services that the incubator provides to client companies. For example, networking events, boot camps, mentor office hours, advisory board meetings, hackathons, etc.</li> <li>○ <b>Client-Driven Milestones</b> – Activities related to incubator client company success, including private capital raised, non-NYSERDA grants awarded, new commercial products tested/introduced, revenue generated, and jobs created/retained, etc. These client-driven milestones, which ensure that compensation for the cleantech incubators is aligned with the performance and success of their client companies and graduates, will be the primary focus of NYSERDA’s continued support for the incubator program.</li> </ul> </li> <li>• <b>Ignition Grants</b> – Moving forward, the cleantech incubators will evolve to include the ignition grants program, which will allow them to offer timely, highly targeted infusions of capital to qualified client companies. Activities funded by the ignition grants (up to \$100,000 per ignition grant) may include, but not be limited to intellectual property work, market validation work, testing services, manufacturing development, etc. The ultimate goal of the ignition grants program is to best position the client companies working with the cleantech incubators to attract and secure sufficient follow-on capital to commercialize clean energy technologies and bring them to market.</li> <li>• <b>Geographic Coverage</b> – Business incubation services will be provided through a competitive process to selected cleantech startup companies in the Southern Tier and southern Western New York regions, which are unserved by NYSERDA’s existing cleantech startup growth program offerings. These services may be provided through existing incubators that are not yet members of NYSERDA’s cleantech incubator network or other venture development organizations providing similar services. Some candidate existing incubators are located in Binghamton, Ithaca, Corning, Alfred, Fredonia, and Olean. Complementary programming aimed at building a business environment in the region that supports the growth of cleantech startup companies may include entrepreneurship training, corporate/investor and university connection activities, startup community development activities, and mentoring programs. Client companies of NYSERDA’s cleantech incubator that is located in the Southern Tier will also be eligible to compete for the ignition grants.</li> </ul>

- **Proof-of-Concept Centers (POCCs)** – NYSERDA has operated a POCC program since 2013. POCCs aid research institutions in moving their innovations to market through the formation new businesses or corporate partnerships.
  - The POCCs use a cohort based system where teams apply to participate in the program. In the application process, teams outline the relevance of the core technology in addressing clean energy objectives and offer a preliminary identification of the target market. An independent judging panel that includes representatives from the energy industry and venture investment community evaluate the applications. Selected teams are assigned a mentor and participate in an approximately 8-week training program based on the Lean Launchpad methodology. Teams then provide a business pitch in front of another panel of independent judges. This is down-select event and selected teams receive funding for additional customer discovery, prototype development, or testing.
  - NYSERDA will continue the POCC effort under this initiative by releasing a competitive solicitation to select entities to serve as POCCs in New York. The solicitation will be open to any academic institution or venture development organization; NYSERDA’s three POCCs will also re-compete for funding through the new solicitation. Some or all of the existing POCCs may be selected for continuation of support. The new program will capture the lessons learned from the first four years of the POCC initiative, and include activities to assist with:
    - **Operations:** This includes reporting, team recruitment, application review, management of judges and mentors, and tracking team progress. The next round of the program will look for an increased emphasis on communicating the outcomes of the POCC to increase program awareness and build interest on the part of new teams and potential corporate and foundation partners.
    - **Program:** Tasks focused on entrepreneurship training, market validation using voice-of-customer techniques and networking. The next round of the program will look for an increased emphasis on the design and implementation of regional and campus-based entrepreneurial workshops, academic courses or other programs targeting clean energy technology innovators to increase the level and quality of applications to the POCCs.
    - **Team-Driven Milestones:** Tasks focused on the legal aspects of business formation, development and implementation of go-to-market strategies that will result in sales, targeted networking to develop strategic and investor partnerships, and management team formation. The next round of the program will include an increased emphasis on the management team and interventions that will identify and address leadership gaps critical to the new business reaching scale.
  - NYSERDA will also release a competitive solicitation to identify and select a support contractor to assist with the recruitment and management of an advisory board for the overall POCC initiative and to continue program evaluation. The evaluation will include a focus on the impact of the investment in the POCC program to stimulate sustained interest in clean energy-related research and entrepreneurship at the institutional level.
- **Entrepreneurs-In-Residence (EIR)** – NYSERDA has operated the EIR program through a third-party program administrator since 2010. EIRs are serial entrepreneurs who have a strong background in executive-level management and commercialization at technology-based companies. EIRs guide early-stage companies through specific projects and issues, such as raising capital, executing complex agreements, staffing for growth, resource planning, strategic partnering, and board management.

	<ul style="list-style-type: none"> <li>○ <b>Mentor Engagements</b> – Provide companies with specialist mentors who will offer targeted advice and assistance to companies. Areas of focus will include strategy, marketing, sales, finance, supply chain, human capital, and partnerships. These Mentor Engagements may happen at any stage of a company’s lifecycle, but will happen most often before a product is fully commercialized.</li> <li>○ <b>Company Review Engagements</b> – Review companies to ascertain strengths and weaknesses. The resulting reviews will be valuable to company management, NYSERDA, private investors and others.</li> <li>○ <b>Office Hours and Expert Presentations</b> – Office Hours provide companies with fast one-on-one access to subject matter experts to discuss the challenges and opportunities they are facing, or simply to learn about clean energy or New York State innovation subjects and understand why they are important to them. Expert Presentations is a low-cost method of providing many cleantech entrepreneurs at one time with critical information (such as protecting intellectual property). Entrepreneurs can learn from each other’s questions and the expert presenter’s answers. The presentations can be seen live and potentially recorded and broadcast for viewing by cleantech entrepreneurs unable to attend the live broadcast due to timing or location. The presentations will help to broadcast why New York State is the place to start and grow a cleantech company.</li> <li>○ <b>Practice Pitch, SWAT Team, and Other Engagements</b> – Practice Pitch will place entrepreneurs in front of EIRs acting as prospective investors or customers. Entrepreneurs will learn to handle and succeed at giving challenging pitches in a risk-free environment before attempting their pitch in front of investors or customers where they have one chance to perform. SWAT Teams are composed of multiple EIRs with various types of expertise who will collaborate over one or more days with a company’s management at highly time sensitive or other critical junctures in the company’s lifecycle, such as when considering a pivot. EIR Website will include a way for companies to obtain help in an easy, low-cost way such as by viewing presentations by experts who understand clean-energy entrepreneurship and New York State. Other information will include learning the attributes NYSERDA and private investors look for when investing in companies, finding resources within the state to help companies attain those attributes, and more.</li> <li>● <b>Investor, Corporate, and Customer Engagement (ICC Engagement)</b> <ul style="list-style-type: none"> <li>○ <b>Network Curation</b> – Networking, matchmaking, and showcase events and forums to connect NYSERDA portfolio companies and other cleantech companies with investors, corporate and strategic partners, and customers. These programs will be designed and developed around key technology and market actor verticals to provide targeted and relevant connections between companies and various types of market actors.</li> <li>○ <b>Due Diligence and Risk Mitigation</b> – Third-party technical and business screening and due diligence<sup>5</sup> support for smaller, less capitalized investors which will also help inform regulatory risk and public benefit of target companies. This activity also includes targeted and strategic seed funding to de-risk early-stage companies that are in the advanced stages of due diligence with pre-qualified investors, corporate and strategic partners, or customers. Additional activities may include support for installation, service, and de-commissioning of innovative clean technology products and</li> </ul> </li> </ul>
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<sup>5</sup> Due diligence is research and analysis of a company or organization done in preparation for a business transaction, such as an investment, a corporate merger, or purchase of securities.

	<p>solutions. These activities mitigate a variety of commercial risks for potential customers of pre-revenue and early-revenue cleantech companies.</p> <ul style="list-style-type: none"> <li>○ <b>Co-Investment Support</b> – Matching funds support for New York State cleantech companies that raise a significant capital in a single round from select, pre-qualified funding sources or intermediaries. Investors and/or affiliated intermediaries will be required to provide all relevant screening, due diligence, investment decision-making, and portfolio management procedures to NYSERDA in order to initially qualify.</li> <li>○ <b>Pipeline Curation and Communications</b> – Development and deployment of a multi-tiered marketing and communications strategy to better promote NYSERDA portfolio company pipeline to the broader investment community and other interested stakeholder. In addition, NYSERDA will formalize and launch a process for aggregating and inventorying NYSERDA’s portfolio of companies as part of an enhanced portfolio management process for all companies supported by NYSERDA.</li> </ul>
<p><b>Key Milestones</b></p>	<p><b><u>Incubators</u></b></p> <p><b><u>Milestone 1 (2016)</u></b></p> <ul style="list-style-type: none"> <li>• First competitive solicitation launched.</li> </ul> <p><b><u>Milestone 2 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Awards from first solicitation contracted.</li> </ul> <p><b><u>Milestone 3 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Second competitive solicitation launched.</li> </ul> <p><b><u>Milestone 4 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Awards from second solicitation contracted.</li> </ul> <p><b><u>Milestone 5 (each year starting in 2017)</u></b></p> <ul style="list-style-type: none"> <li>• Networking Event held.</li> </ul> <p><b><u>Milestone 6 (each year starting in 2017)</u></b></p> <ul style="list-style-type: none"> <li>• Entrepreneur Bootcamp held.</li> </ul> <p><b><u>Ignition Grants</u></b></p> <p><b><u>Milestone 1 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Formal Voice of Customer exercise completed.</li> </ul> <p><b><u>Milestone 2 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Solicitation launched.</li> </ul> <p><b><u>Milestone 3 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Investment Committee established.</li> </ul> <p><b><u>Milestone 4 (each year starting in 2017)</u></b></p> <ul style="list-style-type: none"> <li>• Investment Committee Meetings held.</li> </ul> <p><b><u>Milestone 5 (starting in 2017)</u></b></p> <ul style="list-style-type: none"> <li>• Ignition grant awards issued on ongoing basis.</li> </ul> <p><b><u>Geographic Coverage</u></b></p> <p><b><u>Milestone 1 (2016)</u></b></p> <ul style="list-style-type: none"> <li>• Competitive solicitation launched.</li> </ul>



	<p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Awards from solicitation contracted (~6 months following solicitation due date).</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>• Inventory of Entrepreneurial Assets in Southern Tier completed.</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>• Entrepreneurship Training Programs established.</li> </ul> <p><u>Milestone 5 (each year starting in 2017)</u></p> <ul style="list-style-type: none"> <li>• Networking Events held.</li> </ul> <p><b><u>Proof-of-Concept Centers (POCCs)</u></b></p> <p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>• Competitive solicitation for POCCs launched.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Award(s) from solicitation for POCCs contracted.</li> </ul> <p><u>Milestone 3 (2019)</u></p> <ul style="list-style-type: none"> <li>• Competitive solicitation for POCC support services launched.</li> </ul> <p><u>Milestone 4 (2019)</u></p> <ul style="list-style-type: none"> <li>• Award(s) from solicitation for POCC support services contracted.</li> </ul> <p><b><u>Entrepreneurs-In-Residence</u></b></p> <p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>• Competitive solicitation launched.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Award(s) from solicitation contracted.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Company Reviews initiated.</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• Company Engagements initiated.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>• Office Hours and Expert Presentations initiated.</li> </ul> <p><u>Milestone 5 (each year starting in 2018)</u></p> <ul style="list-style-type: none"> <li>• Practice Pitch, SWAT Team, and Other Engagements initiated.</li> </ul> <p><b><u>Investor, Corporate, and Customer Engagement</u></b></p> <p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>• Competitive solicitations launched.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Awards from solicitations contracted.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• The potential impact of this initiative includes: <ul style="list-style-type: none"> <li>○ Accelerating the time to market for early-stage companies and enable them to raise investment, secure partnerships, and sell products and services in the State.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ Achieving key incubator client company and graduate milestones, including: <ul style="list-style-type: none"> <li>▪ Closing major financing rounds (Seed, Series A, Series B, Series C, etc.)</li> <li>▪ Entering into development/partnership agreements with corporate/strategic partners</li> <li>▪ Reaching significant sales milestones</li> <li>▪ Achieving liquidity events (mergers and acquisitions, initial public offerings, etc.)</li> </ul> </li> <li>○ Maintaining NYSERDA’s historical investment leverage ratio for the incubator program – \$8 of private and follow-on capital mobilized for every \$1 NYSERDA invests.</li> <li>● NYSERDA will continue to evaluate the effectiveness of its approach towards cleantech startup growth and will adjust its strategies accordingly based on the needs of customers and partners in the market. As the cleantech incubators have evolved and gained traction, NYSERDA has shifted the focus of milestones from those for operations and programming to primarily client-driven milestones.</li> <li>● Establishment of a level of cleantech startup and business incubation activity in the Southern Tier approaching the levels found in other major regions of the state.</li> <li>● Move cleantech entrepreneurs and early-stage companies from ideation through the point of traction and scale.</li> <li>● Leverage target market actors (investors, corporate and strategic partners, and customers) to increase awareness of partnership opportunities and New York State’s cleantech innovation ecosystem, which is driven by NYSERDA’s Innovation Program Partners and other market partners to provide access to capital, executive expertise, strategic relationships, and business support for cleantech entrepreneurs and early-stage companies.</li> <li>● In the ideal scenario, the end state of the market that would enable NYSERDA to exit this initiative is one where early-stage cleantech companies in New York State are able to attract follow-on capital and secure partnerships and development agreements without any support from these activities. It is highly unlikely that this end state would be achieved in the next four years. As a result, the need for the assets and resources that make up this initiative is not envisioned to go away after the end of proposed funding for this initiative in 2021. NYSERDA intends to continue to support the activities at a level that is commensurate with the market need for these activities beyond 2021.</li> </ul>
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10.1.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>● The implementation of REV over the coming years will provide new market and business opportunities for entrepreneurs and early-stage companies developing innovative clean energy technologies and solutions.</li> <li>● YSERDA will continue to promote active and ongoing coordination between its Innovation Program Partners and the utilities that operate in their respective markets. It will achieve this by creating new opportunities for entrepreneurs and early-stage companies to meet and network with utilities through existing and future program offerings and events.</li> <li>● Several utilities based in New York State have already participated in previous events, competitions, workshops, etc. to engage with early-stage cleantech companies. NYSERDA will provide even more opportunities for utilities to connect with companies through this set of activities.</li> <li>● Utilities could serve as pilot and demonstration partners for companies in order to accelerate their time to market. NYSERDA will look to engage</li> </ul>
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	<p>utilities as appropriate to help establish these connections with relevant companies that meet their requirements.</p> <ul style="list-style-type: none"> <li>• This initiative will leverage the investments being made to modernize the utility business model through the work of entrepreneurs and early-stage companies that are developing innovative products and solutions for the market.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• The New York utilities do not have any similar offering to this market.</li> </ul>

10.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Innovation & Research Budget Allocation - Commitment Basis**

<b>Commitment Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
Business Support	\$6,000,000	\$6,500,000	\$8,450,000	\$10,450,000	\$7,650,000	\$6,650,000	\$3,500,000	\$49,200,000
Total	\$6,000,000	\$6,500,000	\$8,450,000	\$10,450,000	\$7,650,000	\$6,650,000	\$3,500,000	\$49,200,000

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
Total	12%	13%	17%	21%	16%	14%	7%	100%

10.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics<sup>6</sup>**

Indicators <sup>7</sup>		Baseline (Before/ Current) <sup>8</sup>	2019 (Cumulative)	2022 (Cumulative)
Activity/Outputs	Incubators – Companies Engaged	0	119	146
	Incubators – Companies Graduated (Graduates)	0	12	21
	Geographic Coverage – Companies Engaged	0	24	24
	POCCs – Teams Engaged	0	15	75
	POCCs – Businesses Formed	0	10	40
	EIR – Companies Engaged	0	520	1,420
	ICC Engagement - Companies Engaged	0	141	496
Outcomes	Products Commercialized	66	93	193
	Investor Agreements Executed	0	5	25
	Corporate and Strategic Partnerships Formed	0	3	18
	Customer Agreements Executed	0	1	10

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Continued investment in the incubator program will maintain the historical investment leverage levels of incubator client companies and graduates.
- Highly targeted and timely infusions of capital through the ignition grants program will better position incubator client companies to attract follow-on capital from investors and/or secure commercialization support from development partners.
- High-performing cleantech incubators and POCCs will be able to attract funding from other sponsors to help sustain their operations and programs while retaining a focus on NYSERDA’s clean energy goals.
- Revenue generated in New York State. Exits or liquidity events (mergers and acquisitions, outright sale, initial public offering, private placement, etc.) realized by participant companies.

Benefits shown in Table 4 and Table 5 are direct, near-term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Private Investment refers to private and follow-on capital raised by incubator client companies and graduates as well as the program funding leveraged by the

<sup>6</sup> There may be some overlap in the Activity/Outputs and/or Outcomes that are achieved and reported through this set of initiatives. For example, a company that is a client of an Incubator may also receive support from the Entrepreneurs-In-Residence program or one of the Investor, Corporate, and Customer Engagement activities.

<sup>7</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>8</sup> Revised baseline values are based on preliminary research and will be updated upon completion of a market evaluation study still underway. Once finalized, this study will be available publicly on NYSERDA’s website and in the DPS Document and Matter Management system.

incubators through sponsors other than NYSERDA. As such, there will be lag from the time funds are committed for Incubators and Ignition Grants to realizing the leverage (estimated as ~3 years); this lag is not shown in table 4 due to impacts being expressed on a commitment-year basis.

**Table 4. Direct Impacts**

Primary Metrics <sup>9</sup>		2016	2017	2018	2019	2020	2021	2022	Total
Energy Efficiency	MWh Annual	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-
	MMBtu Annual	-	-	-	-	-	-	-	-
	MMBtu Lifetime	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-	-	-	-	-
Customer Bill Savings Annual (\$ million)		-	-	-	-	-	-	-	-
Customer Bill Savings Lifetime (\$ million)		-	-	-	-	-	-	-	-
Private Investment (\$ million) <sup>10</sup>		\$54.0	\$58.5	\$76.0	\$94.0	\$68.9	\$60.0	\$31.5	\$442.9

**Table 5. Annual Projected Initiative Participation**

	2016	2017	2018	2019	2020	2021	2022	Total
Participants <sup>11</sup>	32	92	586	739	865	921	1,072	4,307

### 10.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• Early-stage cleantech companies are generally involved in developing new business models to bring innovative technologies and solutions to market that will help achieve New York State’s greenhouse gas emission, renewable energy, and energy efficiency goals.</li> <li>• The innovative technologies and startup companies that will advance through this initiative will provide a range of benefits for New York ratepayers to advance REV objectives, potentially including higher efficiency end-use devices, energy</li> </ul>
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<sup>9</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Benefits are rounded to three significant figures. Totals may not sum due to rounding.

<sup>10</sup> In this instance, Private Investment could include, but is not limited to, private capital raised by participant companies, private capital secured for financing clean energy projects by participant companies, and revenue generated by participant companies.

<sup>11</sup> Participants include those directly utilizing one or more initiative(s): entrepreneurs, early-stage companies, NYSERDA innovation program partners, venture development organization partners, service providers, mentors, investors, corporate/strategic partners, and/or customers/end-users. There may be some overlap in the Participants that are engaged and reported through this set of initiatives.

	<p>management systems, new grid technology solutions, better performing renewable energy systems, and a range of improved DER options.</p> <ul style="list-style-type: none"> <li>• There could also be instances where the primary target market for a technology or solution being offered by a client company or graduate is as an alternative fuel.</li> </ul>
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10.1.9 Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• YSERDA will collect and analyze established innovation metrics for participant entrepreneurs and companies, including private capital raised, non-NYSERDA grants awarded, products commercialized, revenue generated, jobs created/retained, investor agreements executed, corporate or strategic partnerships formed, customer agreements executed, and program funding leveraged from other sponsors by NYSERDA Innovation Program Partners. These metrics will be regularly collected for each company that participates in the various programs to assess progress toward the overall outcomes and goals of the initiative.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of programmatic and broader market success.</li> <li>• Baseline measurements of key market indicators will occur soon following initiative approval and will provide additional insights that will allow NYSERDA to adjust strategies. Measurements include, but are not limited to, entrepreneurs engaged, early-stage companies engaged, mentors engaged, investors engaged, corporate and strategic partners engaged, and customers engaged..</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to, product commercialization, revenue generated by new commercial products and products that have previously been commercialized, and private investment.</li> <li>• Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul>
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# 10.2 Manufacturing Corps (M-Corps)

## 10.2.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Cleantech<sup>12</sup> startups frequently don't understand issues of product manufacturability or how to approach manufacturing with a business-like perspective. They often do not know how or where products will be manufactured, or if their product can be manufactured profitably or at scale. This lack of expertise hampers their progress to market and their ability to secure private investment and corporate partners.</li> <li>• Cleantech startup companies often experience a cash flow squeeze when undertaking manufacturing. They struggle to raise cash from the private sector as well as grants or loan backing from the public sector because they have not yet sold their product. At the same time, the cleantech startup company has major capital demands to manufacture their product. These challenges converge to create a cash and resource shortfall that is difficult for many cleantech startup companies to overcome.</li> <li>• Manufacturers are hesitant to work with startup companies because startups are not yet effective partners – lacking broad manufacturing plans, as well as specific critical deliverables like technical drawings of a product Designed for Manufacturing (DFM) at scale.<sup>13</sup> Manufacturers are reluctant to spend time training cleantech startup companies because it is costly and has uncertain returns.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA has identified a series of solutions to the manufacturing challenges that face startups. NYSERDA will pilot a suite of interventions targeting, but not limited to, companies involved with NYSERDA Proof-of-Concept Centers, incubators and Technology and Business Innovation product development activities. The program will first be rolled out on a small scale and then the most promising interventions on a larger scale.</li> <li>• To implement this strategy, NYSERDA will competitively select two or more entities to run the pilot program, while also allowing the selected entities to test out additional interventions that they believe could be promising for their region. Based on the learnings from the pilot, NYSERDA will issue another competitive solicitation to select one or more entities to implement the most promising interventions on a larger scale.</li> <li>• This strategy represents NYSERDA's first attempt at addressing what has been observed as a significant and pressing market need for both cleantech startup companies and established contract manufacturers. As such, the strategy and associated activities will be phased in over time with an initial 12-18-month pilot deployment. Upon analysis of program impact and after making necessary adjustments, a broader statewide rollout will occur. NYSERDA's investment in the M-Corps Initiative will cover both the pilot period and the statewide rollout over a combined period of approximately four years.</li> <li>• NYSERDA intends this to be a short-term initiative where, after NYSERDA's initial involvement, market actors including investors, manufacturing partners, and venture development organizations will organically implement the most successful interventions that make a proven impact on cleantech startups' ability to scale. The interventions are designed to incentivize these market actors to continue forward after the close of the NYSERDA program period.</li> </ul>

<sup>12</sup> Here, cleantech refers to energy-related technologies that generate commercial benefits to customers while addressing environmental concerns, such as global climate change, sustainability, and energy security.

<sup>13</sup> DFM is defined by the adjustments to early product design that ensure large scale manufacturing will be economical. As an example, a product that was machined for prototype units may need to be injection molded for manufacturing thousands of units. The design of the injection mold tooling and redesign of the product for that manufacturing process fall under DFM.

	<ul style="list-style-type: none"> <li>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Manufacturing Corps Initiative” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>Accelerate the time-to-market<sup>14</sup> for cleantech startup companies by removing barriers for cleantech startup companies to work with New York State (NYS) manufacturers.</li> <li>Better prepare startup companies for working with manufacturers by addressing both product DFM and the ability of startups to pay for manufacturing costs. This technical and financial de-risking is key to the desirability of startup companies as customers for manufacturers. Evidence of success may include signed contracts between startups and manufacturers to produce cleantech hardware products. These same activities also address a startup company’s investor readiness.</li> <li>Improve the profitability of NYS cleantech companies through reduction in Cost of Goods Sold (COGS) by reducing supply chain and manufacturing costs.</li> <li>Increase seed and follow-on capital investments in cleantech startup companies who have strong manufacturing strategies for their product(s).</li> <li>Improve manufacturers’ ability to unlock new customer opportunities by working with startups and thereby increasing revenue.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>A focus of the State Energy Plan is to remove market barriers and bridge market gaps to enable a dynamic clean energy economy operating at a scale to create jobs and drive local economic growth, while protecting our environment by reducing greenhouse gas (GHG) emissions and other pollutants.</li> <li>As articulated in the State Energy Plan, NYSERDA assists cleantech startup and early stage businesses bringing innovative clean energy technologies to the customer through strategic investments in statewide, multi-use assets that provide business incubation, manufacturing support, mentorship, and access to private sector investors and potential development and commercialization partners. The M-Corps Initiative is a component of the portfolio of NYSERDA innovation investments.</li> <li>NYSERDA investments will result in the deployment of the next generation of clean energy products and solutions that advance REV principles and address the state’s key environmental, energy, and economic challenges.</li> </ul>

10.2.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<ul style="list-style-type: none"> <li>This initiative will target cleantech hardware startup companies in NYS and manufacturing entities working with cleantech startup companies in NYS.</li> <li>The initiative is sector/technology agnostic for all areas of the clean energy and clean technology space.</li> </ul>
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>Entrepreneurs</li> <li>Cleantech startup companies</li> <li>Investors, including but not limited to: <ul style="list-style-type: none"> <li>Angel investors</li> <li>Venture capital funds</li> <li>Impact investors</li> <li>Family offices (a private firm that manages investments and trusts for one or more families.)</li> <li>Foundations</li> <li>Government agencies</li> <li>Corporate/strategic investors</li> </ul> </li> <li>Venture Development Organizations, including but not limited to: <ul style="list-style-type: none"> <li>NYSERDA Cleantech Incubators</li> </ul> </li> </ul>

<sup>14</sup> A review of NYSERDA investments in product development projects for cleantech companies between 2009 and 2015 indicates the average time-to-market is 3.5 years. This cycle time only applies to hardware products not software.



	<ul style="list-style-type: none"> <li>○ NYSERDA Proof-of-Concept Centers</li> <li>○ Empire State Development’s New York State Innovation Hot Spots and Certified Business Incubators</li> <li>○ Empire State Development’s (ESD) Regional Technology Development Centers</li> <li>○ ESD’s Centers for Advanced Technology</li> <li>○ Universities</li> <li>● Manufacturing Partners, including but not limited to: <ul style="list-style-type: none"> <li>○ Contract manufacturers</li> <li>○ Original Equipment Manufacturers</li> <li>○ Strategic corporate partners</li> <li>○ DFM experts</li> <li>○ Plant design and LEAN Six Sigma experts</li> <li>○ Federally-funded Manufacturing Extension Partnerships</li> <li>○ Early prototyping spaces</li> <li>○ Manufacturing process prototyping experts</li> <li>○ Testing, certification and regulatory experts</li> <li>○ Industrial project management experts</li> <li>○ Quality assurance experts</li> <li>○ Component sourcing and supply chain experts</li> <li>○ Packaging and industrial design experts</li> <li>○ Manufacturing project management experts</li> </ul> </li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>● New York’s clean energy market is steadily growing, especially given REV and the aggressive energy and emissions goals that have been established. Cleantech startup companies have an important role to play in the achievement of NYS’ clean energy goals.</li> <li>● NYSERDA’s engagements with market actors indicate a strong need for manufacturing interventions. Manufacturing partners are particularly interested in business development opportunities with startups that NYSERDA and the greater investment community have identified as ready for manufacturing.</li> <li>● Investors have expressed a desire for trusted manufacturers to partner with them on investment opportunity panels. Investors also seek manufacturing assistance for their startup portfolio companies (e.g. vendors and mentors).</li> <li>● Dozens of manufacturers who participated in NYSERDA’s customer discovery reported an interest in working with startup companies to grow their businesses but reported a lack of knowledge of how to access the market opportunity. Adding startup companies to the manufacturers’ customer base is a client diversification tool.</li> <li>● Throughout the customer discovery process, NYSERDA has fielded many requests from startups for manufacturing and scaling assistance. The need is particularly timely now as a number of NYSERDA’s portfolio companies are trying to scale up.</li> <li>● During customer discovery, all six NYSERDA-funded incubators, the eleven federally-funded Manufacturing Extension Partnership sites in NYS, and many other venture development organizations expressed an urgency for the interventions outlined in NYSERDA’s M-Corps Initiative based on their collective experience bringing new hardware products to market.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>● The NYSERDA M-Corps Initiative will contribute to the manufacture and commercialization of cleantech products as well as the mobilization of capital in a way that would most likely not occur in the absence of this program.</li> <li>● For a startup company targeting the cleantech sector who needs to deliver a complex hardware product to the market, NYSERDA’s M-Corps Initiative provides a clear manufacturing strategy that lends legitimacy with potential manufacturers and potential investors for market-validated products.</li> <li>● For a private capital investor who needs quality deal flow that leads to profits, NYSERDA’s M-Corps Initiative provides a technically and financially de-risked</li> </ul>

	<p>investment in a startup company who has a clear manufacturing strategy for their market-validated product(s).</p> <ul style="list-style-type: none"> <li>• For a strategic corporate investment partner who needs innovative, disruptive, and efficient cleantech solutions to complement existing product lines or add new capability, unlocking new market channels, NYSERDA's M-Corps Initiative provides a deal flow of hardware-focused startup companies who are actively seeking investment partners including strategic corporate partners.</li> <li>• For a contract manufacturer who needs opportunities for growth, NYSERDA's M-Corps Initiative provides incremental revenue and higher profit margin potential, access to new customers and partners as well as customer diversification.</li> <li>• For a venture development organization who needs business results for their client companies, NYSERDA's M-Corps Initiative provides real world expert manufacturing mentorship and training that allow venture development organizations to help startups develop a strong manufacturing strategy and raise capital.</li> </ul>
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10.2.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement and Customer Discovery</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA has conducted extensive, ongoing customer discovery and market engagement work including more than 100 interviews of market actors including startup companies at all stages, private investors, strategic corporate partners, manufacturing partners, potential venture development organizations, U.S. Department of Energy's Advanced Manufacturing Office, and other similar manufacturing programs across the United States.</li> <li>• NYSERDA's M-Corps Initiative has been designed to leverage best practice and lessons learned through customer discovery from startup companies who have successfully scaled, other manufacturing initiatives across the country, past NYSERDA programs, ESD programs past and present, and the collective expertise of NYSERDA's partners and contractors.</li> <li>• NYSERDA will engage with market actors and stakeholders throughout the M-Corps Initiative. NYSERDA recognizes that ongoing customer discovery is needed to ensure the program adjusts to meet the dynamic needs of the marketplace.</li> </ul>
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10.2.4 Theory of Change

<p><b>Technology Opportunities and Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Entrepreneurs and startup companies often lack the manufacturing expertise necessary to successfully bring clean energy technologies to market.</b> The problem is even more prevalent for cleantech startup companies developing advanced hardware technologies.</li> <li>• <b>Many cleantech startup companies in New York State do not know how to find manufacturers for their product(s).</b> This creates an opportunity for NYS' manufacturing and venture development organizations, through this initiative, to build networks and increase the potential for productive, meaningful interactions between startup companies and manufacturing partners</li> <li>• <b>Once startup companies and manufacturers find each other, they do not know the best practices for working with each other.</b> Manufacturers often give up on startup company business opportunities because they do not want to train startup companies on manufacturing strategy or tactical decision making.</li> <li>• <b>Startup companies do not have the requisite cash flow to undertake production runs.</b> Manufacturers find working with startup companies challenging because funding production is challenging for startup companies.</li> </ul>
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	<ul style="list-style-type: none"> <li>• <b>When a startup company does not have a manufacturing strategy, private investment is more difficult to obtain.</b> This creates an opportunity for NYSERDA to mobilize private capital through this initiative by helping startup companies develop a manufacturing strategy and engage potential manufacturing partners.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA’s M-Corps Initiative helps startup companies develop a manufacturing strategy, then manufacturers will be more willing to work with startups.</li> <li>• If NYSERDA’s M-Corps Initiative lowers the risk of production costs for startup companies by providing cash flow assistance, then manufacturers will more readily work with startup companies.</li> <li>• If NYSERDA’s M-Corps Initiative helps a startup company develop a manufacturing strategy, then the cleantech startup company will be in a better position to attract capital from private investors, and secure agreements with strategic corporate partners.</li> </ul>
<p><b>Activities (Resources)</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA will collect additional data to further develop market insights to better understand the barriers between startup companies and manufacturers, to identify manufacturers interested in working with startups as initial M-Corps participants. This activity will collect necessary baseline information against which to measure progress. The results will be used for program design, and targeted marketing and communications. This may include but shall not be limited to the completion of a survey of startups and manufacturing partners.</li> <li>• NYSERDA will identify and embed manufacturing experts in cleantech startup companies for limited engagements. These experts will help the cleantech startup build a roadmap for manufacturing and commercialization during a contract period, providing valuable insight and potential pivot opportunities to both the cleantech startup and the NYSERDA team overseeing each cleantech startup.</li> <li>• NYSERDA will partner with respected industry partners to develop manufacturing curriculum and training content for cleantech entrepreneurs.</li> <li>• NYSERDA may partner with other government agencies (ESD, New York City Economic Development Corporation, Industrial Development Agencies, etc.) to make scalable manufacturing spaces available to cleantech startup companies. An assessment of cleantech startup companies who are ready to manufacture and seek scaling assistance will determine future activities.</li> <li>○ NYSERDA will create and implement a communications strategy for the M-Corps Initiative that could include print, social media, videos, white papers, and/or events.</li> <li>• NYSERDA will issue a competitive solicitation in a pilot of the activities below to engage one or more entities. Proposers will be asked to specify the geographic region in which they will pilot these activities. By building a pilot program before a statewide rollout of the initiative, NYSERDA will be well-positioned to capture best practices and pivot opportunities on a smaller scale then leverage them for maximum impact. The solicitation will include offerings that: <ul style="list-style-type: none"> <li>○ Build knowledge of product manufacturability among entrepreneurs (i.e., DFM workshops, manufacturing expert office hours, networking sessions, etc.).</li> <li>○ Match cleantech startup companies with relevant manufacturers (i.e., build a database of interested parties, arrange tours of manufacturer locations, etc.).</li> <li>○ Mentor cleantech startup companies in manufacturing strategy and work product development (i.e., temporarily embed manufacturing expertise in cleantech startup companies, engage testing and certification bodies to mentor startup companies on material and component choices, etc.).</li> <li>○ Improve access to manufacturing resources (i.e., early prototyping facilities, multi-use facilities, specialty equipment, etc.).</li> <li>○ Production Cost De-Risking Program that reduces the burden of production costs and improves cash flow for cleantech startup companies as well as</li> </ul> </li> </ul>

	<p>manufacturers (i.e., NYSERDA payment guarantees for upfront manufacturing costs, NYSERDA-facilitated improved payment terms, etc.).</p> <ul style="list-style-type: none"> <li>○ Engage manufacturers to work with startups more successfully (i.e., assist with market-validation and purchase order due diligence, train on the best practices of working with startup companies, etc.).</li> <li>● NYSERDA will review the M-Corps pilot program on an ongoing basis for effectiveness and subsequently adjust it as needed. NYSERDA and the contractor will collect data on successes and barriers for market actors, adding, removing, or changing interventions as needed.</li> <li>● NYSERDA will issue a competitive solicitation to enlist entities in a statewide implementation of the interventions proven successful during the pilot program. These interventions may include those outlined above, as well as interventions that evolve through the pilot.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2017):</u></p> <ul style="list-style-type: none"> <li>● Competitive solicitation launched for pilot sites.</li> </ul> <p><u>Milestone 2(2017):</u></p> <ul style="list-style-type: none"> <li>● Awards from RFQ are contracted.</li> </ul> <p><u>Milestone 3 (2018):</u></p> <ul style="list-style-type: none"> <li>● Awards from pilot site solicitation are contracted. Pilot program launched.</li> </ul> <p><u>Milestone 4 (2020)</u></p> <ul style="list-style-type: none"> <li>● Pilot program ends. Metrics reviewed based on pilot program performance and adjustments identified to implement in statewide solicitation.</li> </ul> <p><u>Milestone 5 (2020):</u></p> <ul style="list-style-type: none"> <li>● Statewide competitive solicitation based on pilot program launched.</li> </ul> <p><u>Milestone 6 (2020):</u></p> <ul style="list-style-type: none"> <li>● Awards from statewide solicitation are contracted. Statewide program launched.</li> </ul> <p><u>Milestone 7 (2023):</u></p> <ul style="list-style-type: none"> <li>● NYSERDA investment in statewide program ends. Metrics reviewed based on statewide program performance.</li> </ul>
<b>Goals Prior to Exit<sup>15</sup></b>	<ul style="list-style-type: none"> <li>● Venture development organizations organically assist hardware startup companies with minimal NYSERDA intervention as they work to design their products for scale manufacturing.</li> <li>● Startup companies can solicit at least three competitive quotations with manufacturing partners who are willing to extend reasonable payment terms to the startup. This allows startups to finance production costs without dilutive equity investment and control COGS with competitive bidding practices.</li> <li>● Venture development organizations, manufacturers, and investors network with each other and collaboratively accelerate the most promising startup companies to market.</li> <li>● Investors and manufacturers work together to educate entrepreneurs on manufacturing readiness.</li> </ul>

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<sup>15</sup> NYSERDA recognizes that this ideal end state may take more or less time than this Investment Plan outlines given the lack of historical information. NYSERDA therefore will review key outcomes and metrics throughout the program to determine future activities (continue, pivot, or end).

### 10.2.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• The implementation of REV over the coming years will provide new market and business opportunities through utilities and others for startup companies developing emerging clean energy technologies.</li> <li>• Bringing more cleantech products to market through NYSERDA’s M-Corps Initiative drives technological efficiencies within the state that REV relies upon.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• The New York utilities do not have any similar offering to this market.</li> </ul>

### 10.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 6. The annual expenditure projection is included in Table 7. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 6: Annual Innovation & Research Budget Allocation – Commitment Basis**

<b>Commitment Budget<sup>16</sup></b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Business Support	\$4,000,000	\$3,000,000	\$5,000,000	\$12,000,000
Total	\$4,000,000	\$3,000,000	\$5,000,000	\$12,000,000

**Table 7: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
Total	20%	20%	27%	27%	6%	100%

### 10.2.7 Progress and Performance Metrics

Table 8 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the Initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

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<sup>16</sup> The 2018 and 2020 Commitment Budget reflects the ramp up required for the pilot program and the statewide program, respectively. The 2019 budget reflects a period of pilot program wind down and evaluation in preparation for the statewide program launch.

**Table 8. Initiative Specific Metrics<sup>17</sup>**

Indicators <sup>18</sup>		Baseline (Before/ Current) <sup>19</sup>	2020 (Cumulative)	2023 (Cumulative)
Activities / Outputs	Manufacturing strategies developed for cleantech products	0	24	66
	Manufacturing agreements signed between startups & manufacturers	0	24	66
Outcomes	Cleantech products manufactured total <sup>20</sup>	23	47	89
	Agreements to invest in cleantech startup companies signed <sup>21</sup>	48	48	62

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes for companies engaged in the M-Corps Initiative:

- Cleantech products manufactured in NYS.
- Revenue generated by cleantech companies producing cleantech products.
- Revenue generated by manufacturing partners producing cleantech products.
- Accelerate time-to-market for cleantech products.
- Cost share by market actors including services, equipment, machine time, as well as cash cost share.

Benefits shown in Table 9 and Table 10 are direct, near-term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Private Investment refers to private and follow-on capital raised by engaged cleantech startup companies as well as the program funding leveraged by the market actors through sponsors other than NYSERDA. As such, there will be lag from the time funds are committed to the Initiative to realizing the leverage (estimated as 3-5 years); this lag is not shown in table 9 due to impacts being expressed on a commitment-year basis. Due to the nature of the activities, estimating energy impacts at this stage is difficult because the specific technologies that will be supported are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

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<sup>17</sup> An engaged market actor is one who is accessing a specific M-Corps Initiative intervention. All activities, outputs, and outcome metrics outlined in this initiative are stated and will be measured using engaged actors.

<sup>18</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for engaged market actors.

<sup>19</sup> Revised baseline values are based on preliminary research and will be updated upon completion of a market evaluation study still underway. Once finalized, this study will be available publicly on NYSERDA’s website and in the DPS Document and Matter Management system.

<sup>20</sup> NYSERDA recognizes that not all cleantech products will be manufactured in NYS. For those engaged in the M-Corps Initiative, NYSERDA will track both the total number of cleantech products manufactured and the subset of those that are manufactured in NYS.

<sup>21</sup> In this instance, “Number of agreements to invest in cleantech startup companies signed” refers to the number of agreements between engaged cleantech startup companies and private capital investors and/or strategic corporate partnerships. The value of these agreements depends on the exact mix of cleantech startup companies and cleantech products. This assumes a 3-5-year lag from the time agreements are committed toward realizing the target.

**Table 9. Direct Impacts**

Primary Metrics <sup>22</sup>		2018	2019	2020	Total
Energy Efficiency	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MMBtu Annual	-	-	-	-
	MMBtu Lifetime	-	-	-	-
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-
Customer Bill Savings Annual (\$ million)		-	-	-	-
Customer Bill Savings Lifetime (\$ million)		-	-	-	-
Private Investment (\$ million) <sup>23</sup>		\$20.0	\$15.0	\$25.0	\$60.0

**Table 10. Annual Projected Initiative Participation**

	2018	2019	2020	Total
Participants <sup>24</sup>	100	150	200	450

### 10.2.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>The M-Corps Initiative is intended to accelerate the commercial introduction of the new products supported across the Innovation &amp; Research portfolio. As this initiative is a companion to other Innovation &amp; Research programs, the assessment of and justification for fuel neutrality is provided as a component of those other programs.</li> <li>Individually, each of the products supported by this initiative will deliver energy and environmental benefits to NYS and advance REV objectives. The additional support offered through this initiative will increase the likelihood that commercially viable products will be manufactured and that the energy and environmental benefits will be realized.</li> </ul>
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<sup>22</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Benefits are rounded to three significant figures. Totals may not sum due to rounding.

<sup>23</sup> Private investment for Table 9 is inclusive of public, private, and corporate sources of funding and investment. See Table 8 for specific metrics for the program. This assumes a 3-5-year lag from the time agreements are committed toward realizing the target investment leverage goal.

<sup>24</sup> Participants include those directly utilizing M-Corps programs: manufacturing partners, entrepreneurs (and venture development organizations that support entrepreneurs). Metrics are on a commitment basis and represent lag time outlined.

## 10.2.9 Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p><b>Test-Measure-Adjust Strategy</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will collect and analyze established innovation metrics for engaged cleantech startup companies including number of cleantech products manufactured, revenue generated by engaged startups and manufacturing partners, and time-to-market as well as new metrics including the number of contracts signed between cleantech startup companies and manufacturers. These metrics will be collected for each cleantech company participating in the initiative to assess progress toward the overall outcomes/goals of the initiative.</li> <li>• The pilot program interventions will be evaluated and adjusted according to quantitative results and qualitative feedback gathered during and at the close of the pilot period. Throughout the full length of the M-Corps Initiative including during/after the pilot period and during the statewide rollout, interventions will continue, pivot, or end based on those findings.</li> </ul> <p><b>Market Evaluation</b></p> <ul style="list-style-type: none"> <li>• Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key performance indicators of programmatic and broader market success.</li> <li>• Baseline measurements of key market indicators will occur following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. They may include but are not limited to: time-to-market for cleantech products, manufacturing strategies developed for cleantech products, and private investment leverage.</li> <li>• Regular (e.g., annual) updates to key performance indicators and measurement of market change, include but are not limited to number of commercial cleantech products introduced, revenue generated, and time-to-market.</li> <li>• Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul>
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## 10.3 Novel Business Models and Offerings

### 10.3.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Reforming the Energy Vision (REV) envisions a future for New York State’s energy system that involves new and changing relationships between utilities and electricity market participants, including in related energy markets, such as transportation and natural gas. This will likely require and inspire new business models, services and products.<sup>25</sup></li> <li>• Conventional business models – in which a provider of a fully-developed energy efficiency, renewable energy, or distributed energy resource product sells capital equipment to a customer who reaps the benefit of savings or revenue streams over time – have frequently met with market resistance.</li> <li>• While many investments in established, commercially available clean energy products will provide a positive return on investment, they are often not made because of high first costs to individuals and businesses, along with uncertainty in recouping the resulting financial returns. Therefore, much value that could result from such investments remains to be unlocked.</li> <li>• Novel business models that reallocate costs, risks, ownership, and returns relative to conventional models have produced offerings that have been more attractive to their customers than conventional business models employing the same established, demonstrated technology.</li> <li>• However, companies pursuing new business models face high development costs, while early volumes of customer demand are low. This results in an inability to raise necessary capital, even for business models that can ultimately be commercially sound.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• The Novel Business Models and Offerings (NBMO) initiative will support promising companies in making business model investments to accelerate the deployment of these models. NYSERDA will provide these companies selected through a competitive solicitation with financial resources to:             <ul style="list-style-type: none"> <li>○ Assist with validation of new business models and offerings</li> <li>○ Assist with the implementation and scaling of new business models and offerings</li> </ul> </li> <li>• The funds may be used for the development and refinement of legal documents, development of tools for marketing and customer engagement, business development personnel, raising project capital, and other activities that enable the company to scale the deployment of the business model more rapidly. The funding is not for product or technology development and the initiative will take no technology risk.</li> <li>• The new business models will advance clean energy in various markets, including but not limited to:             <ul style="list-style-type: none"> <li>○ Commercial/Industrial buildings</li> <li>○ Multifamily buildings</li> <li>○ Residential buildings</li> <li>○ Distributed generation</li> <li>○ Smart grid</li> <li>○ Energy storage</li> <li>○ Transportation</li> </ul> </li> </ul>

<sup>25</sup> Here we use the term “business model” to mean the way in which a company creates value, delivers it to customers and captures some of it for itself. It encompasses a company’s key activities and resources, its cost structure, its offerings to customers and the nature of its revenue streams.

	<ul style="list-style-type: none"> <li>○ Transactive energy<sup>26</sup></li> <li>• The NBMO initiative is adjacent to strategies under REV Connect, the Market Characterization and Design Chapter (MCDC) novel solutions and concepts support, and Cleantech Startup Growth (CTSG), however the NBMO initiative differs in key ways. In contrast to REV Connect, NBMO is to develop solutions for the whole market, not just a single project opportunity. In contrast to MCDC, NBMO is to enable scaling of a single commercial solution. In contrast to CTSG, NBMO financially supports specific investments at specific companies, rather than general broadly available support functions. NYSERDA will coordinate its efforts across the offerings to ensure that duplication is avoided.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Novel Business Models and Offerings,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Support and scale up business models that facilitate greater customer uptake of clean energy solutions.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• This initiative seeks to develop scalable business models that will support the 2015 New York State Energy Plan goals of reducing greenhouse gas emissions by 40%, increasing renewable electricity options to enable the generation of 50% of electricity from renewable sources, and decreasing energy consumption through a 600 trillion BTU increase in statewide energy efficiency. In addition, the initiative seeks to advance the REV goal of enabling greater deployment of DER.</li> <li>• More specifically, the Energy Plan calls for supporting the development of next-generation clean energy technology solutions and innovative business models. This initiative will assist in validating and scaling new business models that will facilitate increased deployment of clean energy technologies and solutions.</li> </ul>

10.3.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market segments are early-stage and startup businesses that develop and operationalize new business models, existing clean energy businesses that seek to evolve their business model to improve customer uptake and capitalize on REV market opportunities, and service providers that offer novel services that facilitate clean energy deployment.
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• End use customers.</li> <li>• Entrepreneurs seeking to enter the clean energy space.</li> <li>• Existing clean energy service providers seeking to evolve their business model through new offerings or services such as HVAC firms, lighting companies, demand response companies, building systems companies, and on-site energy solutions providers.</li> <li>• Non-clean energy firms offering related services to end use customers such as security providers, internet providers or property management firms.</li> <li>• Firms offering new services to clean energy companies that can reduce their costs and enhance their customer acquisition, such as brokers, insurers, information providers, or financial service companies.</li> <li>• New integrated solutions providers and aggregators seeking to capitalize on REV opportunities.</li> </ul>

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<sup>26</sup> According to The GridWise Architecture Council formed by the US Department of Energy, “transactive energy” means, “a system of economic and control mechanisms that allows the dynamic balance of supply and demand across the entire electrical infrastructure using value as a key operational parameter.”

	<ul style="list-style-type: none"> <li>• Business incubators.</li> <li>• Utilities and their REV partners.</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• NYSERDA and others who work regularly with clean energy companies, for example the directors of NYSERDA’s incubators, routinely see companies with new business models thwarted by an inability to raise capital to scale, even for models that are commercially sound. Even employing proven technology, they face high costs of development and low rates of early customer acceptance because of the novelty of the offering.</li> <li>• Companies pursuing business model innovation regularly respond to NYSERDA research and development solicitations for funding. The preliminary REV Connect test pipeline shows that eight companies offered novel partnership structures with utilities<sup>27</sup> that could be candidates for a NBMO program. NY Prize, NYSERDA’s upcoming soft cost challenge and similar initiative are also expected to reveal companies that face challenges addressed by the NBMO initiative.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Businesses pursuing innovative approaches will benefit from increased information on the solutions valued by potential customers and partners, as well as support for building their business and its offering.</li> <li>• Novel offerings will make it easier for end-use customers to implement clean energy solutions, and subsequently reduce their energy costs.</li> <li>• Some new business models will also offer additional sources of related value to the customer (e.g., home security) as well as opportunities to participate in new areas of energy markets, for example through aggregation projects.</li> <li>• New business models, particularly those that deal with first cost barriers and risk management, can extend the reach of clean energy products and services to new customer segments and groups.</li> <li>• New business models that harness the power of information and data, develop new processes, or optimize resources offer the potential to drive down soft costs which in turn can make clean energy more affordable for end use customers. In addition, energy information and data could potentially be monetized in other industries.</li> </ul>

10.3.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA has met with early-stage and startup businesses, existing companies, utilities, and incubator directors, to gather feedback on this initiative.</li> <li>• Stakeholders interviewed indicate that new business models have high potential value and climate impact, and a program to foster their development and implementation could accelerate deployment.</li> <li>• Funding to support legal expenses, business development expenses, marketing, and capital raising were highlighted as needs in order to accelerate scaling.</li> <li>• In addition to assistance with addressing costs associated with launching a new business model (e.g. legal fees, marketing, customer acquisition), some stakeholders indicated that tools and advice on understanding the value proposition to customers was critical.</li> <li>• Stakeholders also indicated that speed and flexibility are key. Companies need to be able to move quickly to be competitive, and any NYSERDA initiative needs to be designed with that in mind.</li> </ul>
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<sup>27</sup> Examples of novel partnerships with utilities include new shared savings agreements for efficiency retrofits between small and medium sized companies and utilities, and partnerships between utilities and electric vehicle charging companies that allow the charging infrastructure to be leveraged for grid benefits.

	<ul style="list-style-type: none"> <li>• Market engagement will continue via program marketing. In addition, companies proposing new business model activity to other NYSERDA programs will be identified through internal NYSERDA coordination and targeted via outreach efforts.</li> </ul>
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10.3.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Market-specific barriers:</b> <ul style="list-style-type: none"> <li>○ <b>High Customer Acquisition Costs.</b> Cost of customer acquisition is high for many clean energy solutions. New business models can aim to standardize customer approaches, bundle energy with other services, or use new techniques to target high-potential customers.</li> <li>○ <b>High Upfront Costs.</b> Clean energy solutions frequently require a large upfront investment. New business models can make use of innovative financing structures to reduce initial costs.</li> <li>○ <b>Low Customer Priority.</b> Energy is not always a top-of-mind customer issue. New business models that combine multiple customer value streams, such as energy efficiency paired with security features, to make the sale may have improved success over energy-only products.</li> <li>○ <b>Perceived Risks.</b> Customers perceive long term risks with implementing new technologies. New business models can reallocate risks and rewards to insurers and investors, and provide customer guarantees. Customers also perceive risks about recouping their investments should their situation (e.g., location) change. New models can facilitate transactions to transfer benefits to new holders.</li> </ul> </li> <li>• <b>Company-specific barriers:</b> <ul style="list-style-type: none"> <li>○ <b>Companies advancing new business models face a lack of capital to fully develop and scale.</b> New business models require trial and error, which can be costly. They need to be strongly promoted to scale, which requires capital. NBMO funding directly fills this additional need for capital.</li> <li>○ <b>Unproven returns of new business models keep the cost of project capital high.</b> NBMO funding to scale innovative business models helps to demonstrate investor returns, which can attract new capital sources and bring the cost of capital down.</li> </ul> </li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If entities advancing innovative business models receive stage-appropriate support, then they will be able to accelerate the acquisition of customers and the deployment of clean energy products and technologies.</li> </ul>
<p><b>Activities</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA’s will issue a competitive solicitation to award funding to scale and validate novel business models and offerings. The level of funding provided will differ for companies with a well-defined and validated business model, and for companies with a well-articulated business model that is plausible, but has not yet been tested against the needs of market participants and real-world costs and barriers. <ul style="list-style-type: none"> <li>○ For validated business models, as evidenced by real transactions, NYSERDA will provide direct funding to enable the company to begin execution and scale. Funding would be available for legal, marketing, insurance, customer acquisition, and other expenses, but not for buying down the capital cost of any installed equipment and technology.</li> <li>○ For not yet validated models that still require market testing NYSERDA may provide a lower level of direct funding enable the company to fill in knowledge gaps and validate the model with robust customer and stakeholder engagement.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• NYSERDA will solicit proposals from companies with novel business models and offerings. These will be evaluated competitively with multiple opportunities per year.<sup>28</sup> Proposals will be evaluated using the following criteria: <ul style="list-style-type: none"> <li>○ Soundness of the novel business model based on a thorough description and as evidenced by real transactions.</li> <li>○ Absence of technology risk</li> <li>○ The economic return on the deployed clean energy enabled by the new business model or offering, including the sustainability of the company while delivering value to customers and financial backers</li> <li>○ The scalability of the new business model and its market potential</li> <li>○ Low levels of company risk, as evidenced by prior investment, financial strength, or demonstrated quality of the management team.</li> <li>○ Market relevance of funding milestones.</li> </ul> </li> <li>• Following awards, NYSERDA will employ project management practices to further limit the risks of market acceptance and mitigate execution risk as much as possible. Companies that cannot demonstrate transactions will not be eligible for the highest funding level, and NYSERDA will use Innovation Advisors, - experienced entrepreneurs and investors under contract to NYSERDA - in support of project selection and management. Progress will be monitored with a focus on ensuring achievement of well-defined and commercialization-critical milestones.</li> <li>• NYSERDA will coordinate with utilities in cases where the company’s business model intersects with evolving utility business models to ensure there is no duplication and to share lessons learned.</li> </ul>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>• Release solicitation for New Business Models and Offerings proposals for both scaling and validation support.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with first-round NBMO awardees.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with second-round NBMO awardees.</li> </ul> <p><u>Milestone 4 (2019)</u></p> <ul style="list-style-type: none"> <li>• Conduct preliminary program process assessment, examining the distribution of proposers, scope of proposed impact, and marketing and selection processes through first two rounds, and revise the solicitation as necessary.</li> </ul> <p><u>Milestone 5 (2020)</u></p> <ul style="list-style-type: none"> <li>• Re-release solicitation if necessary for the third round.</li> </ul> <p><u>Milestone 6 (2020)</u></p> <ul style="list-style-type: none"> <li>• Contract with third-round NBMO awardees.</li> </ul> <p><u>Milestone 7 (2020)</u></p> <ul style="list-style-type: none"> <li>• Perform program assessment to determine continuation.</li> </ul> <p><u>Milestone 8 (2020)</u></p> <ul style="list-style-type: none"> <li>• Contract with fourth-round NBMO awardees, if the program is continued.</li> </ul>

<sup>28</sup> The initiative will start with two funding opportunities a year.

<b>Goals Prior to Exit</b>	<p>NYSERDA will exit or cease funding specific areas of business model innovation and shift focus once sustainability of such business models is confirmed, as indicated by:</p> <ul style="list-style-type: none"> <li>• New equity investments in NBMO awardees</li> <li>• Multiple REV-enabling business models being pursued by non-utility companies</li> </ul> <p>In addition if the mid-term program assessment indicates that too few business models have demonstrated success and scaling, the program may be terminated.</p>
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10.3.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• Proposers applying to this program may also be seeking a utility partner within a REV demo framework. In these cases, NYSERDA will coordinate with utility and DPS staff to ensure alignment on project goals, outcomes, and the most optimal use of available resources.</li> <li>• This offering could help companies with innovative business models validate their value proposition and thereby position the company for more effective utility engagement</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• REV Demos could be used to deploy and test new business models</li> <li>• REV Connect could highlight partnerships with utilities that may require further development before utilities can sign on.</li> </ul>

10.3.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 11. The annual expenditure projection is included in Table 12. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 11. Annual Innovation & Research Budget Allocation – Commitment Basis**

<b>Budget</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
Business Support	\$3,150,000	\$3,500,000	\$4,550,000	\$4,900,000	\$16,100,000
Total	\$3,150,000	\$3,500,000	\$4,550,000	\$4,900,000	\$16,100,000

**Table 12. Annual Expenditures Projection**

<b>Expenditures</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
<b>Total</b>	7%	20%	24%	29%	20%	100%

10.3.7 Progress and Performance Metrics

Table 13 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are

measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 13. Initiative Specific Metrics**

<b>Indicators<sup>29</sup></b>		<b>Baseline (Before/Current)</b>	<b>2019 (Cumulative)</b>	<b>2022 (Cumulative)</b>
<b>Activity/ Outputs</b>	Number of companies supported	0	16	33
	Number of validation and scaling projects initiated	0	19	46
	Number of validation and scaling projects completed	0	14	46
<b>Outcomes</b>	Number of supported companies raising additional capital	0	0	11
	Number of new business models successfully scaled by supported companies	0	4	8
	Number of new business relationships formed with utilities by supported companies	0	2	6

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Declining cost of capital for clean energy equipment deployed via new business models.
- Demonstrated returns on capital provided by financial institutions to new business models.

Benefits shown in Table 14 and Table 15 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Due to the nature of the activities, estimating energy savings impacts at this stage is difficult because the specific businesses and technologies that will be supported are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

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<sup>29</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

**Table 14. Direct Impacts**

Primary Metrics		2018	2019	2020	2021	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MMBTu Annual	-	-	-	-	-
	MMBTU Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-	-
Customer Bill Savings Annual (\$ million)		\$-	\$-	\$-	\$-	\$-
Customer Bill Savings Lifetime (\$ million)		\$-	\$-	\$-	\$-	\$-
Private Investment (\$ million)		\$32.9	\$36.6	\$47.6	\$51.3	\$168.4

**Table 15. Annual Projected Initiative Participation**

	2018	2019	2020	2021	Total
Participants <sup>30</sup>	9	6	9	9	33

### 10.3.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• Awardees under this program are generally involved in developing new business models to bring innovative technologies and solutions to market that will help achieve New York State’s greenhouse gas emission, renewable energy, and energy efficiency goals.</li> <li>• The innovative business models and startup companies that will scale through this program will provide a range of benefits for New York ratepayers to advance REV objectives, potentially accelerating the deployment of energy efficiency investments, a range of improved DER options, new transactions with electric and gas utilities, energy management, and other services.</li> </ul>
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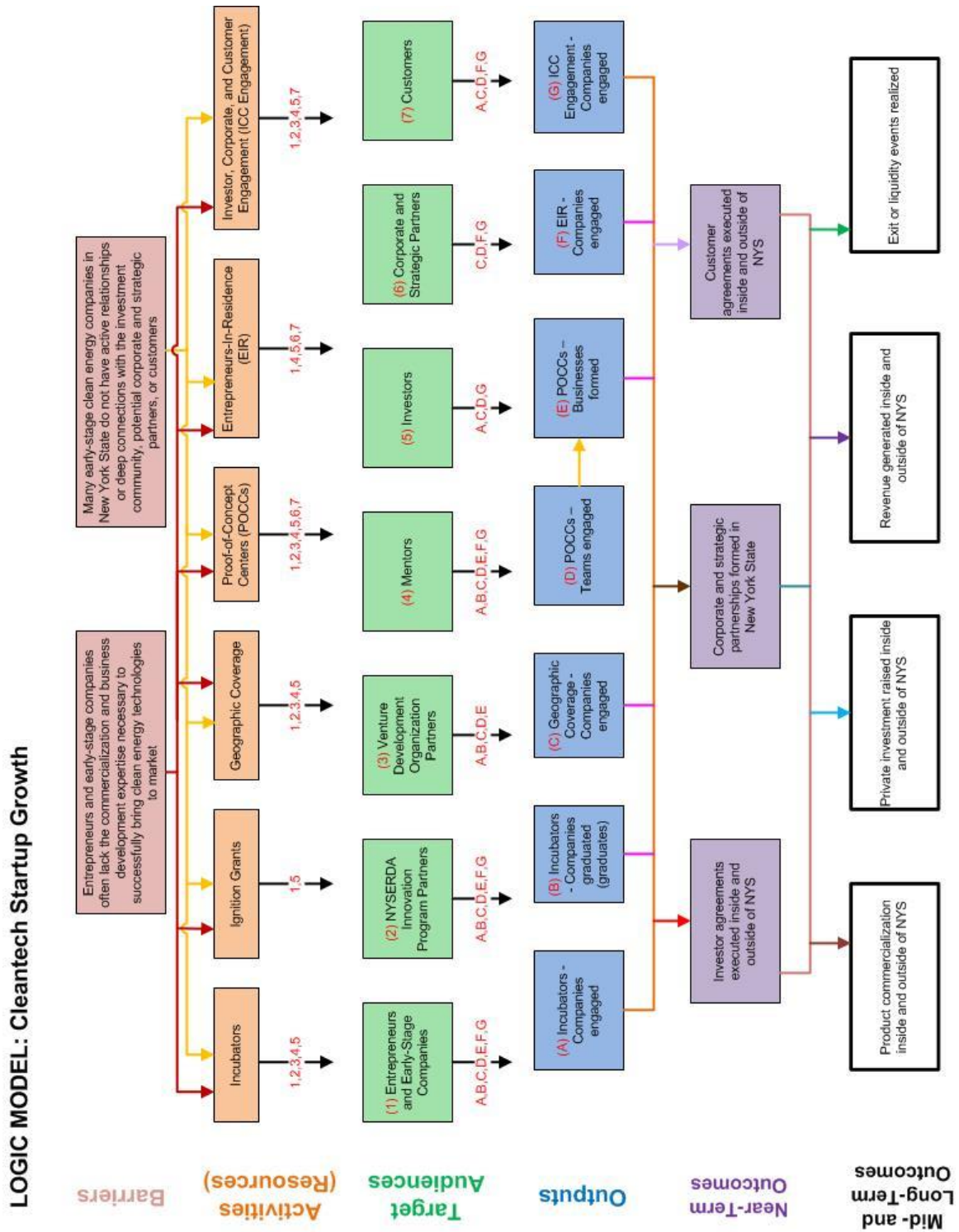
<sup>30</sup> Participants are clean energy companies awarded funding under this program area. Note that some companies may receive funding both for validation and for scaling; they are counted once. In addition some companies may receive funding under this program and also receive research and development funding, as well as support under CTSG. The amount of overlap is unknown at this time but will be monitored to avoid double-counting of benefits.



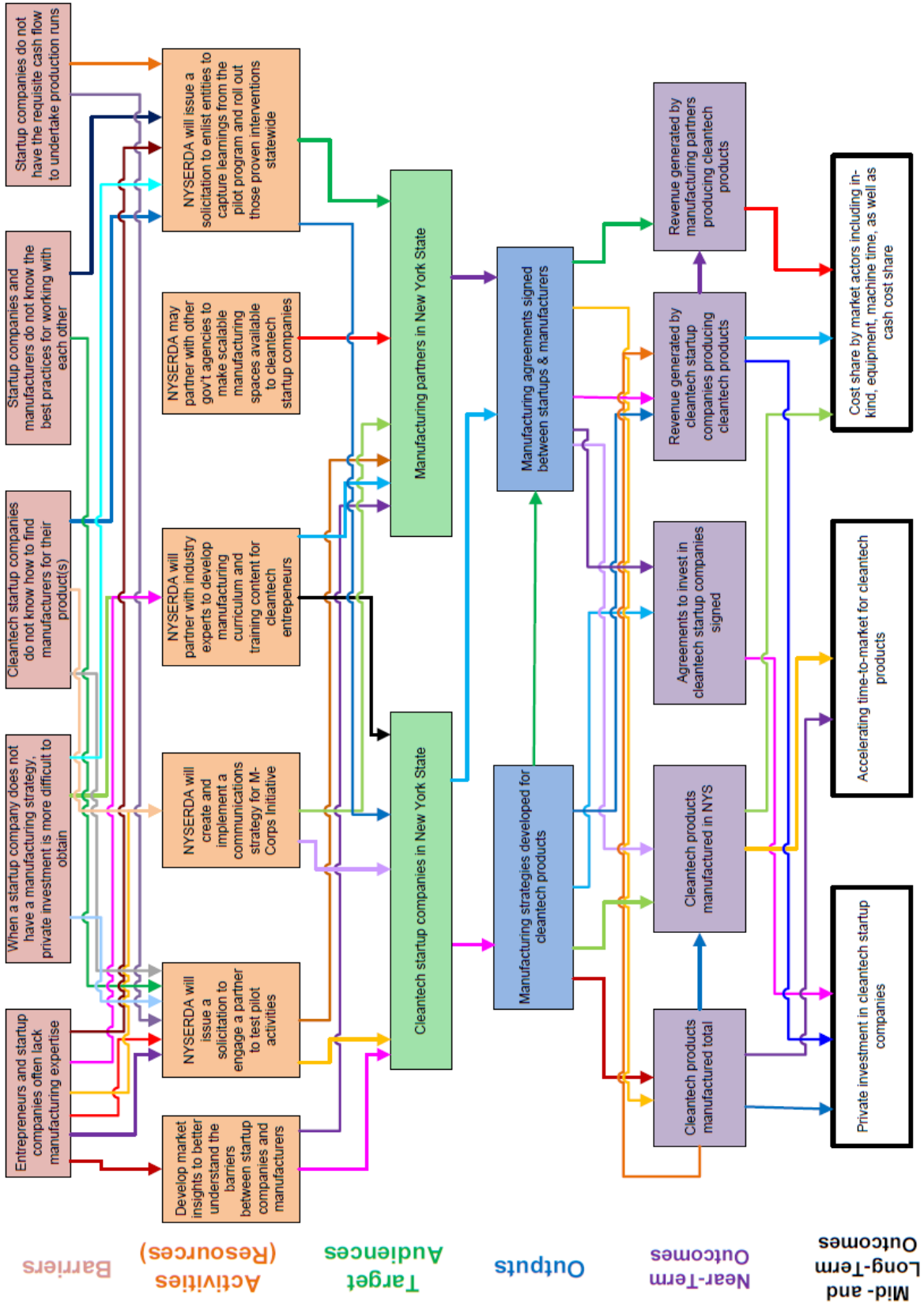
### 10.3.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"><li>• Collect, analyze and report on progress of the initiative by monitoring the activities including number of projects initiated and completed by type, the level of private investment attracted, and other key output metrics on a regular basis (i.e., quarterly, bi-annually).</li><li>• For any new business models launched under the program, on an annual basis, NYSERDA staff and supported companies will track customer uptake.</li><li>• Following the first two rounds, during the first year, NYSERDA will assess program process, examining the distribution of proposers, size and scope of proposed impact, and marketing and selection processes through first two rounds. This assessment may lead to new tactics for promoting the program particularly to strategic sectors.</li><li>• Following the award of projects from the first three rounds, estimated to occur in the third year, program success in accomplishing the deployment and growth of new business models will be assessed. At this point, the program solicitation could be terminated if too few business models have demonstrated success or if they fail to demonstrate sufficient scale.</li></ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"><li>• Market Evaluation is not planned for this initiative, beyond aspects addressed in the Test-Measure-Adjust Strategy.</li></ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"><li>• Impact evaluation and field verification is not planned for this initiative as there are no energy impacts claimed.</li></ul>
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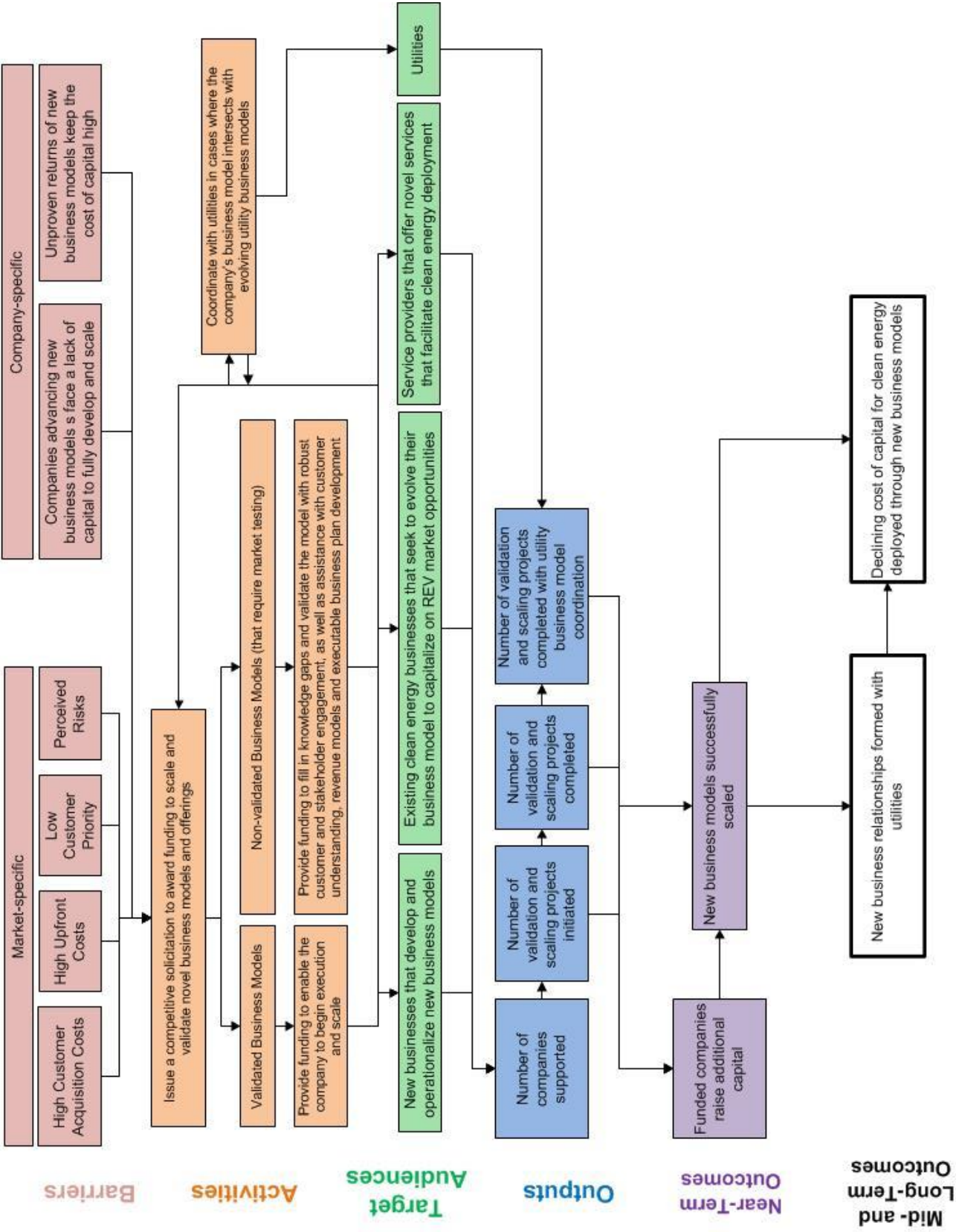
# Appendix A – Logic Models



# LOGIC MODEL: Manufacturing Corps (M-Corps) Initiative



# LOGIC MODEL: Novel Business Models and Offerings



## Appendix B – Investment Plan Review Supplement<sup>1</sup>

### Cleantech Startup Growth

#### Results to Date – Metrics

The Cleantech Startup Growth initiative is exceeding its cumulative current target through Q2 2017 for private investment. The initiative is not yet accounting for participant enrollment as contract negotiations are still on-going. However, it is expected that the 2017 participant enrollment target will also be met by year end. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	*	-	*	-
	Lifetime Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	*	-	*	-
	Lifetime Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Dollars	-	-	-	\$124.50	\$124.50	\$116.00	107%	\$225.00	55%
Participants	Participants	-	-	-	-	-	78	-	191	-

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	2022 Target	June 2017 Actual	
		(Cumulative)	(Cumulative)	(Cumulative)	
Activity/Outputs	Incubators – Companies Engaged	0	119	146	0
	Incubators – Companies Graduated (Graduates)	0	12	21	0
	Geographic Coverage – Companies Engaged	0	24	24	0

<sup>1</sup> As this report includes performance through Q2 2017 and the Novel Business Models and Offerings Initiative was filed in Q4 2017, that initiative is not included herein.

### Performance Against Key Milestones

Cleantech Startup Growth has made good progress toward its current milestones. Current milestones that are not yet complete are in progress. The four incubator contracts will begin in the second half of 2017, along with networking events as work commences on these projects. For Cleantech Start-up Growth Ignition Grants, the customer discovery and market validation exercise is in the final stages, and the solicitation is currently under development. For Cleantech Start-up Growth Geographic Coverage, one incubator contract is in negotiation and should be in place by the end of August.

Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

#### **Cleantech Startup Growth Incubators**

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
✓	2016	First competitive solicitation launched.
	2017	Awards from first solicitation are contracted.
✓	2017	Second competitive solicitation launched.
	Starting 2017	Networking event held.
	Starting 2017	Entrepreneur boot camp held.

#### **Cleantech Startup Growth Ignition Grants**

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
	2017	Formal Voice of Customer exercise is completed.
	2017	Solicitation launched.
	2017	Establish investment committee.
	Starting 2017	Investment committee meetings held.
	Starting 2017	Launch ignition grants solicitation and issue awards on ongoing basis.

#### **Cleantech Startup Growth Geographic Coverage**

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
✓	2016	Competitive solicitation launched.
	2017	Awards from solicitation are contracted (~6 months following solicitation due date).

	2017	Inventory of entrepreneurial assets in Southern Tier is completed.
	2017	Establish entrepreneurship training programs.
✓	Starting 2017	Networking events held.

Plan for Continuation/Modification/Termination

The Cleantech Startup Growth initiative was updated in November 2017 to add new components to assist clean energy technology companies, with associated budget and benefits. The program has also been extended through 2022 to accommodate the new components and associated activities. The new components include: proof-of-concept centers, entrepreneurs-in-residence, and investor, corporate, and customer engagement. Following these modifications, the initiative will continue as planned.

## Manufacturing Corps

### Results to Date – Metrics

The Manufacturing Corps Initiative will begin recording benefits once project commitments are made. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	-	-	*	-	*	-
	Annual Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Lifetime Dollars	-	-	-	-	-	*	-	*	-
	Dollars	-	-	-	-	-	\$10.00	-	\$60.00	-
Participants	Participants	-	-	-	-	-	50	-	450	-

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA's current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	2021 Target	June 2017 Actual <sup>2</sup>
			(Cumulative)	(Cumulative)	(Cumulative)
Activity/ Outputs	Manufacturing strategies developed for cleantech products	0	24	66	n/a
	Manufacturing agreements signed between startups & manufacturers	0	24	66	n/a

### Performance Against Key Milestones

The Manufacturing Corps Initiative is early in its development but is making progress toward its current milestones. Current milestones that are not yet complete are or will soon be in progress. The RFQ is in development and expect to launch Q4 2017. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<sup>2</sup> Outputs are "n/a" because initiative only launched on June 29, 2017.



Complete ✓	Time Frame	Milestone
	2017	RFQ launched to identify manufacturing experts.
✓	2017	Competitive solicitation launched for pilot sites.
	2017	Awards from RFQ are contracted.
	2017	Awards from pilot-site solicitation are contracted. Pilot program launched.

Plan for Continuation/Modification/Termination

The Manufacturing Corps initiative was modified in November 2017 to provide additional clarity to the broad outcomes being tracked, update the logic model to more clearly align with the language in the investment plan, and shift the timing of the budget, benefits, and milestones to reflect the current program schedule, as well as to remove a milestone that will no longer be completed. The milestone has been removed because its goal was achieved in a prior milestone so it was no longer necessary to pursue. Following these modifications, the initiative will continue as planned.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Energy Storage Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan: Energy Storage Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
August 1, 2016	Original Issue	Original Issue
June 23, 2017	Tables 1, 2, 4, and 5 have been updated to reflect a shift in timing of budget and benefits.	Multiple
November 1, 2017	Updated the baseline values in Table 3 to reflect latest data available.	15

# 11 Energy Storage

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Energy storage will play a critical role in achieving the State’s renewable generation and greenhouse gas reduction objectives. Storage can reduce the intermittency of solar and wind energy, helping these resources to be flexible assets deployed when needed. It can avoid the need for new electric system infrastructure, increase system efficiency and resiliency, and reduce the requirement for fossil fuel plants to meet periods of peak electric demand, which occur infrequently.<sup>1</sup> Storage can also integrate with demand response and energy efficiency measures within buildings to achieve greater energy savings without sacrificing occupant comfort. Finally, energy storage can also redefine the transportation system through electric vehicles and rail.

Energy storage is a multi-faceted technology that cuts across many sectors, including clean energy production, energy efficiency, various types of customers and buildings, and established technologies as well as those still in development. NYSERDA’s energy storage strategy will target key barriers limiting energy storage adoption in three sectors: customer-sited (behind-the-meter systems), transmission and distribution system needs, and the transportation system. The initial initiative described in this chapter addresses barriers in the customer-sited (behind-the-meter) sector and the ability to use these systems to meet transmission and distribution system needs. Five activities are included in this initiative that contribute toward reducing soft costs by 33% and enabling half of all distributed energy storage installations to provide value to two or more parties within five years: safety validation and permitting for electrochemical systems, best fit customer acquisition, quality assurance (performance confidence), value stacking pilots, and tools to support market replication.

This initiative is part of NYSERDA’s coordinated intervention strategies to develop and deploy energy storage products and remove market barriers to their adoption. In addition to this initiative, NYSERDA is considering an integrated PV and storage market development initiative and an energy storage technology and product development initiative for submission. Insights gained from the activities included in this chapter will also be incorporated into the demonstrations proposed under other chapters, as appropriate. Program investments and activities will be informed via engagement with stakeholders and subject matter experts. The budget, benefit, and participant values for this initiative have been updated to shift the timing of work completed under this initiative from 2016-2019 to 2017-2020 to reflect a later than expected program start date.

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<sup>1</sup> Average electric system load is approximately 18 GW, yet the system is built to reliably meet well over 30 GW of demand that arise only 60 hours per year.

# 11.1 Reducing Barriers to Deploying Distributed Energy Storage

## 11.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Energy storage will help achieve New York’s long-term renewable and greenhouse gas reduction goals by integrating intermittent renewables, increasing utilization of electric system assets, and reducing the need for fossil fuel peaker plants.<sup>2</sup> In particular, leveraging dispatchable behind-the-meter resources to meet customer need and those of the electric system is integral to a Reforming the Energy Vision (REV) future.</li> <li>• The market is ripe for driving scale as hardware costs are declining, customer interest in energy storage is growing, and the importance of this solution in achieving the State’s renewable energy, greenhouse gas, and REV objectives is increasingly recognized.</li> <li>• However today, the typical distributed storage resource is underutilized in serving multiple system needs, has high installed costs relative to the hardware costs, and often has an unacceptable return on investment. This initiative will address these challenges to deploy and validate optimized distributed storage solutions under REV.</li> <li>• While still a nascent market, since 2012, employment in New York’s energy storage sector has grown 30% to approximately 3,900 employees and global annual revenues from New York companies have increased 50% to \$900 million. A recent study projected that by 2030 this sector could employ 25,000 in New York State and comprise \$8 billion in annual revenues.<sup>3</sup> Distributed energy storage is still very much in the early stages of deployment in New York with approximately 23 MW of rated power installed, including the 20 MW Beacon flywheel facility for frequency regulation, and another 10 MW to 20 MW in various stages of permitting.</li> <li>• Three main stall points are preventing wide-scale adoption of distributed energy storage<sup>4</sup> in New York. While these barriers affect all forms of energy storage to different extents, the impact is especially significant on electrochemical systems such as advanced batteries which, due to their features, are especially well suited for many distributed storage functions.             <ul style="list-style-type: none"> <li>○ <u>Soft costs</u>: including permitting, customer acquisition, design, interconnection, and financing, can comprise 25% or more of the total installed cost of an energy storage system. While battery costs are declining by 10% or more annually,<sup>5</sup> these soft costs are largely driven by local conditions.</li> <li>○ <u>Uncertainty</u>: since the number of distributed storage installations is still small, customers, investors and utilities are uncertain regarding performance, perceived safety risks, and financial models. In addition, uncertainty in future tariff structures adds difficulty in projecting long-term project revenues.</li> <li>○ <u>Return on investment limitations</u>: while an energy storage system’s flexibility (fast response, precise load management, repeatable load curtailment, generation shifting) allow it to perform multiple functions due to unproven</li> </ul> </li> </ul>
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<sup>2</sup> For example, the *Renewable Electricity Futures Study* prepared by NREL in 2014 identified the need for 2.2 GW to 2.6 GW of energy storage in New York State at 50% renewable penetration, and up to 5.9 GW at 80% renewable generation.

<sup>3</sup> Data obtained from *The Energy Storage Industry in New York: Recent Growth and Projections, 2015 Update*, June 2016 DRAFT and prepared by Industrial Economics, Inc. Final study to be published soon.

<sup>4</sup> Distributed energy storage refers to energy storage systems in the kW to multi-MW range that are located behind and in-front-of a customer’s meter within the distribution and transmission system, but does not include bulk storage resources such as pumped hydro.

	use cases, performance uncertainty, and market rules such as minimum system sizing in the wholesale markets, few systems in New York State provide more than one or two services limiting the ability to earn revenue.
<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• This initiative will primarily target building owners and operators, permitting agencies, and vendors to address the stall points presented above and includes five elements that build upon NYSERDA’s reputation as a source of objective and credible information: <ol style="list-style-type: none"> <li>1. Safely deploy energy storage technologies by conducting battery testing to address safety uncertainty, training first responders, and engaging with authorities having jurisdiction (permitting agencies) to develop model permitting guides;</li> <li>2. Reduce customer acquisition cost by identifying characteristics of best fit customers, data mining, and supporting feasibility studies and pilots to accurately predict good fit customers;</li> <li>3. Increase confidence by compiling and inputting data on deployed systems into a publicly searchable platform, evaluating value propositions and customer bill savings, and conducting educational outreach to customers and vendors;</li> <li>4. Invest in “value stacking pilots” that assess the effectiveness of using a distributed storage system to meet distribution and/or wholesale system needs in addition to those of the host site; and</li> <li>5. Invest in tools that support market replication through fact sheets, best practices, and use cases with clear economics.</li> </ol> </li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: reducing barriers to installing distributed energy storage,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Reduce soft costs by 25% per kWh in three years and 33% or more in five years, based on a 2015-16 baseline. This would reduce the total installed cost of a four-hour customer-sited system in New York City by almost \$75/kWh (representing 10% of today’s installed cost and 15% of projected installed cost by 2022).</li> <li>• Half of all distributed energy storage installations in the market in five years provide value to two or more parties (customer, distribution utility, load serving entity, New York Independent System Operator (NYISO)).</li> <li>• Expand customer choice by increasing the number of experienced vendors selling energy storage solutions in New York State, and increase vendor capabilities and business models through data sharing, case studies, and best practices.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• Energy storage will play a critical role in reaching the State’s renewable generation and greenhouse gas reduction objectives and in reducing peak electric demand.</li> <li>• Distributed energy storage will firm intermittent renewables avoiding the need for new fossil fuel peaker plants, permit greater customer load control, and reduce electric bills.</li> <li>• Leveraging distributed storage systems to address multiple system needs will create a more cost-effective electric system and reduce ratepayer cost for traditional utility infrastructure.</li> <li>• The proposed strategies will help inform new test tariffs proposed by utilities for locational-based marginal price plus distribution value (LBMP+D), which would reflect the delivered price of electricity at a specific time of day and location.</li> </ul>

11.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The initial target will be interval-metered customers in the multifamily, commercial, industrial and educational sectors with low load profiles (high peak loads for short periods), their distribution utilities and load serving entities, and vendors. Interval-metered customers are those with the highest amounts of electricity use, typically measured in 15 minute or less intervals. This quantity of electric load data permits
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	identifying customers best aligned for realizing bill savings by reducing their electric demand using energy storage. As the costs of energy storage systems decline and value stacking opportunities become better quantified, the target market will expand to medium-sized demand metered entities within these same verticals.
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• Building owners and operators</li> <li>• Storage vendors and service providers</li> <li>• Permitting agencies (authorities having jurisdiction (AHJ) such as building and fire departments)</li> <li>• Architects and engineers</li> <li>• Distribution and municipal utilities, load serving entities, curtailment service providers (aggregators), NYISO</li> <li>• Professional associations and trade associations such as Building Owners and Managers Association (BOMA) and the New York Battery and Energy Storage Technology consortium (NY-BEST)</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• Advanced energy storage on the grid, encompassing grid-connected (utility side of the meter) and customer-connected (customer side of the meter) applications are projected to grow globally from 538 MW installed in 2014 worth \$675 million to 21,000 MW worth \$15.6 billion in 2024, and up to \$400 billion by 2030. <sup>6</sup> New York firms engaged in the energy storage sector include Fortune 500 companies, original equipment manufacturers, system integrators, and a strong startup and research community.</li> <li>• Battery prices are declining by 10% or more annually. For example, since 2008-2010, lithium-ion battery module cost has decreased by a factor of four while lifetime and capacity has doubled.<sup>7</sup> In 2016, quoted cost of an installed customer-sited four-hour lithium-ion system in a metropolitan location was on the order of \$850/kWh or greater. Multiple market research firms point to customer-sited systems declining to approximately \$500/kWh or lower by the early to mid-2020's. Other advanced storage technologies also offer the potential for lower lifetime costs and attractive performance attributes. At these projected price points, the number of systems with positive return on investment increases substantially and large-scale deployment is possible.</li> <li>• Growth in renewable generation, interest in demand response, and desire for utility non-wires alternatives is positioning energy storage to be a significant component in meeting the needs of the electric system.</li> <li>• The number of vendors developing and selling energy storage solutions continues to increase. Many firms are watching the New York market evolve and ready to be engaged more meaningfully.</li> </ul>

<sup>6</sup> Navigant Research, *Energy Storage for the Grid and Ancillary Services, 2Q 2016* (providing 2014 and 2024 market data): <http://www.navigantresearch.com/newsroom/energy-storage-for-the-grid-is-expected-to-reach-15-6-billion-in-annual-revenue-by-2024>

Citigroup, *Investment Themes in 2015*, January 2015 (providing energy storage market predictions for 2030): <https://ir.citi.com/20AykGw9ptuHn0MbsxZVgmFyppuQUUt3HVhTcejz4ibR%2Bx79LajBxIyoHIoSDJ3S%2BWRSMg8Woc%3D> and <http://www.energy-storage.news/news/citigroup-predicts-240gw-energy-storage-market-by-2030>

Data from GTM Research, Navigant Consulting, Citibank

<sup>7</sup> Battery price percentage decline prices:

Battery Power Magazine, October 2013, <http://www.batterypoweronline.com/main/articles/the-lithium-ion-inflection-point/>  
 PV Magazine, November 2015, [http://www.pv-magazine.com/news/details/beitrag/li-ion-battery-costs-to-fall-50-in-next-5-years--driven-by-renewables\\_100022051/#axzz4G5vZqQof](http://www.pv-magazine.com/news/details/beitrag/li-ion-battery-costs-to-fall-50-in-next-5-years--driven-by-renewables_100022051/#axzz4G5vZqQof)

Bloomberg New Energy Finance Summit historical price chart: <http://c1cleantech.com/wpengine.netdna-cdn.com/files/2015/09/battery-learning-rate.png>

Pike Research and Deutsche Bank price trends: <https://grist.files.wordpress.com/2011/09/li-ion-projected-costs.png>

Lithium ion density trends: [http://static.cdn-seekingalpha.com/uploads/2012/5/14/saupload\\_Battery\\_20Density.jpg](http://static.cdn-seekingalpha.com/uploads/2012/5/14/saupload_Battery_20Density.jpg) and <http://www.nissan-global.com/JP/TECHNOLOGY/FILES/2010/07/f4c4d5d2e20391.jpg>

	<ul style="list-style-type: none"> <li>• Customers are increasingly aware of energy storage but generally remain unclear as to its maturity and value proposition.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Many multifamily, commercial, and industrial operations are striving to manage their energy demand, uncertain about revenue potential in utility/NYISO demand response programs, and seeking a straightforward semi-automated mechanism to achieve this value. The proposed strategies will identify and help to deploy energy storage in best fit customers to meet these customer needs.</li> <li>• Under REV, distribution utilities will increasingly pursue less expensive, non-wires alternatives including energy storage integrated directly at substations and aggregated from customer-sited systems to provide load relief. The proposed pilots will evaluate the effectiveness of dispatching customer-sited energy storage to also meet distribution utility system needs.</li> <li>• NYSERDA’s investments in specific projects through pilots will decrease the customer’s payback period from 7 or more years to a projected 5 or fewer years and increase persistence by decreasing the risk of projects being abandoned or systems being under-utilized. This will help to build a library of learnings and successful case studies to further stimulate customer confidence and growth.</li> <li>• Storage can also provide modest resiliency benefits for customers, especially when integrated with on-site generation.</li> <li>• In addition, as intermittent renewables generate the majority of New York’s electricity, energy storage will firm these resources so that renewable energy is dispatchable when needed reducing the need for fossil fuel peaker plants, reducing greenhouse gas emissions and health pollutants, and decreasing the cost of meeting peak electric demand.</li> </ul>

11.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<p>Engagement to date:</p> <ul style="list-style-type: none"> <li>• Building owners, technology vendors and installers, architects and engineers, permitting agencies, and utilities have been engaged in identifying needs and strategy development; strong engagement will continue with these organizations during program development and rollout.</li> <li>• Relationships have been forged and strengthened with the Fire Department of New York City, NYC Department of Buildings, Con Edison, NY-BEST, and the Distributed Generation Hub at City University of New York (CUNY).</li> <li>• Organizations outside of New York are being leveraged for battery safety modeling (Sandia National Lab), building and life safety codes development (Pacific Northwest National Lab), and distributed energy resource (DER) integration and interoperability (Electric Power Research Institute). These relationships will be expanded to achieve the most with CEF funds.</li> </ul> <p>Further engagement:</p> <ul style="list-style-type: none"> <li>• Meaningful engagement with other distribution and municipal utilities, the Department of Public Service (DPS), and the NYISO will be prioritized.</li> <li>• Market participants will be periodically solicited to assess program effectiveness in meeting needs, identify new program opportunities, and refine program strategies based on success in removing barriers.</li> <li>• On-site visits will be conducted to maintain an understanding of project participants’ experiences, needs, success, and challenges.</li> <li>• Webinars will be conducted for potential customers and energy storage vendors to share results from these activities and best practices.</li> </ul>
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	<ul style="list-style-type: none"> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) to engage with stakeholders, as appropriate.<sup>8</sup></li> </ul>
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#### 11.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Permitting is exacerbated by safety uncertainty which causes significant delays or prevents projects from being considered.</li> <li>• Customer acquisition cost is too high.</li> <li>• Lack of unbiased information on vendor experience or system performance prevents customers from considering energy storage and hinders the distribution utilities and/or NYISO from relying on aggregated storage to address system needs.</li> <li>• Return on investment is poor in many cases when an energy storage system addresses only a single need and/or accesses only a subset of possible value streams the storage system can provide.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If safety uncertainty is reduced, then permitting agencies will be more comfortable approving systems resulting in a faster path to deployment.</li> <li>• If model operating procedures are developed, there will be greater clarity to the vendor community resulting in a faster path to deployment.</li> <li>• If soft costs are reduced by 25% or more from a 2015-16 baseline of approximately \$220/kWh while battery costs continue to decline through global manufacturing scale-up, then installed cost for a distributed energy storage system in New York State will become much more attractive for greater numbers of customers to manage their peak electric demand and use these systems to meet electric system needs.<sup>9</sup></li> <li>• If customers, architects, engineers, and distribution utilities have confidence in vendors and system performance, then more systems will be considered for implementation and market growth will accelerate.</li> <li>• If distributed energy storage systems can predictably earn revenue by addressing electric system needs in addition to customer demand management, then many more systems will be financially viable with paybacks of three to six years<sup>10</sup> and energy storage will become integrated into planning decisions without the need for NYSERDA incentives.</li> </ul>
<b>Activities</b>	<p>Each of these activities contributes toward reducing soft costs by 25% per kWh in three years and 33% or more in five years, and enabling half of all distributed energy storage installations to provide value to two or more parties within five years.</p> <p><b>1. Safely deploy energy storage technologies by conducting battery testing to address safety uncertainty, training first responders, and engaging with authorities having jurisdiction (permitting agencies) to develop model permitting guides:</b></p> <ul style="list-style-type: none"> <li>• <b>Conduct burn tests</b> – while electrochemical systems (batteries and ultracapacitors) are well suited for distributed storage because of their fast response, precise load management, and locational flexibility, deployment in New York State has been hindered because of safety uncertainty. An independent lab will be contracted to develop and conduct tests that address questions being raised by permitting agencies and create best practices for first responders. These tests will include evaluating the rate of heat rise and ignition, propagation between cells, gases and liquids released during a fire, and efficacy</li> </ul>

<sup>8</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094, et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

<sup>9</sup> Refer to the Market Readiness Section for an example of battery installed cost estimates.

<sup>10</sup> This is almost twice as fast a payback as many systems today.

	<p>of various extinguishing agents. Initially, lead acid, lithium-ion, and flow batteries will be tested. Scope will then expand to emerging storage technologies such as zinc-based and alkaline batteries, ultracapacitors, or flywheels. Storage technologies tested will be based upon those submitted for approval with Authorities Having Jurisdiction (permitting agencies such as fire and building departments), and will initially be based on those under review by the NYC Fire Department and NYC Department of Buildings.</p> <ul style="list-style-type: none"> <li>• <b>Develop training materials</b> in collaboration with National Fire Protection Association to inform safe installation of energy storage systems, and identify containment, extinguishing, and ventilation techniques in the event of a building fire.</li> <li>• <b>Hold training sessions for New York AHJ</b> (permitting agencies) and vendors. These training sessions will be integrated with existing training programs, such as PV training, to the greatest extent possible.</li> <li>• <b>Create model operating procedures and developer guides</b> in conjunction with AHJs that aggregate best practices for safe installation of systems, extinguishment and containment, and summarizing existing codes and standards in understandable guides, and educate vendors about these requirements. Assist AHJs in efficiently reviewing applications.</li> <li>• <b>Develop model permitting guides</b> for energy storage technologies in conjunction with AHJs, based on AHJ priorities and independent results obtained through these safety tests and requirements in use elsewhere. This will include model permitting guides for energy storage systems used independently in load management applications and systems integrated with other distributed energy resource such as PV. Guide development of building and life safety code evolution to consider validated model approaches.</li> <li>• <b>Stay engaged on interconnection requirements</b> – while not yet a stall point, NYSERDA staff will remain engaged on interconnection requirements to help proactively address issues that could arise as the number of storage systems seeking interconnection increases.</li> </ul> <p><b>2. <u>Reduce customer acquisition cost</u> by identifying characteristics of best fit customers, data mining, and supporting feasibility studies and pilots to accurately predict good fit customers:</b></p> <ul style="list-style-type: none"> <li>• <b>Identify characteristics of best fit customers</b> – vendor experience has shown that NYC medium and large multifamily buildings with common area load that is in the 100’s of kW have been good initial fit customers for using energy storage to reduce demand charges and peak load. Working with this customer class, other early adopters, and the distribution utilities, key characteristics that define best fit customers will be identified and validated. Characteristics will include load predictability, load factor, peak duration, available space, sensitivity to energy costs, curtailment tolerance, and building’s alignment within constrained distribution systems.</li> <li>• <b>Identify and contact potential customers</b> – in conjunction with the distribution utilities, interval-metered customers meeting these characteristics will be contacted about DER and load management opportunities including energy storage. Segmentation will continue to expand as best fit customer characteristics are quantified, beginning with common area space in multi-family residential buildings, coops, and condos and commercial buildings including hotels. Opportunities where a distribution utility can earn revenue conducting these data analytics will also be evaluated.</li> <li>• <b>Conduct feasibility studies and pilots to validate best fit customer characteristics</b> and determine if these characteristics accurately predict customer fit for energy storage. Data will be captured to create modeling tools made publicly available that identify best fit demand metered customers within different building classifications. These tools may also include modeling to compare customer electric bills among various tariffs, similar to those developed for Combined Heat and Power, to help customers understand tariff impacts on value proposition (e.g., switching to a standby tariff).</li> </ul>
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	<ul style="list-style-type: none"> <li>• <b>Conduct feasibility studies and pilots to examine under-utilized exterior sites</b> such as closed landfills or brownfields for solving distribution or transmission constraints by locating energy storage or storage co-located with DER. Often, these sites are in economically-distressed areas and are otherwise unusable land.</li> </ul> <p><b>3. <u>Increase confidence by compiling and inputting aggregated data on deployed systems into a publicly searchable platform, evaluating value propositions and customer bill savings, and conducting educational outreach to customers and vendors:</u></b></p> <ul style="list-style-type: none"> <li>• <b>Collect and compile data on deployed systems</b> including performance and revenue/savings data. Non-proprietary information will be aggregated in a publicly searchable platform that allows potential customers to examine operating systems. This will include use cases, building type, case studies, technology, ownership, and business models.</li> <li>• <b>Conduct bill analytics</b> for deployed customer-sited systems to evaluate bill savings and value proposition both pre-and post-energy storage deployment. In particular, this will help to create more accurate and trusted savings models and could lend itself to a future utility revenue service.</li> <li>• <b>Develop a catalogue of use cases</b> for deployed systems to reduce customer uncertainty, minimize the need for customized engineering and design, and accelerate the learning curve when a customer is considering storage.</li> <li>• <b>Conduct educational outreach</b> to building owners and customers, including events to connect stakeholders, and gathering people to learn, ask questions, and build their knowledge, thereby instilling confidence.</li> <li>• <b>Engage suppliers</b> to increase their knowledge of local markets and AHJ requirements, and increase exposure to local partners and resources to engage such as by maintaining a resource directory for stakeholders (e.g., knowledgeable engineering firms). Coach and guide companies through New York State use cases, permitting processes, and the intricacies of rate structure in New York.</li> </ul> <p><b>4. <u>Invest in “value stacking pilots” that assess the effectiveness of using a distributed storage system to meet distribution and/or wholesale system needs in addition to those of the host site:</u></b></p> <ul style="list-style-type: none"> <li>• <b>Evaluate the performance and quantify the value of using customer-sited energy storage to meet electric system needs.</b> Independent validation will assess the technical and cost effectiveness of using customer-sited energy storage to address customer needs such as energy management as well as distribution system and/or NYISO needs. These system needs could include peak reduction, renewable firming, and ancillary services. Various ownership and business models will be evaluated to determine those that can most effectively optimize a system, and value will be quantified in the context of the next best alternative. Validation will also evaluate the storage system’s performance reliability in meeting system needs when competing demands must be optimized. Interoperability needs, aggregation, direct utility control and dispatching the storage resource through a control signal, as well as third party ownership models including energy service companies, will be tested.</li> <li>• <b>Information sharing and replication</b> will occur through a catalog of pilots and use cases that provide guidance on system optimization and inform future tariffs and regulations. <ul style="list-style-type: none"> <li>○ Aggregate pilot results and develop case studies to provide customers, vendors, utilities, and policymakers with unambiguous results of a system’s ability to effectively serve multiple needs, performance, and value.</li> <li>○ Produce and promote fact sheets for vendors that clarify energy storage products in the distribution utility and wholesale markets that can currently be monetized, as well as the most compelling and valuable needs identified through these pilots.</li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>○ Provide best practices on alternative business models that facilitate value stacking, including more clearly examining the aggregator business model.</li> <li>○ Engage with utility partners to model and test new tariff designs, assess effectiveness in driving consumer behavior, and broaden the scope of REV pilots.</li> <li>● <b>Pilot projects</b> will be competitively selected based on distribution or wholesale system locational need, magnitude of statewide replicability, and potential for acceptable returns on investment without incentives if the proposed use cases prove valid. Projects submitted that do not align with current regulations and tariffs will be considered. Projects will adhere to the following criteria: <ul style="list-style-type: none"> <li>○ The distribution utility and/or NYISO must support the pilot.</li> <li>○ The pilot must present a compelling market opportunity with potential to reduce peak electric demand, integrate renewables, and/or reduce the need for fossil fuel peaker plants.</li> <li>○ The storage system must provide customer value through reduced energy cost and demand charges in addition to one or more of the following benefits: <ul style="list-style-type: none"> <li>(1) utility services including, but not limited to, congestion relief, transmission and distribution deferral, power quality, or renewable firming;</li> <li>(2) NYISO services including, but not limited to, capacity reduction, or ancillary services; and</li> <li>(3) testing of new products or services such as Volt/VAR optimization.</li> </ul> </li> <li>○ Independent measurement and verification will be conducted for at least 24 months. Projected savings will be compared to actual savings to enable more sophisticated cost/benefit models in the future.</li> <li>○ NYSERDA cost-share will not exceed 50% of total project cost.</li> </ul> </li> </ul> <p><b>5. Invest in tools that support market replication through fact sheets, best practices, and use cases with clear economics:</b></p> <ul style="list-style-type: none"> <li>● <b>Disseminate information to market participants</b> in conjunction with other NYSERDA initiatives, in an integrated manner to reduce customer confusion and burnout, and to ensure that communication methods are most effective and targeted to specific audiences. Information will be targeted to building owners and operators, design and engineering professionals, energy storage vendors/installers, utilities, permitting agencies, and professional networks. Best practices and lessons learned through these soft cost reduction strategies and through deploying value stacking pilots will be disseminated to the vendor community.</li> <li>● <b>Serve as an independent information clearinghouse</b> with a useful library of knowledge including searchable online tools that leverage existing third-party platforms, workshops and webinars, and storage breakfasts where potential customers can engage with operators who have deployed systems to learn about: <ul style="list-style-type: none"> <li>○ state of commercial deployments, technology readiness, use cases and business models</li> <li>○ actual performance data, revenue and savings from feasibility studies, pilots and deployed systems</li> </ul> </li> <li>● <b>Develop case studies and fact sheets</b> that help vendors and customers understand and maximize utility tariffs and wholesale market products, best practices, and economics available today and as the regulatory structure evolves.</li> <li>● <b>Engage with other government partners</b> including at the local and federal levels to create policy environments conducive to energy storage deployment.</li> <li>● <b>Work towards replicable financing</b> in the future through bankability studies and engaging with, and educating, financiers about New York State market structures.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2016)</u></p> <ul style="list-style-type: none"> <li>● Issue solicitation to competitively select technical consultants and organizations to assist with soft cost reduction strategies, quality assurance, and feasibility studies under value stacking pilots.</li> </ul>

Milestone 2 (2017)

- Lead acid, lithium-ion, and flow batteries are independently tested with results aggregated into first responder training materials for authorities having jurisdiction.

Milestone 3 (2017)

- Technical consultants or organizations to assist with soft cost reduction strategies, quality assurance, and feasibility studies are selected.

Milestone 4 (2017)

- Launch a competitive program funding value stacking pilots.

Milestone 5 (2017)

- Expand scope of battery testing lab for additional chemistries to be tested.

Milestone 6 (2017)

- Model permitting guides are developed.

Milestone 7 (2017)

- Public platform is launched including use cases, system performance results, and fact sheets.

Milestone 8 (2017)

- Customers with deployed energy storage systems begin engaging for post installation quality assurance to validate savings.

Milestone 9 (2017)

- Safety testing is completed on additional emerging commercial chemistries.

Milestone 10 (2017)

- Market segmentation for NYSERDA customer acquisition activities supported under this investment plan expands to non-interval-metered customers.

Milestone 11 (2017)

- Increasing numbers of customers seek information on storage solutions to mitigate their peak demand and electricity requirements, as determined through vendor interviews and the number of permits submitted to authorities having jurisdiction, surveyed at least annually.

Milestone 12 (2017)

- Increasing numbers of energy storage vendors are engaged in New York State, as surveyed at least annually.

Milestone 13 (2018)

- Safety testing is completed on additional emerging commercial chemistries.

Milestone 14 (2018)

- Model permitting guides are updated.

Milestone 15 (2018)

- Convincing use cases and best fit customer characteristics and acquisition tools are publicized.

	<p><u>Milestone 16 (2018)</u></p> <ul style="list-style-type: none"> <li>• Pilots convert prospective installations into installed energy storage projects that are used to provide customer benefit and address electric system needs.</li> </ul> <p><u>Milestone 17 (2019)</u></p> <ul style="list-style-type: none"> <li>• Independent validation assesses the ability of aggregated customer-sited storage systems to provide locational relief to the distribution utility or NYISO when called upon.</li> </ul> <p><u>Milestone 18 (2019)</u></p> <ul style="list-style-type: none"> <li>• During the pilot period, NYSERDA direct support for specific projects is reduced annually as installed cost decreases, revenue opportunities are better quantified, and results of pilots increase performance confidence.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• Soft costs for distributed energy storage systems have been meaningfully reduced, with a goal of 25% per kWh in three years (end of 2019) and 33% in five years (end of 2021) compared to a 2015-16 internal baseline<sup>11</sup>, to be further refined through a soft cost study planned for completion in early 2017.</li> <li>• Permitting, building and life safety codes, and interconnection requirements are clear and unambiguous within concentrated population areas of the State with significant electric load</li> <li>• Industry standards such as Underwriters Lab adequately address safety and performance concerns to the satisfaction of authorities having jurisdiction, distribution utilities, and customers</li> <li>• Identifying and attracting best fit customers is readily accomplished by vendors as measured through vendor surveys and customer surveys</li> <li>• Ability to use distributed energy storage, including aggregated systems behind customer meters, to meet system needs is understood and readily recognized in utility planning and procurement</li> <li>• Termination of individual interventions will be based upon achieving three to six year paybacks within specific verticals, speed in deploying systems, and ability to customer-sited systems to address system needs. NYSERDA will survey the market periodically to measure progress in these areas and will reduce and adjust support as needed to maximize impact.</li> </ul>

11.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• Utilities are key partners in these activities, especially in customer data mining, identifying constrained areas of the distribution feeders, and evaluating load relief using energy storage. Additionally, the REV Track 2 Order requires utilities to propose system efficiency targets such as peak reduction and load factor improvement, both of which can be accomplished through distributed energy storage. NYSERDA will work directly with distribution utility staff who work on smart grid, REV demos, or non-wires alternatives. All value stacking pilots will be implemented in direct coordination with the distribution utility, assess the effectiveness in using these distributed assets to meet system needs, and evaluate or inform test tariffs. Additionally, utilities will begin identifying roles for storage in the Distribution System Investment Plans submitted to DPS in fall 2016, and these plans will be leveraged in identifying strategic areas of the distribution system for program implementation.</li> </ul>
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<sup>11</sup> This internal distributed storage soft cost baseline utilized a GTM Research study and then augmented that data with pricing from New York State deployments under the Demand Management Program and vendor inquiries.

	<ul style="list-style-type: none"> <li>Initial discussions and information sharing with New York Power Authority will be expanded to leverage their ability to finance projects including at municipal and educational customers.</li> <li>The NYISO is also a key partner to identify wholesale system needs and evaluate the effectiveness of distributed storage solutions in meeting these requirements.</li> <li>NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>Con Edison’s Demand Management Program offered in conjunction with NYSERDA has been fully subscribed. Con Edison’s Brooklyn-Queens Demand Management load relief program is seeking load relief strategies in these feeder circuits. Con Edison’s Clean Virtual Power Plant REV demonstration is evaluating how aggregated fleets of solar plus storage assets in hundreds of homes can collectively provide network benefits to the grid, resiliency services to customers, monetization value to the utility, and results that help inform rate and market design.</li> <li>It is possible that additional feeder circuits will be targeted by Con Edison and other distribution utilities, and these opportunities will be coordinated.</li> <li>Long Island Power Authority (LIPA) and New York State Electric and Gas (NYSEG) have solicited proposals for load relief, generally with larger quantities of bulk energy storage.</li> <li>Customers will be directed by NYSERDA to these respective utility initiatives.</li> </ul>

11.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Tools, Training, and Replication	\$-	\$1,300,000	\$1,150,000	\$700,000	\$300,000	\$3,450,000
Implementation Support	\$-	\$1,550,000	\$2,175,000	\$1,175,000	\$600,000	\$5,500,000
Direct Incentives and Services	\$30,000	\$4,350,000	\$6,000,000	\$4,900,000	\$220,000	\$15,500,000
<b>Total</b>	<b>\$30,000</b>	<b>\$7,200,000</b>	<b>\$9,325,000</b>	<b>\$6,775,000</b>	<b>\$1,120,000</b>	<b>\$24,450,000</b>

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
<b>Total</b>	0%	16%	31%	32%	10%	7%	3%	100%

11.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking

progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

Indicators <sup>12</sup>		Baseline (Before/Current) <sup>13</sup>	2020 (Cumulative)
Activities/ Outputs	Total number of projects by project size and technology type seeking approval by authorities having jurisdiction such as local fire and building departments (AHJs)	approx. 15 lead acid and li-ion batteries and thermal storage	160 systems including lead acid, li-ion, flow, and other chemistries and thermal storage
	Number of projects and type of energy storage systems approved by AHJs	5 lead acid battery systems and 2 thermal storage	130 systems including lead acid, li-ion, flow, and other chemistries and thermal storage
	Number of pilot sites engaged	0	50
Outcomes	Cycle time of projects from customer proposal to commissioning	Lead acid median of 19.5 months. Thermal storage not provided.	6-18 months
	Soft costs % decline per kWh of battery storage based on CEF strategies	Lead Acid: Min. \$50/kWh; Max. \$100/kWh (Median of 20% of average soft cost of installed lead acid systems). Lithium ion and other storage types not provided.	25% decrease based on \$220/kWh internal baseline <sup>14</sup>
	Direct peak demand reduction through energy storage resulting from pilots (in MW and MWh reduced)	Not applicable	10 MW and 6,000 MWh of annual peak reduction
	Percentage of distributed energy storage installations deployed throughout the New York market that provide value to two or more parties (customer, distribution utility, load serving entity, NYISO)	<10% <sup>15</sup>	50% by 2021

<sup>12</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>13</sup> Revised baseline metrics reflect the recently-completed Energy Storage market baseline evaluation. This study will be available publicly on NYSERDA’s website and in the DPS Document and Matter Management system in the near future.

<sup>14</sup> The separate internal NYSERDA program-led distributed storage soft cost baseline utilized a GTM Research study and then augmented that data with pricing from New York State deployments under the Demand Management Program and vendor inquiries.

<sup>15</sup> This value is based on internal discussions with developers as part of the separate NYSERDA program-led distributed storage soft cost baseline.



Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 4. Direct Impacts** <sup>16</sup>

Primary Metrics		2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	2,600	4,700	4,600	1,900	13,800
	MWh Lifetime	26,000	47,000	46,000	19,000	138,000
	MMBTU Annual	-	-	-	-	-
	MMBTU Lifetime	-	-	-	-	-
	MW	5	9	8	3	25
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		1,370	2,470	2,420	1,000	7,260
CO2e Emission Reduction (metric tons) Lifetime		13,700	24,700	24,200	10,000	72,600
Customer Bill Savings Annual (\$ million)		\$0.35	\$0.63	\$0.61	\$0.25	\$1.836
Customer Bill Savings Lifetime (\$ million)		\$3.46	\$6.25	\$6.12	\$2.53	\$18.36
Private Investment (\$ million)		\$8.50	\$11.60	\$9.50	\$0.40	\$30.10

**Table 5. Annual Projected Initiative Participation**

Participants	2017	2018	2019	2020	Total
Number of customers engaged (potential sites for deployments)	30	45	30	15	120
Number of vendors engaged	15	15	10	5	45
Total	45	60	40	20	165

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

<sup>16</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

**Table 6. Estimated Indirect Market Impact**

Indirect Impact		2021	2025	2030
Energy Efficiency	MWh Cumulative Annual	35,000	90,000	190,000
	MMBtu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	60	160	340
CO2e Emission Reduction (metric tons) Cumulative Annual		18,400	47,300	100,000

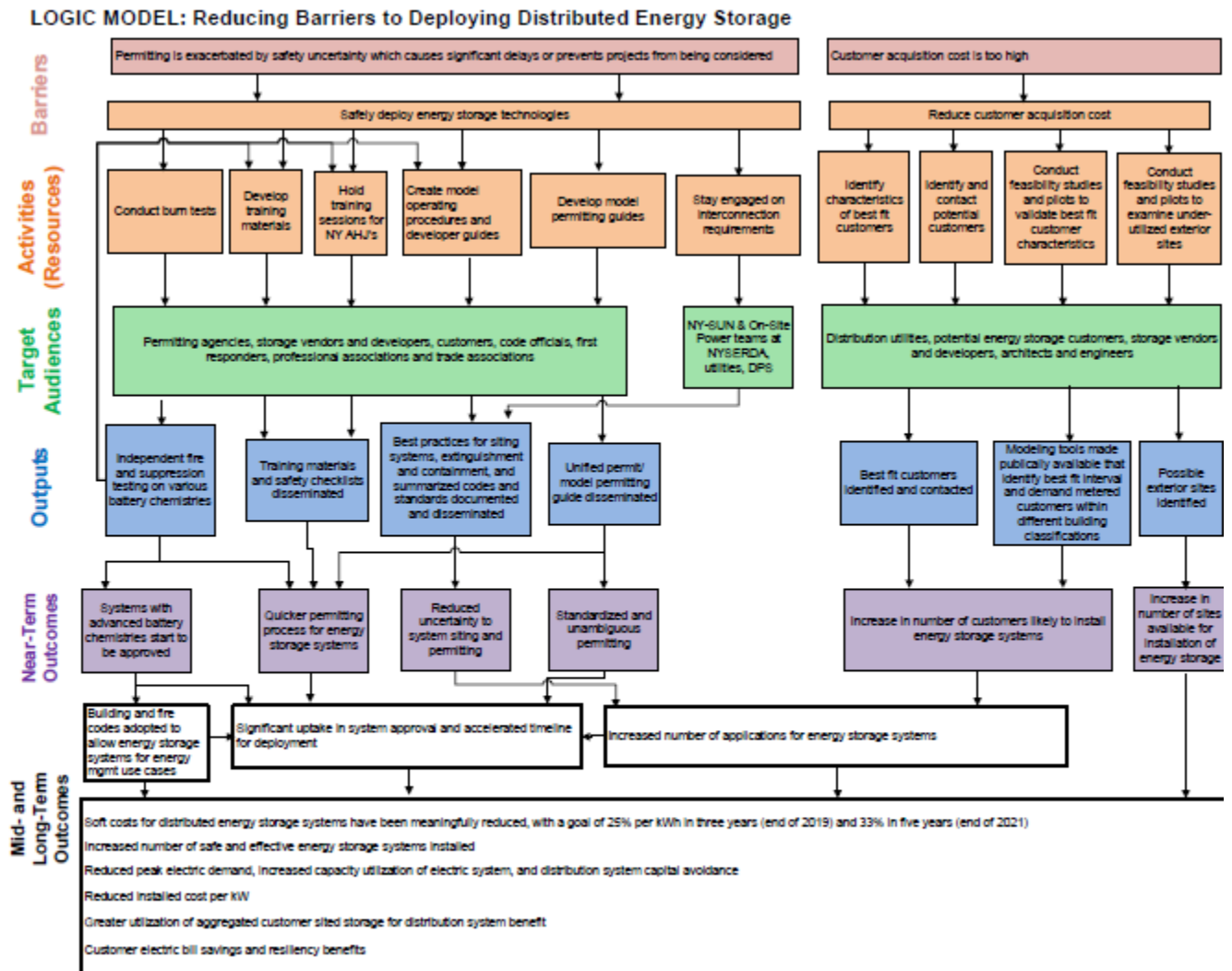
### 11.1.8 Fuel Neutrality

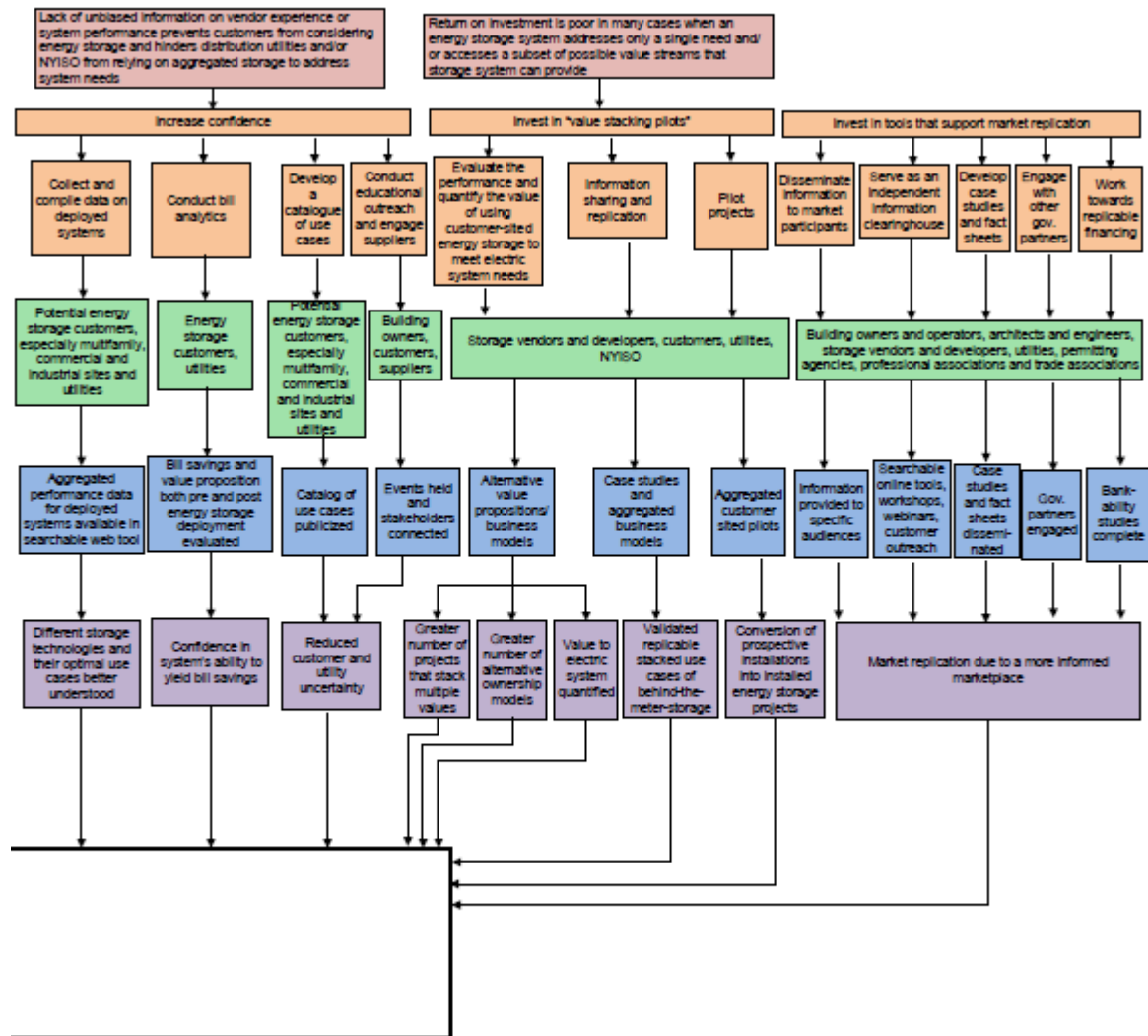
<b>Fuel Neutrality</b>	This initiative is not being delivered on a fuel neutral basis.
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### 11.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below, and builds upon the evaluation performance embedded in the Activities section above.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>NYSERDA will monitor standard activity/output metrics including completion of training materials and guides, pilots underway, etc.</li> </ul> <p><b><u>Quality Assurance (M&amp;V)</u></b></p> <ul style="list-style-type: none"> <li>Quality assurance will be integrated into the specific activities described above with the following approaches: <ul style="list-style-type: none"> <li>Collect and compile data on deployed systems</li> <li>Conduct bill analytics for savings</li> <li>Conduct independent validation to assess technical and cost effectiveness of using distributed storage systems to meet customer and distribution system and/or NYISO needs.</li> </ul> </li> <li>Review of the programmatic measurement and verification will occur as needed.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>Market Evaluation draws on the theory of change of the related logic model and will include baseline and longitudinal measurement of key indicators of success.</li> <li>Baseline measurements of key performance indicators will occur within one year of initiative approval and will further quantify indicators including cycle time of projects and balance of system costs for distributed energy storage systems. In these areas, NYSERDA will first utilize existing information and will fill gaps in information as needed and feasible for appropriate baselining.</li> <li>Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including the number of projects and type of energy storage systems approved by AHJs, will occur once the initiative is underway.</li> <li>Sources of data will include public and commercially available data, balance of system surveys conducted by the National Renewable Energy Laboratory (NREL), and primary data collection through surveys of key market actors.</li> </ul>
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# Appendix A – Logic Model





## Appendix B – Investment Plan Review Supplement

### Reducing the Barriers to Deploying Distributed Energy Storage

#### Results to Date – Metrics

The Reducing the Barriers to Deploying Distributed Energy Storage Initiative is exceeding most of its current cumulative targets through Q2 2017, with the exception of private investment and customer participation which are at 4% and 20% of target respectively. Customer engagement is beginning through market engagement and will increase as best-fit customers are identified and outreach and technical assistance work gets underway. Vendor engagement was greater than anticipated and customers engaged (sites for deployment) are expected to accelerate as best fit customer identification and outreach with technical assistance contractors gets underway in Q4 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	1,690	1,690	1,300	130%	13,800	12%
	MWh Lifetime	-	-	-	16,900	16,900	13,000	130%	138,000	12%
	MWbtu Annual	-	-	-	-	-	*	-	*	-
	MWbtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	3	3	2	141%	25	13%
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	889	889	685	130%	7,260	12%
	Lifetime Tons	-	-	-	8,892	8,892	6,850	130%	72,600	12%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$0.22	\$0.22	\$0.17	130%	\$1.84	12%
	Lifetime Dollars	-	-	-	\$2.25	\$2.25	\$1.73	130%	\$18.35	12%
Private Investment (millions)	Dollars	-	-	-	\$0.15	\$0.15	\$4.25	4%	\$30.00	1%
Number of customers engaged (sites for developments)	Participants	-	-	-	3	3	15	20%	120	3%
Number of vendors engaged	Participants	-	-	-	55	55	8	733%	45	122%

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	June 2017 Actual
			(Cumulative)	(Cumulative)
<b>Activity/Outputs</b>	Total number of projects by project size and technology type seeking approval by authorities having jurisdiction such as local fire and building departments (AHJs)	approx. 15 lead acid and li-ion batteries and thermal storage	160 systems including lead acid, li-ion, flow, and other chemistries and thermal storage	Active in pipeline (announced or seeking permitting) is 44 projects comprising 50 MW and 126 MWH, 90% are lithium ion

	Number of projects and type of energy storage systems approved by AHJs	5 lead acid battery systems and 2 thermal storage <sup>1</sup>	130 systems including lead acid, li-ion, flow, and other chemistries and thermal storage	7 projects; 5 are lead acid and 2 are exterior lithium ion systems
	Number of pilot sites engaged	0	50	0

### Performance Against Key Milestones

The Reducing the Barriers to Deploying Distributed Energy Storage Initiative is early in its development but is making progress toward its current milestones. Current milestones that are not yet complete are or will soon be in progress. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Quarter 2, 2017 CEF report.

Complete	Time Frame	Milestone
✓		
✓	2016	Issue solicitation to competitively select technical consultants and organizations to assist with soft cost reduction strategies, quality assurance, and feasibility studies under value-stacking pilots.
	2017	Lead acid, lithium-ion, and flow batteries are independently tested with results aggregated into first responder training materials for authorities having jurisdiction.
✓	2017	Technical consultants or organizations to assist with soft cost reduction strategies, quality assurance, and feasibility studies are selected.
✓	2017	Launch a competitive program funding value-stacking pilots.
	2017	Expand scope of battery testing lab for additional chemistries to be tested.
	2017	Model permitting guides are developed.
	2017	Public platform is launched including use cases, system performance results, and fact sheets.
	2017	Customers with deployed energy storage systems begin engaging for post-installation quality assurance to validate savings.
	2017	Safety testing is completed on additional emerging commercial chemistries.
	2017	Market segmentation for NYSERDA customer acquisition activities supported under this investment plan expands to non-interval metered customers.
	2017	Increasing numbers of customers seek information on storage solutions to mitigate their peak demand and electricity requirements, as determined through vendor interviews and the number of permits submitted to authorities having jurisdiction, surveyed at least annually.

<sup>1</sup> Values are from the 2016 Baseline Market Evaluation Metrics for Energy Storage Report that will be published in 2017.

	2017	Increasing numbers of energy storage vendors are engaged in New York State, as surveyed at least annually.
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Plan for Continuation/Modification/Termination

The Reducing Barriers to Distributed Energy Storage initiative was modified in June 2017 to shift the timing of the budget, benefit, and participant values from 2016-2019 to 2017-2020 to reflect a later than expected program start date. Following these modifications, the initiative will continue as planned.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Building Innovations Chapter

Portfolio: Innovation & Research

**Submitted by:**

**The New York State Energy Research and Development Authority**

August 1, 2016



# 12 Building Innovations

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NYSERDA seeks to support the development and demonstrations of new technologies and strategies to enable buildings to be more energy efficient, load flexible and resilient. Buildings are a large user of energy, a major contributor to system peak demand and greenhouse emissions, and an important critical infrastructure for New York State. Activities are designed to engage market participants and the innovation community to create technologies and systems that can enable net zero energy buildings, deep energy efficiency retrofits, and smart buildings – providing value and comfort to occupants and owners.

The broad objectives of the program include:

- Commercialization of advanced building technologies
- Technology validation to drive market impact
- Fostering strategic partnerships between market participants, manufacturers and the innovation community

The first initiative described in this Chapter is the NextGen HVAC initiative, which focuses on heating, cooling and ventilation (HVAC) in buildings. The initiative will focus primarily on improving the performance and validating value propositions in three areas of significant potential: heat and cooling appliances, HVAC controls, and thermal distribution. The goal of the program is to create new economically viable opportunities for energy efficiency in buildings by improving the performance and value propositions of existing and advanced HVAC systems through innovations.

Potential additional initiatives under consideration include Smart Buildings and Deep Energy Retrofits. Smart Buildings have the potential to minimize energy costs, support a robust grid, enable a transactive energy market, increase system resiliency, and facilitate integration of on-site generation and storage. With 80% of existing buildings built before energy codes were established in the late 1970s, New York has the challenge in how to effectively retrofit its stock of older buildings. The Deep Energy Retrofit initiative will look into innovations to offer economically attractive solutions to retrofitting older buildings

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 12.1 NextGen HVAC

### 12.1.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"><li>• Heating, ventilation, and cooling (HVAC) equipment consumes approximately 40%<sup>1</sup> of the energy used by buildings, making this end use responsible for</li></ul>
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<sup>1</sup> US EIA - 2012 Commercial Building Energy Consumption Survey & 2009 Residential Energy Consumption Survey Data

	<p>approximately 25% of the total energy used<sup>2</sup> and 36%<sup>3</sup> of the greenhouse gas (GHG) emissions in New York State.</p> <ul style="list-style-type: none"> <li>• Cooling requirements for buildings is the primary contributor to the difference between peak utility demand (&gt;32 GW) and typical utility demand (&lt;18 GW).<sup>4</sup></li> <li>• The large capital investment and long asset life of existing HVAC equipment requires new HVAC technologies to have compelling value propositions in order to achieve market adoption. This is particularly important given the timing of equipment investments, which often occur on a short timeline as emergency equipment replacements.</li> <li>• Due to these market dynamics, investments in research and development to target improvements in efficiency, performance and cost reduction of HVAC technologies is lagging other building technology advancements.</li> <li>• Additionally, solutions on the market today do not uniquely address New York’s diverse climate or dense urban population, and are not sufficient to meet New York’s aggressive energy and GHG reduction goals.</li> <li>• Focusing on NextGen HVAC equipment innovation will significantly alleviate the stress imposed on the electric grid during the summer months, improving reliability and potentially delaying or avoiding the need for utility distribution system upgrades.</li> </ul>
<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• To encourage private investment in HVAC research and development, NYSERDA will de-risk investments through cost-sharing projects that facilitate the development and commercialization of cutting-edge energy efficient HVAC technologies.</li> <li>• Historically, NYSERDA’s building innovation activities have provided support across a wide spectrum of technologies and phases of development. To drive more impact, NYSERDA will focus efforts on high-impact areas and embrace a stronger technology-to-market focus.</li> <li>• The strategy will focus primarily on improving performance and validating value propositions in three areas of significant potential: heating and cooling appliances, HVAC controls, and thermal distribution.</li> <li>• Support will be provided primarily through competitive solicitations for: product development, pilot demonstrations, strategic partnerships, technology-specific challenges, and market coordination.</li> <li>• NYSERDA will identify attributes that will drive HVAC innovation, challenge the innovation/entrepreneur community to develop systems that deliver on those attributes, help establish credibility of new companies and products through engagement and involvement of influential buildings sector stakeholders, and drive market entry through identification and leveraging of existing channels to market for HVAC products and services.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: NextGen HVAC,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• The goal of the NextGen HVAC program is to improve the performance and value propositions of advanced HVAC systems, creating new economically viable opportunities for energy efficiency in buildings.</li> </ul>

<sup>2</sup> Derived from State Energy Plan and EIA data (40% of 60%)

<sup>3</sup> From 2013 NYS Energy Fast Facts the total NYS GHG emissions is 180 million metric tons. The total emissions associated with HVAC is estimated to be 64 million metric tons (see Appendix) which is 36% of the greenhouse gas (GHG) emissions in New York State.

<sup>4</sup> NYISO Power Trends 2015: Rightsizing the Grid (Figure 5 – Peak vs Average Load). The peak demand in New York State is approximately 32 GW compared to an annual time-averaged demand of 18 GW.

<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The State Energy Plan identifies buildings as a major user of energy (~60%) and source of GHG emissions in the State. HVAC equipment consumes approximately 40% of the energy used by buildings, making this end use responsible for approximately 25% of the total energy used in New York State.</li> <li>• The State Energy Plan also discusses the need to manage electricity demand to ensure efficient and reliable operation of the grid. The hours of the year when these objectives are most difficult to manage occur during the summer months when space cooling is at highest usage.</li> </ul>
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12.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<ul style="list-style-type: none"> <li>• While the end use target market segment is all building types, this initiative will target HVAC innovators and manufacturers of technologies that have applications across multiple building types.</li> </ul>
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Building-systems-related startups and entrepreneurs</li> <li>• Large original equipment manufacturers (OEMs) with a corporate strategic interest in HVAC technologies and HVAC product manufacturers</li> <li>• Universities with known research activities in HVAC technologies, material science and manufacturing and contract research organizations</li> <li>• Professional Design Societies</li> <li>• National laboratories</li> <li>• Commercial building developers and owners</li> <li>• New York Independent System Operator (NYISO) and Utilities</li> <li>• Established HVAC vendors</li> <li>• Established HVAC contractors</li> <li>• Energy service companies (ESCOs)/energy consultants</li> <li>• System designers</li> <li>• Housing authorities</li> <li>• Builder and trade associations</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• NYSERDA’s engagement with building owners and specifiers to-date indicates a need for HVAC solutions currently not being offered by equipment manufacturers. Recent networking events sponsored by NYSERDA for technology developers, building owners and specifiers has shown that owners and specifiers are willing and eager to consider the use of new products that improve the operations of their facilities.</li> <li>• Large equipment manufacturers are typically focused on general market needs where their product development investments have wide geographical application (e.g., all buildings across the nation) and less on specific regional needs (e.g., New York State buildings) where they believe a return on their investment will be more difficult to achieve. However, historically, NYSERDA has been able to inform and influence small to medium technology vendors to develop products focused on State-specific needs.</li> <li>• New York already has a number of small cooling and several heating equipment manufacturers that serve the NYS market, many of whom have expressed interest in product development and commercialization support. NYSERDA has also developed a broad network of contacts and resources that can be leveraged in the HVAC area, including National Laboratories, university researchers, and Centers of Excellence.</li> <li>• Thru past activities NYSERDA is also familiar with a number of large property owners and management companies in NYS that have expressed interest in</li> </ul>

	participating in piloting activities to help prove out HVAC equipment value propositions.
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Technology developers receiving awards via this initiative will be able to leverage resources to de-risk investments, gain market insights, and receive customer introductions, thereby increasing sales, reducing time to market, lowering product costs, and creating jobs in NYS</li> <li>• Building owners and management community will gain access to objective third party evaluation of technologies (either as demonstration sites or through case studies), and can provide input with regard to their specific technology needs.</li> <li>• For building owners and management companies, NextGen HVAC solutions will provide compelling value propositions that encompass energy savings (15 to 30% increase in energy savings above current commercial and economically viable HVAC technologies), reduced maintenance, enablement of renewables, load flexibility and improved productivity and health.</li> </ul>

12.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement and Customer Discovery</b>	<ul style="list-style-type: none"> <li>• NYSERDA intends to leverage its relationship with established HVAC consortiums and associations that provide a broad range of targeted economic development assistance to small, medium, and large manufacturers and suppliers of thermal and environmental control equipment.</li> <li>• NYSERDA will engage and partner with building owner and manager associations, real estate boards, and other building related associations.</li> <li>• NYSERDA has initiated customer engagement with key stakeholders (including large property managers, architectural engineering firms, building science practitioners, and technology developers) through a series of meetings in NYC and Syracuse to identify and better understand the building owner pain points regarding HVAC in new and existing buildings. Requests for Information (RFIs) will also be used going forward to define technology challenges for the program-established outcomes (see Activities below).</li> <li>• To assist in achieving engagement by various stakeholders, dedicated outreach activities will be initiated to promote program participation.</li> </ul>
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12.1.4 Theory of Change

<b>Technology Opportunities and Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• <b>Centralized HVAC systems have high distribution losses.</b> Most buildings are heated and cooled using a large central HVAC plant and a distribution system to transfer the thermal energy throughout the building. The current distribution methodology introduces large thermal losses of 9 to 26% affecting overall system performance.<sup>5</sup> Potential innovations to be investigated include: sealing and insulating solutions for distribution systems, “local” on-demand heating and cooling systems (distributed appliances), and novel energy transfer and storage solutions.</li> </ul>
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<sup>5</sup> Wray, C.P., Diamond, R.C, and Sherman, M.H. 2005. Rationale for Measuring Duct Leakage Flows in Large Commercial Buildings Lawrence Berkeley National Laboratory. LBNL Report 58252.

	<ul style="list-style-type: none"> <li>• <b>There is a need for improvements to cold climate heat pumps (CCHPs).</b> Current air source heat pumps do not perform well in the NYS climate at temperatures below 40F, requiring supplemental electric resistive heating<sup>6,7</sup> Potential innovations to be investigated include: variable speed and multi-stage compressors, turbochargers, hybrid systems, and scaling of the technology for small to medium commercial buildings.</li> <li>• <b>Energy consumption for air conditioning is dominated by the use of compressors.</b> The electricity need by compressors can represent more than 80% of total energy consumed by a conventional air conditioning system.<sup>8</sup> A paradigm shift in air conditioning energy efficiency appears achievable if compressor-less cooling approaches can be developed.</li> <li>• <b>There is a lack of advanced controls for HVAC for small to medium size buildings.</b> Current HVAC controls for these types of buildings are very basic and limit the opportunity for sustained and additional energy savings through continuous diagnostics and commissioning, and predictive and adaptive controls. Specific opportunities exist for integrated control of hybrid systems consisting of a conventional system, thermal storage, and renewable generation. Advance control capabilities are also expected to optimize renewables and enable participation in demand reduction programs.</li> <li>• <b>There is a need for integration of renewables/storage with conventional HVAC.</b> Integration of novel thermal storage solutions with conventional and renewable heating and cooling solutions can significantly improve efficiency and economics as existing storage solutions can be expensive and complex to operate. Integration of renewables/storage with conventional HVAC will also provide demand reduction benefits.</li> <li>• <b>The coupling of space conditioning and ventilation limits cooling efficiency improvements.</b> As building envelopes have improved, the sensible cooling requirement has decreased. However, latent cooling requirements, which are largely driven by ventilation needs, have not changed. Lack of solutions for decoupling of the sensible and latent cooling requirements limits opportunities to improve air conditioning efficiency.</li> <li>• <b>Short duration cooling demand negatively impacts grid reliability and energy bills.</b> The HVAC industry practice is to size air conditioning equipment to meet peak cooling demands, which occur less than 2% of the time. This practice leads to equipment that operates inefficiently the rest of the time due to “short cycling.”</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If large influential building owners and management companies are involved in program development, then it is more likely that they will participate as demonstration sites and will ultimately accelerate adoption of new innovations.</li> <li>• If building operators are provided with innovations that improve the controllability of HVAC systems, they will then capture unrealized economic value through demand management and/or participation in demand response programs. Pilot demonstrations will be pursued to quantify the site economic value, and when at scale from a market perspective</li> </ul>

<sup>6</sup> “Emera Maine – Heat Pump Pilot Program Final Report”; November 17, 2014, EMI Consulting

<sup>7</sup> “Air Conditioners & Cold Climate Air Sourced Heat Pumps”; NYSERDA (internal report), January 15, 2016; Kevin Howley (Intern); Performance and Cost Assessment of Currently Available Air Conditioners and Cold Climate Air Source Heat Pumps.

<sup>8</sup> Unpublished NYSERDA staff analysis using Oak Ridge National Laboratory’s Mark VII Heat Pump Model to simulate 36,000 Btu/hr capacity air conditioning system operating at 95 degree F outdoor and 75 degree F indoor conditions.

	<ul style="list-style-type: none"> <li>If innovations can enable increased performance with a compelling value proposition from heating and cooling equipment (including thermal distribution systems, integration of renewables and thermal storage), then homeowners, building owners, and building management firms will adopt this equipment to reduce their energy costs.</li> </ul>
<b>Activities</b>	<ul style="list-style-type: none"> <li><b>Determine Technology Performance and Cost Needs.</b> To operationalize this strategy, RFIs will be issued that seek market intelligence on the specific performance and cost thresholds for various technologies that are likely to drive adoption. Once these targets are well understood, focused competitive “technology challenges” solicitations will be released targeting these thresholds. The solicitations will look to support technology development, technology validation, and tech to market activities.</li> <li><b>HVAC Technology Development.</b> Solicitations will empower the innovation community to develop solutions that have the ability to provide the desired performance. Multiple innovators may be sought to address a specific technology barrier, increasing the likelihood of a viable/investable solution. Where appropriate, utility involvement will be included.</li> <li><b>Technology Validation Effort.</b> Demonstration/validation efforts to test the developed, and other available, innovations in the intended relevant operational environment. For this tactic, NYSERDA will directly engage large real estate management organizations and other key stakeholders to serve as test beds.</li> <li><b>Tech to Market Support.</b> Tech to market support will be provided to technology developers to help drive the commercialization of new innovations. This support will be tailored specifically to help early-stage companies navigate the typical channels to market for buildings technologies; for instance, introductions through planned and structured events with key decision makers (HVAC contractors, architecture and engineering firms, energy service companies, consultants, and building owners/operators).</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2016)</u></p> <ul style="list-style-type: none"> <li>Issue RFI, evaluate and establish technology challenge areas and targets.</li> </ul> <p><u>Milestone 2 (2016)</u></p> <ul style="list-style-type: none"> <li>Issue 1<sup>st</sup> Technology Challenge.</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>Contract projects from 1<sup>st</sup> Technology Challenge.</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>Review portfolio of activities, solicit market input and reassess technology challenges areas and targets.</li> </ul> <p><u>Milestone 5 (2017)</u></p> <ul style="list-style-type: none"> <li>Issue 2<sup>nd</sup> Technology Challenge.</li> </ul> <p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>Contract projects from 2<sup>nd</sup> Technology Challenge.</li> </ul> <p><u>Milestone 7 (2018)</u></p> <ul style="list-style-type: none"> <li>Review portfolio of activities, benefits to date, solicit market input and reassess technology challenges areas and targets.</li> </ul> <p><u>Milestone 8(2018)</u></p> <ul style="list-style-type: none"> <li>Issue 3<sup>rd</sup> Technology Challenge.</li> </ul>

	<p><u>Milestone 9 (2019)</u></p> <ul style="list-style-type: none"> <li>• Contract projects from 3<sup>rd</sup> Technology Challenge.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• A portfolio of successfully completed projects (i.e., contracts) in a given focus area that establish: <ul style="list-style-type: none"> <li>○ Increased market offerings of non-compressor/non electric cooling technologies</li> <li>○ Technology solutions enabling easy integration of renewables and seasonal energy storage into HVAC systems</li> <li>○ Improvements in cold climate heat pump (air and ground source) performance</li> <li>○ Availability of advanced algorithms, controls, and data analytics capabilities to support optimal commissioning, installation, operation, and maintenance of HVAC systems.</li> </ul> </li> <li>• An assessment of the above will be conducted annually with a determination of future activities (continue, pivot or end).<sup>9</sup></li> <li>• The projected 2030 HVAC end usage is estimated to be 1,315 TBtu of which 267 TBtu will be achievable (economical viable), this leaves 1,048 TBtu as the addressable market for innovations.<sup>10</sup> If the target innovations in NextGen HVAC are successful, an additional 200 TBTUs of economic EE potential could be created. Assuming that 30% of these innovations are adopted in the market by 2030, the program could deliver the following impacts: <ul style="list-style-type: none"> <li>○ An additional 60 TBtu reduction in energy consumption by buildings</li> <li>○ 5 million metric tons of CO2 reduction annually</li> <li>○ 15 to 30% increase in energy savings above current commercial and economically viable HVAC technologies</li> <li>○ 5 - 10% penetration of non-compressor/non-electric based cooling technologies in commercial buildings by 2025, with a demand reduction potential of 500 - 800 MW</li> </ul> </li> <li>• A small investment of \$3/ton<sup>11</sup> increases the economic potential for GHG reductions by ~ 5M tons.</li> </ul>

12.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• Focusing on development of NextGen HVAC equipment will create the opportunity to improve reliability and potentially delay or avoid the need for utility distribution system upgrades. Similarly, improved controls and capabilities will enable consumers to manage HVAC systems in response to price signals and participate in a transactive energy market envisioned under REV.</li> <li>• To fully realize the benefits of these advances, NYSERDA will engage with the utilities to understand where innovative cooling solutions (peak demand reduction) could provide added value to the distribution system and what performance requirements are necessary.</li> </ul>
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<sup>9</sup> As product development time may take 2 to 3 years, and measurable impacts may take an additional 3 to 4 years from product commercialization, an accurate assessment of the goals prior to exit may take 5 to 7 years. NYSERDA will monitor market conditions and potential for market impact, and exit a focus area if conditions warrant

<sup>10</sup> NYSERDA Optimal Energy Study 2014

<sup>11</sup> \$15 M investment in NextGen HVAC technologies is expected to enable 5M tons GHG economic potential. Note this is not the cost of the measure but the cost associated with enabling the economic potential. -+

	<ul style="list-style-type: none"> <li>• Utilities could also serve as pilot and demonstration partners to accelerate the time to market of new HVAC technologies. NYSERDA will help to engage utilities as appropriate to help establish these connections.</li> <li>• NYSERDA will partner with utilities to demonstrate the opportunities of aggregation and control of dispersed flexible HVAC systems as an alternative to more expensive distribution system upgrades</li> <li>• NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• Utilities are not supporting end-use buildings research and development. However, utilities are providing a range of incentives for commercially available energy efficient equipment in the target markets, which potentially could be informed by the results of the activities undertaken in this initiative.</li> </ul>

12.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Innovation & Research Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
Research and Technology Studies/Development/Demos	\$4,000,000	\$6,000,000	\$5,000,000	\$15,000,000
Total	\$4,000,000	\$6,000,000	\$5,000,000	\$15,000,000

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
<b>Total</b>	13%	27%	27%	17%	17%	100%

12.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.



**Table 2. Initiative Specific Metrics**

<b>Indicators<sup>12</sup></b>		<b>Baseline (Before/Current)</b>	<b>2019 (Cumulative)</b>	<b>2022 (Cumulative)</b>
Activity/Outputs	# of product development projects initiated	0	15	15
	# of product development projects completed	0	6	15
	# of demonstration projects	0	5	10
	# of companies supported or other partnerships (Joint Development, Joint Venture) with established manufacturers	0	20	25
Outcomes	# of products commercialized	0	4	6
	Revenue to companies commercializing products (\$millions)	0	\$3.0	\$18
	# of replications <sup>13</sup> from demonstration projects	0	30	60

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Demonstrated improvement in economic value proposition of resulting products
- Demonstrated level of kW, Btu, and kWh reduction achieved from developed technologies, demonstrations and replications.

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Due to the nature of the activities, estimating energy savings impacts at this stage is difficult because the specific technologies that will be supported are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

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<sup>12</sup> A 0 (zero) as the baseline value denotes that NYSERDA will not count any activities, outputs, and outcomes supported with prior resources (e.g., pre CEF) towards the achievement of the stated goals in this table.

<sup>13</sup> Here, replications are defined as known incidences where the innovation was deployed without NYSERDA involvement.

**Table 3. Direct Impacts**

Primary Metrics <sup>14</sup>		2017	2018	2019	TOTAL
Energy Efficiency	MWh Annual				
	MWh Lifetime				
	MMBtu Annual				
	MMBtu Lifetime				
	MW				
Renewable Energy	MWh Annual				
	MWh Lifetime				
	MW				
CO2e Emission Reduction (metric tons) Annual					
CO2e Emission Reduction (metric tons) Lifetime					
Customer Bill Savings Annual (\$ million)					
Customer Bill Savings Lifetime (\$ million)					
Private Investment (\$ million)		20.0	30.0	25.0	75.0

**Table 4. Annual Projected Initiative Participation**

	2017	2018	2019	2020	Total
Participants <sup>15</sup>	5	8	7	5	25

### 12.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• This initiative anticipates a heavy focus on electric reductions related to cooling and ventilation, however as systems and controls are often integrated, a successful strategy will also support heating aspects.</li> <li>• Thirty-six percent (66 M tons) of the State’s GHG emissions are associated with the heating, cooling and ventilation in buildings.             <ul style="list-style-type: none"> <li>○ Of the total GHG emissions associated with HVAC in buildings 75% is associated with fossil fuel use, only 25% is associated with electricity use, however systems are often integrated.</li> <li>○ Improvements in the energy efficiency of fossil fuel driven HVAC technologies are expected to lag that of electric driven technologies. The technical potential therefore is greater for the former.<sup>16</sup></li> </ul> </li> <li>• Innovations in natural gas and solar driven thermal technologies (e.g. absorption chillers, hybrid HVAC systems) offer the opportunity for significant reduction in peak demand through permanent load reduction, thereby providing benefits to the grid and electric rate payers more broadly.<sup>17</sup></li> </ul>
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<sup>14</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Totals may not sum due to rounding.

<sup>15</sup> Participants are awardees of NYSERDA contracts to develop or demonstrate NextGen HVAC technologies under this initiative.

<sup>16</sup> Based on the 2030 achievable potential with commercially available technologies for commercial space heating and cooling. Space heating achievable potential is 3% of total 2030 end usage and in commercial buildings is predominantly fossil fuel based. Colling achievable potential is 40% of total 2030 end usage and in commercial buildings is predominantly electric.

<sup>17</sup> “The Future of Air Conditioning for Buildings”; Navigant Consulting and Oak Ridge National Laboratory; July 2016

	<ul style="list-style-type: none"> <li>Investing in the development of hybrid HVAC systems that combine renewable technologies together with natural gas driven technologies provide emissions, economic, and resiliency benefits that would not be achievable through an electric-only focused initiative.<sup>18</sup></li> <li>Given the significantly large ratio of fossil fuel heating equipment to electric HVAC manufacturers in State, the potential economic benefits to NYS are greater with a fuel neutral strategy.</li> </ul>
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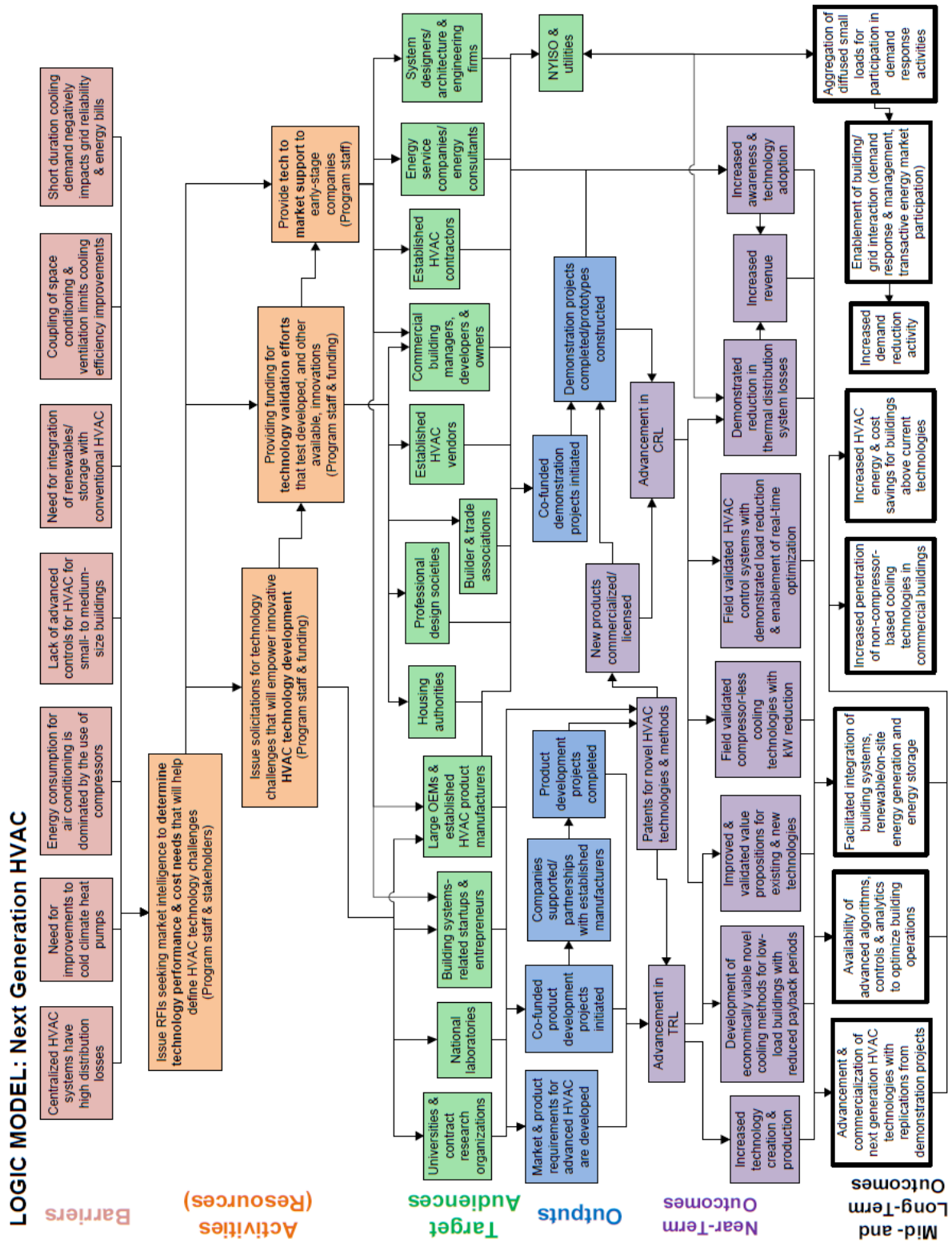
### 12.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>Standard metrics: # of projects, leveraged funds, technical/business progress measured via technology readiness level (TRLs) and commercial readiness levels (CRLs).</li> <li>On a 6 to 8-month interval NYSERDA staff and project participants will reassess the TRLs and CRLs for each project in the portfolio to gauge project progress.</li> <li>NYSERDA will conduct staged peer reviews of projects at key points. Examples – technical impasse, pivot point, critical milestone.</li> <li>NYSERDA will assess the portfolio of projects annually with regard to goals, metrics, outputs and outcomes.</li> </ul> <p><b><u>NextGen HVAC Strategy M&amp;V</u></b></p> <ul style="list-style-type: none"> <li>Technology performance will be measured and verified as part of this strategy.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>Market evaluation draws on the theory of change outlined in the logic model and will longitudinal measurement of key indicators of success, such as leveraged funds, products developed and demonstrated, increased revenue, and ultimately replication through increased awareness and technology adoption.</li> <li>Sources of data include program data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>A broad demonstration project impact evaluation will include projects from this area and will examine benefits of demonstration projects, rate of and success factors associated with replication, and benefits of replication projects. Cost and energy savings will be quantified as part of this study.</li> <li>Impact Evaluation will utilize, and verify as needed, data collected as part of this strategy to measure and verify technology performance. Where additional measurement and verification is required, it will be conducted according to IPMVP method(s).</li> </ul>
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<sup>18</sup> “Exploring the Potential Business Case for Synergies Between Natural Gas and Renewable Energy”; National Renewable Energy Laboratory; February 2014

# Appendix A – Logic Model



## Appendix B – Investment Plan Review Supplement

### NextGen HVAC

#### Results to Date – Metrics

The NextGen HVAC Initiative has not recorded any benefits yet as projects will be selected and awarded in Q4 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	*	-	*	-
	Lifetime Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	*	-	*	-
	Lifetime Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Dollars	-	-	-	-	-	\$10.00	-	\$75.00	-
Participants	Participants	-	-	-	-	-	3	-	25	-

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	2022 Target	June 2017 Actual
		(Cumulative)	(Cumulative)	(Cumulative)
# of product development projects initiated	0	15	15	0
# of product development projects completed	0	6	15	0
# of demonstration projects	0	5	10	0
# of companies supported or other partnerships (Joint Development, Joint Venture) with established manufacturers	0	20	25	0

#### Performance Against Key Milestones

The NextGen HVAC Initiative is early in its development and is making progress toward its current milestones. However the second technology challenge is expected to launch in Q1 2018, which is

later than planned. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓		
✓	2016	Issue RFI to evaluate and establish technology challenge areas and targets.
✓	2016	Issue first technology challenge.
	2017	Contract projects from first technology challenge.
	2017	Review portfolio of activities, solicit market input, and reassess technology challenges areas and targets.
	2017	Issue second technology challenge.

Plan for Continuation/Modification/Termination

As noted above, the NextGen HVAC initiative is expected to launch it’s second technology challenge in early 2018. As it is anticipated that the initiative will meet the 2017 metrics and milestone targets early in 2018, there are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Clean Transportation Chapter

Portfolio: Innovation & Research

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 13, 2017

Clean Energy Fund Investment Plan: Clean Transportation Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
August 1, 2016	Original Issue	Original Issue
June 23, 2017	Milestone 1 and Tables 1-5 for the Electric Vehicles initiative have been updated to reflect a shift in timing of budget and benefits.	Multiple
September 15, 2017	Added Public Transportation and Electrified Rail initiative. Updated second outcome for Electric Vehicle Rebate program in Table 3 to align wording with values included in the table.	Multiple
November 1, 2017	Updated the baseline values in Table 3 to reflect latest data available.	14
November 13, 2017	Chapter updated to include the previously approved Public Transportation and Electrified Rail initiative, which was inadvertently deleted from the November 1, 2017 filing.	Multiple



## 13 Clean Transportation

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In Clean Transportation, NYSERDA seeks to support the development and demonstration of new technologies and strategies to reduce greenhouse gas emissions from the transportation sector and to gain market traction for these products to advance their use to the point at which the market no longer requires NYSERDA's interventions. Activities are designed to harness stakeholders' creative solutions to New York State's transportation energy use challenges, facilitate the development of these solutions into products or services that are commercially viable, demonstrate their benefits to critical stakeholders, and research, identify solutions for and resolve any barriers to adoption that might prevent these solutions from being adopted. The program focuses on reducing energy use from personal vehicles, commercial vehicles, and public transportation. The broad objectives of the program include:

- Accelerate transportation electrification and decarbonization in New York State;
- Increase the energy efficiency of electrified rail, which uses a significant portion of the State's electricity;
- Improve the efficiency of the transportation system and encourage the use of more efficient transportation modes where possible; and
- Work with New York State stakeholders and other public-sector entities to identify new market opportunities and facilitate the adoption of new technologies, strategies, and policies.

The first initiative described in this Chapter is the Electric Vehicles initiative, which consists of two separate programs, an Electric Vehicle (EV) Rebate program and an EV Innovation program. The primary goal for both programs is expanding market adoption of EVs to the point where the market does not rely on consumer financial incentives. The programs seek to achieve this by growing consumer awareness, reducing the initial cost of EVs, making EV charging more widely available, engaging critical stakeholders, and overcoming technical and cost hurdles. Due to the market development and market adoption activities of the EV Rebate program, it will be supported by CEF Market Development funds. This initiative has been updated to provide current data on the number of EVs and charging stations, to update the timing of Milestone 1 to reflect actual launch date of the EV Rebate Program, and to update the timing of the committed budget and direct benefits to account for the later than anticipated launch of the EV Rebate Program.

The second initiative described in this Chapter is Public Transportation and Electrified Rail, which will invest in the development and demonstration of new energy-efficient products and operating strategies for New York State's public transportation system. The program's goal is to advance products and strategies that can reduce energy use from subway and commuter rail traction power, enable electric transit bus service, and improve transit agency operations and ridership statewide. The program seeks to achieve these goals by bringing new products to market, conducting in-service testing, and removing key financial, logistical, and bureaucratic barriers to adoption.

Coordination with transit agencies and NYS Department of Transportation will help NYSERDA focus on priority system needs and realistic solutions.

Potential additional initiatives under consideration include:

- A program focused on developing, improving, and testing options for mobility management services in New York State. Mobility management services include transportation demand management (providing additional options for travel other than driving alone), shared-use services (such as bike-sharing and car-sharing), intelligent transportation systems that provide advanced information to drivers to reduce congestion, and emerging smart mobility technologies including connected and autonomous vehicles and smart infrastructure solutions.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 13.1 Electric Vehicles

### 13.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• There are 11 million vehicles registered in New York State (approximately 8.5 million light-duty, 2.5 million medium and heavy-duty), but only about 14,000 electric vehicles (EVs). EVs have only really been available since 2011, and have seen strong initial adoption, but NYS aims much higher. Gov. Cuomo established the ChargeNY initiative in 2013, which sets ambitious goals for EV and EV charging station deployment, regulatory reforms, and consumer education. New York has also adopted the California Zero Emission Vehicle (ZEV) regulations, which require automakers to sell an increasing number of EVs in New York State. In 2013 New York joined with seven other states that have adopted these regulations to collaborate on measures that will advance the EV market in those states. Collective action is critical for advancing EVs, because the market is so much larger than New York State and vehicle costs, styles, and features depend on many market forces beyond New York State’s influence.</li> <li>• EV adoption is held back by low consumer awareness, price differentials with gasoline vehicles, and a lack of fueling infrastructure, among other barriers. EVs will play a critical role in achieving NYS’s greenhouse gas (GHG) reduction goals and present an opportunity to provide significant benefits to ratepayers and utilities.</li> <li>• New York State is taking a broad approach to accelerating EV market growth:             <ul style="list-style-type: none"> <li>○ To encourage EV sales, NYS Department of Environmental Conservation (DEC) regulations call for automakers to sell up to 40,000 EVs by 2018 and over 750,000 by 2025.</li> <li>○ To expand charging station installations, NYSERDA, New York Power Authority (NYPA), and DEC have been and will continue to work with workplaces, multi-family buildings, and municipalities to bring down the cost of stations, and NYS Department of Public Service (DPS) and utilities are exploring how utilities can support greater charging infrastructure investment.</li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>○ Other NYS activities to date, and moving forward, target consumer acceptance of EVs, regulatory restrictions that hamper EV adoption, and the development and demonstration of new technologies, policies, and business models that can enable greater EV adoption.</li> </ul>
<p><b>Intervention Strategy</b></p>	<p>NYSERDA's intervention strategy consists of two distinct parts: an EV rebate program and a set of activities intended to develop new technologies, policies, and business models that will lead to an expansion of the EV market.</p> <p><u>EV Rebate Program</u>          NYSERDA will implement a point-of-sale EV rebate program for new EV buyers that will help to reduce the price differential between EVs and conventional vehicles. The program, modeled after successful programs in states like Connecticut and Massachusetts that also offer tiered rebates for new EV buyers, will help accelerate EV sales, raise consumer awareness of EVs, and encourage auto manufacturers and car dealers to invest more time and effort in selling EVs in New York State.</p> <p><u>EV Innovation Program</u>          NYSERDA will promote further private sector investment in the EV market by implementing data-driven EV policies and demonstrating the value of EVs to industry participants. To generate a critical mass of stakeholders invested in growing the EV market in NYS, key elements of the strategy will include:</p> <ul style="list-style-type: none"> <li>• Reducing upfront costs and increasing the user experiences of EVs and EV charging stations through new product and business model development;</li> <li>• Working with DPS and utilities to assess the potential benefits broad EV adoption could bring to ratepayers, utilities, and the electric grid, and using this analysis to help inform utility plans for appropriate EV market interventions;</li> <li>• Piloting public-private partnerships that test cost-effective ways to expand EV adoption through actions such as incentives, purchasing partnerships, and consumer awareness campaigns; and</li> <li>• Expanding stakeholder participation in EV adoption efforts by demonstrating the value of EVs to their businesses and by making their entry into EV activities less risky through co-funding their initial efforts.</li> </ul> <p>Initial Innovation focus areas have been identified with input from a wide range of stakeholders. The initial scope is broad and focuses on a number of topic areas, but is expected to narrow as the program advances and certain research projects show more promise than others. NYSERDA may not complete all the activities listed below; they represent the likely range of activities but may be adjusted or narrowed depending on EV market needs, technical and commercial opportunities available, and other considerations.</p> <p>Innovation projects are typically selected through competitive solicitations. Co-funding for projects is usually required, and proposers are responsible for identifying sources of co-funding at the time they submit proposals. All projects will seek technologies and strategies that can be replicated at a larger scale and in a cost-effective manner. Target technologies and operational strategies will be evaluated not less than annually and adjusted, with input from partners, as needed based on a "test/measure/adjust" approach.</p> <p>This strategy is timely because New York State has committed to greatly accelerating the growth of its EV market in the next five years. Generating consumer acceptance of EVs and finding ways to help private industry participants develop business models that work for them will be critical to meeting these targets.</p>

	For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Electric Vehicles,” which can be found in Appendix A.
<b>Goals</b>	Both elements of NYSERDA’s EV program support the same end goal: NYSERDA seeks to expand market adoption of EVs to the point where it does not rely on consumer financial incentives by growing consumer awareness, reducing the initial cost of EVs, making charging more widely available, engaging critical stakeholders, and overcoming technical and cost hurdles. This will reduce petroleum dependency, GHG emissions, and criteria pollutant emissions and save EV drivers, and possibly all ratepayers, money.
<b>State Energy Plan/Clean Energy Standard Link</b>	The State Energy Plan identifies transportation as a major user of energy and the source of approximately 40 percent of fossil-fuel based GHG emissions in the State. The Plan recognizes that EVs are one of the most promising opportunities to decarbonize the transportation sector, and that to further reduce transportation emissions the State must invest in more energy efficient ways to move people, including further investment in EVs. The State Energy Plan includes a section on ChargeNY that anticipates approaches to EV adoption that are aligned with the approaches advanced in this plan, including reducing upfront costs and engaging the private sector. Additionally, EVs could help support the Clean Energy Standard by providing additional energy storage and ancillary services in support of intermittent renewables.

13.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<p>The target market for the EV rebate program is consumers who purchase and lease light-duty vehicles and are willing to consider EVs. Over the term of this plan (6 years), that will mostly consist of early adopters, but will increasingly include a wide range of New Yorkers who see opportunities to increase their convenience, reduce their environmental impact, drive an exciting car, and save money by owning an EV. This is already beginning, but will accelerate in the next two to three years as more models of EVs become available and car buyers get more comfortable with the technology.</p> <p>The other aspects of the EV Innovation Program will each target specific market segments.</p> <ul style="list-style-type: none"> <li>• Product development and demonstration efforts will target technology and business model innovators</li> <li>• Consumer engagement efforts will work with major industry participants, such as utilities, auto manufacturers, charging station manufacturers, and car dealers, as well as advocacy groups, employers, and municipalities,</li> <li>• EV infrastructure expansion efforts will include charging station manufacturers, utilities, municipalities, and site owners</li> </ul>
<b>Market Participants</b>	<p><b>Key market participants will in large part be similar for both the EV Rebate and EV Innovation Programs. They include:</b></p> <ul style="list-style-type: none"> <li>• <b>Auto manufacturers</b> control large advertising budgets, develop new models based on consumer preferences, and decide which models to sell in NYS; these groups will be involved with marketing and consumer awareness efforts</li> <li>• <b>Car dealers</b> decide which models to carry, how aggressively to sell them, serve as a main educator of consumers; dealers will be involved with marketing and consumer awareness efforts</li> <li>• <b>Charging station manufacturers, operators, and installers</b> are developing new technologies and business models for EV charging and expanding the EV charging</li> </ul>

	<p>infrastructure in NYS; these entities will be involved in research and development projects and consumer awareness efforts</p> <ul style="list-style-type: none"> <li>• <b>Utilities</b> are interested in EVs’ potential to align with their business models. EVs offer opportunities to increase their sales in a major market segment (transportation), improve system utilization, and balance load shapes and create new revenue opportunities, but are concerned about the potential for EVs to add to peak loads and overload local distribution systems if not managed effectively; utilities will be very involved with technology and policy research activities and demonstrations, as well as consumer awareness efforts</li> <li>• <b>Technology developers and academic researchers</b> look for support for technology development and commercialization and can use help identifying paths to market; these entities will be program participants in the EV Innovation Program</li> <li>• <b>Potential charging station site owners</b> (e.g. employers, municipalities, multi-family building owners, retailers, developers, etc.) operate highly visible sites for EV charging that drivers frequently visit, but have not installed charging infrastructure to date. They often have poor returns on their investments for installing charging stations because of high costs and low current usage rates. These entities will be involved in demonstration projects and business model development projects, and will be participants in aggregate purchases.</li> <li>• <b>Municipalities</b> own popular parking lots, control many of the regulations that impact EV charging station installations, and can establish local EV incentives; municipalities will be involved with both consumer awareness efforts and aggregate purchases</li> <li>• <b>Environmental advocates</b> are mounting campaigns to encourage the adoption of EVs in New York and elsewhere; advocates will be involved with consumer awareness efforts</li> <li>• <b>Other state agencies, federal agencies, and other states</b> have complementary programs that offer opportunities for collaboration and learning best practices; these entities will be part of broad-based multi-state and multi-agency efforts with New York, where there is a clear benefit to broader action</li> </ul>
<p><b>Market Readiness</b></p>	<ul style="list-style-type: none"> <li>• Market demand for EVs and efficient vehicles is growing, backed by both new market offerings and policy drivers. The number of EVs in NYS has grown from under 1,000 in 2012 to over 16,000 in December 2016.</li> <li>• NYS has adopted the California ZEV regulations, requiring increasing EV sales in NYS through 2025. To facilitate these increasing sales, NYS has been working with the auto manufacturers and the other ZEV states to create the right market conditions for EV adoption. Current policies and market activities include: <ul style="list-style-type: none"> <li>○ Automakers have made nearly 20 EV models available in New York State.</li> <li>○ Federal income tax credits of up to \$7,500 are available for EVs. NYS currently offers EV drivers access to high-occupancy vehicle lanes and reduced Thruway and PANYNJ tolls.</li> <li>○ NYSERDA offers up to \$60,000 vouchers for qualifying electric medium- and heavy-duty trucks and buses (using federal funding through at least 2016).</li> <li>○ Public and workplace charging stations are eligible for a 50% NYS tax credit, up to \$5,000. Public and private entities have installed over 1,600 charging stations in New York State through December 2016. More than 25 NYS workplaces have signed up for the Department of Energy’s Workplace Charging Challenge, recognizing their leadership in providing workplace charging for employees.</li> <li>○ Utilities have been directed to propose ways they can encourage greater EV market expansion by late 2016 as part of the Distributed System Implementation Plan (DSIP) process.</li> <li>○ Six Clean Cities Coalitions in NYS work at the grassroots level to support the adoption of EVs and other alternative fuel vehicles.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ NYSERDA has developed best practices for EV-friendly municipal permitting, zoning, and building codes and NYSERDA's Cleaner, Greener Communities program offers municipalities up to \$5,000 for adopting these permitting and zoning rules.</li> </ul>
<b>Customer Value</b>	<p><u>EV Rebate Program</u></p> <ul style="list-style-type: none"> <li>• Many car buyers are looking for reliable yet exciting cars that are reasonably priced. Electric vehicles offer drivers a low total cost of ownership in a fun-to-drive, convenient, low-maintenance car. Drivers can save as much as \$800 per year on fuel alone by driving an EV (at current prices), and can save hundreds of dollars more in maintenance costs.</li> <li>• Automakers want state support to help meet their ZEV regulation requirements and recoup their large research and development investments. A robust EV market in NYS would generate tens of millions of dollars per year in ZEV credits for automakers.</li> <li>• Car dealers want to be able to move cars off their lots quickly, keeping customer acquisition costs down.</li> <li>• Employers and commercial- and multi-family building owners are always in search of new ways to attract and retain top employees and tenants.</li> <li>• Similarly, retailers are looking for ways to attract new customers to their stores and have current customers spend more with them.</li> <li>• NYSERDA's program can improve the value proposition of buying EVs, increase the rate of EV sales, and offer site owners new, trendy ways to attract and retain employees/tenants/customers.</li> </ul> <p><u>EV Innovation Program</u></p> <ul style="list-style-type: none"> <li>• The innovation elements of the EV program offer similar value propositions to many of the same actors as the EV rebate program does, because the EV innovation program is also focused on expanding the market for EVs.</li> <li>• In addition to the value discussed above, innovators and product developers are looking for both working capital in support of product development and lower-risk opportunities to test new business models that may just be emerging in a rapidly evolving market like EVs. NYSERDA will offer cost-shared opportunities to develop and demonstrate new products and new approaches to selling EVs and EV-related products in New York State, reducing the risk and capital needs for program participants and accelerating their time to market.</li> <li>• Moreover, many partners are simply looking for guidance on ways to make money by participating in the EV market. NYSERDA will support cost-shared pilots of innovative business models and approaches to EV market participation that are economically beneficial to stakeholders and can be readily replicated, reducing the risks associated with trying these new tactics.</li> </ul>

13.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement and Customer Discovery</b>	<ul style="list-style-type: none"> <li>• NYSERDA has met with a wide range of stakeholders to discuss both specific program concepts and general approaches to the EV market. NYSERDA has strong relationships with key stakeholders, including auto manufacturers, charging station manufacturers and operators, charging station installers, auto dealer groups, utilities, non-governmental organizations (NGOs), Clean Cities Coalitions, municipalities, other NYS agencies, federal agencies, and other states.</li> <li>• NYSERDA regularly works with other peer states to learn about best practices and program designs that they have tried. Studies currently being</li> </ul>
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	funded include research comparing different approaches to EV market development, research on different methods for car dealer engagement, and research into battery second-life feasibility. Staff meets with market participants and other stakeholders, such as NGOs, on a regular basis to get input and advice on program development.
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13.1.4 Theory of Change

<b>Market and Technology Barriers Addressed</b>	<p><u>EV Rebate Program</u></p> <ul style="list-style-type: none"> <li>• Low consumer awareness and understanding of the benefits of EVs</li> <li>• EVs still have higher upfront costs than conventional vehicles (from \$2,500 to \$10,000 higher)</li> <li>• Car dealers have a harder time selling EVs because of the added time needed to educate consumers and the newness of the technology</li> </ul> <p><u>EV Innovation Program</u></p> <ul style="list-style-type: none"> <li>• Lack of NYS involvement from key stakeholders, including utilities, automakers, car dealers, employers, and municipalities</li> <li>• The cost of EVs and EV charging stations is still high and technical improvements to both the vehicles (range) and charging stations (speed, ease of use) are needed</li> <li>• Lack of charging infrastructure deployed, especially at workplaces and multi-family buildings, because of a current poor ROI and lack of driver demand</li> <li>• Potential for adverse grid impacts and costly hardware upgrades due to high penetrations of EVs charging at peak times, or even at off-peak times on specific feeder circuits</li> <li>• Local and state policies and regulations are often not supportive of EVs (building codes, planning and zoning, fleet purchases, utility rates designs)</li> </ul>
<b>Testable Hypotheses</b>	<p><u>EV Rebate Program</u></p> <ul style="list-style-type: none"> <li>• If NYSERDA provides rebates for EV purchases that bring the upfront costs closer to those of gasoline vehicles, then more consumers will purchase EVs.</li> <li>• If NYSERDA supports an EV rebate program, then auto manufacturers and car dealers will devote more resources to selling EVs in NYS.</li> <li>• If NYSERDA supports an EV rebate program, then EV charging station investments will become more attractive because of higher utilization rates due to more EVs on the road in NYS.</li> </ul> <p><u>EV Innovation Program</u></p> <ul style="list-style-type: none"> <li>• If NYSERDA supports the development and demonstration of new products and business models that make EVs easier to use and more grid-friendly, then market participants, including utilities, will expedite deployment of these offerings.</li> <li>• If NYSERDA and stakeholders successfully demonstrate new, collaborative consumer outreach strategies for EVs, then key stakeholders, including auto manufacturers, will see greater value in investing in consumer outreach in NYS and make a sustained investment in consumer outreach here.</li> <li>• If NYSERDA quantifies and demonstrates ways that utilities (and generators, NYISO, other electricity market participants) can benefit from greater EV adoption, then these stakeholders will urge their customers to buy EVs more aggressively and possibly invest greater resources in supporting EV adoption.</li> <li>• If NYSERDA can aggregate EV charging station purchases to lower prices and simplify purchasing, then average hard and soft costs of the equipment will fall and more installations will be completed, leading to further EV market expansion.</li> </ul>

	<ul style="list-style-type: none"> <li>• If new technologies and policies that enable easier, cheaper off-peak EV charging are offered to consumers, then more drivers will shift charging to off-peak hours.</li> </ul>
<b>Activities</b>	<p><b>Administer EV Rebate Program</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will administer an EV rebate program that offers consumer rebates for ZEVs at the point of sale. Per NYS legislation instructing NYSERDA to implement a rebate program, the incentives will be up to \$2,000 per vehicle. The details of the program are still under development; however, the program is anticipated to have a similar structure to incentive programs in other states, with incentive levels varying based on the electric range of the vehicle. The program will be monitored and adjusted based on evolving market conditions. Note that CEF funds will only be used for EVs, but the rebate program will include all ZEVs.</li> <li>• NYSERDA will hire an implementation contractor to process rebates, collect survey data from participants, and inform future adjustments to the program</li> <li>• NYSERDA will work with stakeholders to jointly market the program and raise awareness of EVs through both local and statewide program outreach</li> </ul> <p><b>Solicit and Support New Product and Business Model Development and Demonstration</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will fund product development projects aimed at improved technical performance and reduced costs for EV-related products, primarily targeting charging technologies and unique EV component technologies</li> <li>• NYSERDA will fund demonstrations and business model development for innovative financing approaches that focus on battery leasing and second-life battery uses</li> <li>• NYSERDA will support the development of innovative financing and/or leasing models for EV charging stations</li> <li>• NYSERDA will fund product development and demonstration projects on viable options for smart charging technologies and policies</li> <li>• NYSERDA will work with utilities to identify ways EVs can facilitate their operations and provide benefits to ratepayers, and advise them on the design of new approaches and business models that they might adopt that both support EV adoption and enhance grid operations</li> <li>• NYSERDA will develop case studies and “how to” materials to share amongst stakeholders to facilitate replication of successful demonstrations and encourage project partners to present at conferences to support information sharing and technology transfer</li> </ul> <p><b>Advance Consumer and Stakeholder Education and Awareness</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will initiate pilot consumer engagement programs with industry stakeholders to support consumer awareness building. This program will feed data collected from initial efforts back to industry to support their further independent investment in outreach, either through matching grants or jointly managed projects.</li> <li>• NYSERDA will work with other states and US Department of Energy on developing and possibly jointly funding regional or national EV awareness campaigns</li> <li>• NYSERDA will work with contractors to engage employers and car dealers to encourage them to expand their involvement in EV promotion and recognize leaders amongst these groups to encourage participation, possibly including a pilot sales incentive for car dealers that generate EV sales</li> </ul> <p><b>Sponsor Aggregate Purchasing and Cost Reduction for EVs and EV Charging Stations</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will institute a purchasing collaborative that negotiates bulk rates for any NYS site owner who wants to install a charging station to bring down costs and lower customer acquisition costs for vendors/installers. It will be paired with targeted incentives for specific installation site types, including workplaces, multi-family buildings, and municipalities.</li> </ul>



	<ul style="list-style-type: none"> <li>• NYSERDA will fund additional installations of fast-charge stations to support longer distance EV travel within NYS and to other states</li> <li>• NYSERDA will support the demonstration of models for aggregate EV purchases, such as Solarize-style grassroots campaigns that use community ambassadors to raise awareness of EVs</li> </ul> <p><b>Support State and Local EV Policy Development and Implementation</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will work with other states and other NYS agencies to coordinate EV policies and programs to support the continuation of ZEV regulations and region-wide EV travel, such as public fleet EV purchasing and fast-charging infrastructure planning</li> <li>• NYSERDA will collaborate with utilities and DPS to develop solutions for problems that may arise from EV adoption, such as clustering of EVs on distribution circuits and high demand charges for fast-charging stations, through the design, demonstration, and adoption of technologies and policies that encourage off-peak charging and/or utility-controlled charging.</li> <li>• NYSERDA will work with utilities and DPS to quantify the benefits utilities and ratepayers may derive from EV adoption and support utilities in developing their plans for involvement in the EV market by providing information about possible utility strategies for EV market participation and offering research on New York-specific EV opportunities for utilities where possible.</li> <li>• NYSERDA will continue to work with municipalities to encourage the adoption of EV-friendly permitting and zoning and will expand to focus on building codes and the planning approval process</li> <li>• NYSERDA will continue to engage with industry stakeholders, thought leaders, and policymakers, to better understand customer motivations, evolving technology trends, and policy best practices, and to get ideas for future EV activities</li> </ul>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• EV Rebate Program Launch.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Complete bench-scale prototypes of economically viable technologies that enable smart charging.</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>• Support the launch of new business offerings for charging station leasing.</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue first competitive solicitation for the development and demonstration of EV-enabling technologies.</li> </ul> <p><u>Milestone 5 (2017)</u></p> <ul style="list-style-type: none"> <li>• Contract with projects awarded in first competitive solicitation for the development and demonstration of EV-enabling technologies.</li> </ul> <p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue second competitive solicitation for the development and demonstration of EV-enabling technologies.</li> </ul> <p><u>Milestone 7 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with projects awarded in second competitive solicitation for the development and demonstration of EV-enabling technologies.</li> </ul> <p><u>Milestone 8 (2019)</u></p>

	<ul style="list-style-type: none"> <li>• Issue third competitive solicitation for the development and demonstration of EV-enabling technologies.</li> </ul> <p><u>Milestone 9 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with projects awarded in third competitive solicitation for the development and demonstration of EV-enabling technologies.</li> </ul> <p><u>Milestone 10 (2017)</u></p> <ul style="list-style-type: none"> <li>• Initiate aggregation pilots for EVs and EV charging stations, which will begin engaging customers and facilitating initial bulk purchases.</li> </ul> <p><u>Milestone 11 (2018)</u></p> <ul style="list-style-type: none"> <li>• Fast-charging station network expanded to 30 locations statewide along major interstate corridors.</li> </ul> <p><u>Milestone 12 (2018)</u></p> <ul style="list-style-type: none"> <li>• Completion of first collaborative consumer awareness activities.</li> </ul>
<p><b>Goals Prior to Exit and Potential Impact</b></p>	<p>NYSERDA will have accomplished its goals with the EV Rebate program when:</p> <ul style="list-style-type: none"> <li>• EV sales meet or exceed the pace required under ZEV regulations for at least four straight quarters and achieve at least a 3% market share</li> <li>• Auto manufacturers offer all EV models for sale in NYS</li> <li>• More than 75% of new car dealers in NYS sell EVs</li> <li>• The cost of EVs falls to be competitive with gasoline-powered vehicles given a three- to five-year ownership period</li> </ul> <p>NYSERDA will have accomplished its goals with the EV Innovation program when:</p> <ul style="list-style-type: none"> <li>• Groups of stakeholders (industry, municipalities, employers, etc.) host regular (at least quarterly) EV education and awareness-building events in NYS's major metropolitan areas</li> <li>• At least 40% of drivers report having had some personal experience with an EV, either through test drives, family, friends, neighbors, or co-workers</li> <li>• Smart charging technologies are introduced into the consumer market and one or more NYS utilities encourage customers to use them</li> <li>• Charging station owners can reasonably achieve a three to five-year return on investment for installing a charging station (an improvement of at least 50% from current conditions) and have multiple options for ways to purchase, finance, or lease a charging station</li> </ul> <p>EVs have the potential to capture a large market share in the light-duty vehicle market, and a small but significant share of medium- and heavy-duty vehicles. Cars generally are in service for 10 to 15 years, so virtually the entire vehicle fleet will turn over by 2030, providing a real opportunity to drive EV adoption. Many use cases will still not be appropriate for EVs, so the addressable potential is smaller, but EVs could meet the needs of more than half of all drivers in New York State.</p> <p>If successful, this program (when paired with other initiatives from other state agencies, primarily NYSDEC and NYPA) could help EVs account for 5% to 15% of annual new car purchases and number over 750,000 on the road by 2025, reducing CO2 emissions by 3.5 million metric tons per year, while also saving consumers money, reducing the State's petroleum use, generating additional GSP (through less money leaving the State from petroleum purchases), and improving local air quality and health outcomes.</p>

### 13.1.5 Relationship to Utility/REV

<p><b>Utility Role/Coordination Points</b></p>	<ul style="list-style-type: none"> <li>• EVs have the potential to support REV goals by serving a load-balancing function for utilities and may be able to be used as a distributed energy resource. They may also enable new business models for utilities to generate additional revenue.</li> <li>• Utilities have participated in a series of NYSERDA-funded policy studies investigating new utility approaches to EVs. Through this work, NYSERDA has expanded their interest in EVs and suggested potential new business models for encouraging more EV use that enhances utility operations.</li> <li>• NYSERDA will continue to work closely with utilities to inform them about EVs’ benefits to utilities and ratepayers, to share information about where EVs are commonly charged to help utilities’ planning efforts, and to demonstrate EV technologies that can help support broader grid benefits.</li> <li>• In April 2016, the PSC encouraged utilities to develop proposals for how they can enable greater EV adoption, to be submitted in their supplemental DSIP filings in late 2016. Utilities are examining a number of models for action, including the models for providing EV charging stations that the three California investor-owned utilities are pursuing. If NYS utilities and the PSC choose a similar path to utility involvement in EV charging station provision, NYSERDA will work to inform utilities about the most promising opportunities and business models for EV charging. NYSERDA’s proposed programs are complementary to this type of approach, as they are focused on increasing EV sales and awareness through the EV rebate, advancing the state of technology, bringing down the installed cost of charging stations, and providing limited incentives for charging station installations in specific market segments.</li> </ul>
<p><b>Utility Interventions in Target Market</b></p>	<ul style="list-style-type: none"> <li>• NYPA has worked closely with NYSERDA on a wide variety of EV-focused projects, including technology development, charging station installations, and grid-interactive vehicle pilots.</li> <li>• Most of the utilities in NYS have been engaged in EV activities to date in a limited fashion. Some, including Con Edison, National Grid, and Long Island Power Authority/PSEG-LI, have proposed new rates or programs that would encourage greater EV use. Some utilities have also shown interest in EV-related REV demonstration projects.</li> <li>• Some examples of EV interventions include Con Edison’s proposed special EV time-of-use rates for residential customers and National Grid’s ownership of more than 60 public EV charging stations.</li> <li>• Once utilities submit their supplemental DSIP filings, NYSERDA will have a better understanding of the types of EV market interventions they will pursue, which will help NYSERDA coordinate and collaborate further with the utilities.</li> </ul>

### 13.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

To ensure the success of the EV Rebate program statewide, including in areas that do not pay into the System Benefits Charge, such as Long Island, non-CEF funding (primarily RGGI funding) is being used to supplement CEF activities. In addition to the budget outlined below, approximately \$15 million of non-CEF funding will be used for the rebates. In addition, the EV Innovation program will supplement the CEF funds with approximately \$5 million in additional existing non-CEF funds that may only be used for infrastructure projects. This money will be used for EV charging station installations.

**Table 1: Annual Market Development and Innovation & Research Budget Allocation – Commitment Basis (CEF Only)**

<b>Commitment Budget</b>		<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
EV Rebate Program (CEF only)	Direct Incentives and Services	\$6,650,000	\$14,500,000	\$13,350,000	\$3,000,000	\$-	\$37,500,000
	Implementation Support	\$500,000	\$750,000	\$500,000	\$250,000	\$-	\$2,000,000
	Sub-Total	\$7,150,000	\$15,250,000	\$13,850,000	\$3,250,000	\$-	\$39,500,000
EV Innovation Program	Research and Technology Studies/ Development/ Demos	\$2,850,000	\$3,000,000	\$2,250,000	\$2,250,000	\$1,500,000	\$11,850,000
	Sub-Total	\$2,850,000	\$3,000,000	\$2,250,000	\$2,250,000	\$1,500,000	\$11,850,000
<b>Total</b>		<b>\$10,000,000</b>	<b>\$18,250,000</b>	<b>\$16,100,000</b>	<b>\$5,500,000</b>	<b>\$1,500,000</b>	<b>\$51,350,000</b>

**Table 2: Annual Expenditures Projection (CEF Only)**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>Total</b>
<b>Total</b>	14%	34%	32%	11%	3%	2%	2%	1%	100%

### 13.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

Indicators <sup>1</sup>		Baseline <sup>2</sup> (Before/ Current)	2019 (Cumulative)	2022 (Cumulative)
<b>EV Rebate Program</b>				
Activity/Outputs	# of rebates issued	N/A	38,000	46,000 <sup>3</sup>
	% of rebate recipients completing follow-up surveys	N/A	75%	80%
Outcomes	# of EVs registered in NYS	16,131	52,000	150,000
	EV market share (EV sales as a percentage of total car sales in NYS)	0.6%	1.5%	4%
<b>EV Innovation Program</b>				
Activity/Outputs	Number of product development and demonstration projects initiated	0	21	33
	Number of product development and demonstration companies supported	0	15	22
	Number of industry stakeholders engaged in consumer awareness programs	0	20	50
	Number of aggregate charging station purchase participants	0	150	400
Outcomes	Number of charging stations installed in NYS	1,639	3,000	4,500
	Avg. installed cost of Level 2 charging station per port	\$8,774	\$7,500	\$6,500
	Products Commercialized	0	2	4
	Revenue (\$ millions)	0	\$1	\$5
	Replications from Demonstration Projects	0	2	6

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Geographic availability of charging stations, especially DC fast charging stations that enable greater intercity EV travel
- Growth in consumer awareness and experience with EVs, including growth in consumer understanding of the value proposition of EVs

<sup>1</sup> N/A denotes that NYSERDA has not previously administered a similar program, so no baseline is available. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>2</sup> Updated baseline metrics reflect the final Clean Transportation Market Characterization study located here: <https://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2017ContractorReports/Clean-Transportation-Market-Characterization-Study-Vol2.pdf>. Additional volumes of this study, including the Executive Summary, Electric Vehicles and Transportation Demand Management Market Characterization and Baseline Assessments and report appendices can be found under the Clean Transportation Market Characterization Study heading here: <https://www.nyserdera.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/Evaluation-Contractor-Reports/2017-Reports>.

<sup>3</sup> Note that the rebate program is currently anticipated to end by 2020, not 2022. This limits Activity/Output metrics, while Outcome metrics are anticipated to continue growing beyond the end of the rebate program because of momentum generated in the EV market.

- New partnerships formed to encourage consumer awareness and local EV adoption, which may include participation from automakers, car dealers, utilities, charging station manufacturers, advocacy groups, employers, municipalities, and other stakeholders
- Introduction of new products that enable smart EV charging that benefits both EV drivers and utilities/grid operators
- New business models that monetize second-life battery uses and enable charging station financing

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative’s projects. Because the EV Rebate program is being co-funded with CEF and non-CEF funding, all reported metrics associated with implementation of the program will be split proportionately according to the level of funding coming from each source. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. The first table shows all metrics associated with the entire EV Rebate program, including both CEF and non-CEF funding, and the second table shows prorated metrics associated only with CEF funding. The third table shows all metrics associated with the EV Innovation program, which is funded by CEF. All CO2e emission reduction totals in Table 4 are based on a net analysis of emissions, accounting for lower emissions from reduced gasoline use and higher emissions from increased electricity use. Table 5 shows program participation associated with the entire program, including both CEF and non-CEF funding.

**Table 4. Direct Impacts**

**EV Rebate Program – CEF + Non-CEF (entire initiative)**

Primary Metrics <sup>4</sup>		2016	2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	--	--	--	--	--	--
	MWh Lifetime	--	--	--	--	--	--
	MMBtu Annual	-	375,000	841,000	758,000	171,000	2,144,000
	MMBtu Lifetime	-	3,750,000	8,410,000	7,580,000	1,710,000	21,440,000
	MW	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MW	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	20,100	45,100	40,700	9,160	115,100
CO2e Emission Reduction (metric tons) Lifetime		-	201,000	451,000	407,000	91,600	1,151,000

<sup>4</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA’s programs. Energy Efficiency values represent gasoline savings from use of electric vehicle; electricity required to charge vehicles (158,400 MWh cumulative annual and 1,584,000 MWh lifetime in Total) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both gasoline savings which add to the emission benefits and additional electricity required to charge electric vehicles which subtract from the benefits.

Customer Bill Savings Annual (\$ million)	-	-	-	-	-	-
Customer Bill Savings Lifetime (\$ million)	-	-	-	-	-	-
Private Investment (\$ million)	\$-	\$270	\$604	\$544	\$123	\$1,540

### EV Rebate Program – CEF only

Primary Metrics <sup>5</sup>		2016	2017	2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MMBtu Annual	-	250,000	560,000	505,000	114,000	1,430,000
	MMBtu Lifetime	-	2,500,000	5,600,000	5,050,000	1,140,000	14,300,000
	MW	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MW	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	13,400	30,100	27,100	6,100	76,730
CO2e Emission Reduction (metric tons) Lifetime		-	134,000	301,000	271,000	61,000	767,300
Customer Bill Savings Annual (\$ million)		-	-	-	-	-	-
Customer Bill Savings Lifetime (\$ million)		-	-	-	-	-	-
Private Investment (\$ million)		\$-	\$180	\$403	\$363	\$81.7	\$1,027

### EV Innovation Program

Primary Metrics <sup>6</sup>		2016	2017	2018	2019	2020	2021	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-
	MMBtu Annual	-	-	-	-	-	-	-
	MMBtu Lifetime	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-

<sup>5</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs. Energy Efficiency values represent gasoline savings from use of electric vehicle; electricity required to charge vehicles (105,600 MWh cumulative annual and 1,056,000 MWh lifetime in Total) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both gasoline savings which add to the emission benefits and additional electricity required to charge electric vehicles, which subtract from the benefits.

<sup>6</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

Renewable Energy	MWh Annual	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-	-	-	-
Customer Bill Savings Annual (\$ million)		-	-	-	-	-	-	-
Customer Bill Savings Lifetime (\$ million)		-	-	-	-	-	-	-
Private Investment (\$ million)		\$-	\$7.20	\$7.50	\$6.50	\$6.50	\$4.00	\$31.70

**Table 5. Annual Projected Initiative Participation**

	2016	2017	2018	2019	2020	2021	Total
Rebate Recipients – EV Rebate Program (CEF + Non-CEF)	0	5,500 to 9,750	12,500 to 22,000	11,500 to 20,000	2,500 to 4,500	--	32,000 to 56,250
Rebate Recipients – EV Rebate Program (CEF only)	0	3,750 to 6,500	8,000 to 14,500	7,500 to 13,500	1,750 to 3,000	--	21,000 to 37,500
Program Participants Receiving Awards – EV Innovation Program	0	8	8	7	6	4	33

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. Because the EV Rebate program is being co-funded with CEF and non-CEF funding, all reported metrics associated with implementation of the program will be split proportionately according to the level of funding coming from each source. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 6. Estimated Indirect Market Impact**

EV Rebate Program (CEF + Non-CEF)

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		80,000	450,000	800,000

EV Rebate Program (CEF only)



Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		53,333	300,000	533,333

EV Innovation Program

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		25,000	150,000	450,000

13.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• The proposed initiative will focus on the expanded use of electric vehicles instead of gasoline-powered vehicles in New York State. This switch to EVs will generate substantial greenhouse gas emission reductions, both directly and indirectly.</li> <li>• If all the direct lifetime savings from the EV Rebate program are achieved, the program could provide GHG emission reductions at approximately \$50 of NYSERDA spending per ton, which is in line with other CEF programs.</li> <li>• If the EV Rebate and EV Innovation programs achieve the potential GHG reductions noted above (in Goals Prior to Exit and Potential Impacts), the program will have achieved emissions reductions at approximately \$20 of NYSERDA spending per ton, which compares very favorably to other CEF programs.</li> <li>• While EVs present a strong opportunity for GHG emission reductions, they will result in greater electricity consumption. However, EVs can provide benefits to the electric grid despite this increased usage. <ul style="list-style-type: none"> <li>○ First and foremost, as most EV charging can occur overnight, EVs have the potential to level load curves and increase load factors by adding electricity demand during off-peak times. This can potentially reduce electric rates for all ratepayers.</li> <li>○ EVs also have the potential to serve as distributed energy resources that can provide ancillary services to the grid using electricity stored in their batteries. This would provide benefits to both the electric grid and to EV owners, who could realize a new source of revenue to offset their operating costs.</li> </ul> </li> </ul>
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13.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p>
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	<ul style="list-style-type: none"> <li>• NYSERDA will monitor standard activity/output metrics including number of projects initiated and completed by type, private investment, etc.</li> <li>• For any new technology developments launched under the program, on a yearly basis, NYSERDA staff and contractor will reassess the Technology and Commercialization Readiness Levels (criteria by which to measure a new product’s technical and commercial development) for each product development project in the portfolio.</li> <li>• Examples – technical impasse, pivot point, critical milestone.</li> <li>• NYSERDA will assess the portfolio of projects annually regarding goals, metrics, outputs and outcomes.</li> </ul> <p><b><u>Market Evaluation/Impact Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation draws on the theory of change of the related logic model and will include baseline and longitudinal measurement of key indicators of success.</li> <li>• Baseline measurements of key performance indicators will occur within one year following initiative approval and will further refine baseline estimates including number of charging stations installed, consumer awareness, and number of electric vehicles registered in NYS. In these areas, NYSERDA will first utilize existing information and will fill gaps in information as needed and feasible for appropriate baselining.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change will occur once the initiative is underway. Sources of data include public and commercially available data, and primary data collection through surveys of key market actors.</li> <li>• A broad demonstration project impact evaluation starting no sooner than 2018 will include projects from this area and will examine benefits of demonstration projects, rate of and success factors associated with replication, and benefits of replication projects. Cost and energy savings will be quantified as part of this study.</li> <li>• Specific to the rebate program, NYSERDA will collect information from consumers through surveys. Consumers will fill out an initial survey when they purchase an electric vehicle and will be asked to complete a follow-up survey 6-12 months after the purchase to provide information on the factors that drive electric vehicle purchases and how they are being used.</li> <li>• NYSERDA will continue to gather information on at least an annual basis about electric vehicle usage and charging patterns in terms of timing and location to help inform utilities, prospective charging station owners, and other market actors.</li> </ul>
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## 13.2 Public Transportation and Electrified Rail

### 13.2.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"> <li>• New York State has more public transportation ridership than any other state, both overall and per capita. Efficiency improvements could generate millions of dollars in savings annually.</li> <li>• NYS transit agencies have identified areas where energy efficiency improvements are needed, as well as opportunities to improve transit ridership through better service, especially upstate. To date, many of these</li> </ul>
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	<p>opportunities have not been undertaken because of technical and operational hurdles, including a lack of a dedicated research and development (R&amp;D) budget for product development and demonstration, procurement challenges, financing challenges, and logistical hurdles.</p> <ul style="list-style-type: none"> <li>• Transit ridership has been increasing in recent years, especially in the New York City area. New investments are needed to keep up with demand, and transit agencies are looking for ways to serve more people more efficiently. Energy efficiency solutions are necessary to help transit agencies control their costs while continuing to provide high levels of service for their customers.</li> </ul>
<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• NYSERDA will work with transit agencies and technology providers to develop and demonstrate new public transportation and electrified rail technologies that reduce energy use and peak load, helping transit agencies make tangible improvements to their operations while achieving real energy savings. The program is focused on developing and demonstrating new solutions, rather than providing incentives for deployment. NYSERDA’s strategy will include three main elements: <ul style="list-style-type: none"> <li>○ Supporting new technology and product development that solves specific problems transit agencies have identified.</li> <li>○ Testing and validating the benefits, identifying the value streams, and exploring new delivery business models of new or new-to-New York products.</li> <li>○ Supporting transit agencies with finding alternative products that meet their needs and produce energy savings, helping transit agencies develop specifications for buying new products, and coaching potential vendors on how to adapt their products to specific NYS transit operators’ needs.</li> </ul> </li> <li>• There is currently little pilot-scale research and testing being conducted on ways to improve smaller public transportation networks to reduce greenhouse gas (GHG) emissions. NYSERDA will support research into options for increased energy efficiency and lower-cost approaches to increasing ridership and achieving cost savings, such as aggregate purchasing of energy-saving technologies, technologies supporting bus rapid transit, behavioral science-informed marketing, and making data available to private app developers.</li> <li>• Initial focus areas have been identified with input from NYS transit agencies. The initial scope is broad and focuses on a number of topic areas, but is expected to narrow as the program advances and certain research projects show more promise than others.</li> <li>• This initiative is part of NYSERDA’s coordinated intervention strategies to develop and deploy energy storage products and remove market barriers to their adoption. This program will demonstrate new storage technologies in public transportation use cases and will be coordinated closely with NYSERDA efforts to develop new energy storage technologies and products. It will also leverage the insights gained from activities conducted under the “Reducing Barriers to Deploying Distributed Energy Storage” initiative to use energy storage in reducing grid impacts from electrified rail.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Public Transportation and Electrified Rail,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<p>The goal of this program is to develop and demonstrate innovative technologies and operational approaches that are required for New York’s public transportation agencies, to contribute to the State’s energy and GHG reduction goals. Areas of need include:</p> <ul style="list-style-type: none"> <li>• Reducing traction power energy use</li> <li>• Increasing the efficiency of transit buses</li> </ul>

	<ul style="list-style-type: none"> <li>Developing new hardware and software technologies that enable operational improvements to make transit access more widespread and economically viable</li> </ul> <p>This is critical because very little research is conducted on transit operations nationally, so NYSEERDA's efforts fill a gap in federal and private research.</p>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>The 2015 State Energy Plan identifies transportation as a major user of energy and source of GHG emissions in the State. The Plan recognizes that New York's extensive public transportation system is the reason that New York State is the most transportation fuel-efficient state in the nation on a per capita basis, and that to further reduce transportation emissions the State must invest in more energy efficient ways to move people, including further investment in public transportation.</li> <li>The 2015 State Energy Plan also discusses the need to manage electricity demand to ensure efficient and reliable operation of the grid. The Metropolitan Transportation Authority's (MTA's) electricity use is in the area of the state with the highest electricity prices and most congested electric grid. Consistent with the Reforming the Energy Vision (REV) agenda, reductions in MTA electricity use could help alleviate pressures on the electric grid.</li> </ul>

13.2.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market for the proposed activities will primarily be product vendors and developers, researchers, and transit agencies (which will participate primarily as partners).
<b>Market Participants</b>	<p><b>Key market participants include:</b></p> <ul style="list-style-type: none"> <li>Private sector technology and service providers, including: <ul style="list-style-type: none"> <li>Rail car and bus manufacturers, component manufacturers, and third-party solution providers</li> <li>Energy storage companies and the New York Battery and Energy Storage Technology consortium (NY-BEST)</li> <li>Financial sector organizations and energy service companies</li> <li>Software developers</li> <li>Researchers and inventors</li> </ul> </li> <li>NYS public transit agencies</li> <li>Public transportation riders</li> <li>Federal, State, local and regional transportation agencies, including United States Department of Transportation (USDOT), Federal Transit Administration (FTA), New York State Department of Transportation (NYSDOT) and the state's metropolitan planning organizations (MPOs)</li> <li>Utilities</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>Transit agencies across New York State have seen increases in ridership in recent years and demographic trends point toward a continued increase in ridership in coming years.<sup>7</sup> This is in part because of an increase in people moving back into urban centers, high gas prices in the early 2010s, and the Great Recession. Transit agencies are looking for ways to meet this increased demand through new operating strategies and investments that have low operating costs. Making sure that there are energy efficient options for transit agencies to choose from when making investment</li> </ul>

<sup>7</sup> MTA ridership in 2016 hit the highest level since 1948. <http://web.mta.info/nycct/facts/ffsubway.htm>, accessed 8/8/17  
NYPTA has stated that "Ridership is up almost everywhere in the state," according to a 12/31/16 news article: [http://www.pressrepublican.com/news/local\\_news/as-ridership-grows-public-transit-looks-to-state-for-money/article\\_130bde0f-b0b2-5fdc-b68e-e4858b886dee.html](http://www.pressrepublican.com/news/local_news/as-ridership-grows-public-transit-looks-to-state-for-money/article_130bde0f-b0b2-5fdc-b68e-e4858b886dee.html), accessed 8/8/17

	<p>decisions is critical if New York is going to meet its State Energy Plan goals for reduced transportation energy use.</p> <ul style="list-style-type: none"> <li>• Transit agencies have taken some initial steps. For example, MTA has implemented a number of energy efficiency upgrades, including improved rail switch heaters and LED lighting. MTA and other transit agencies have adopted compressed natural gas (CNG) and hybrid-electric buses for about 25% of their fleets to date, but these options have only had incremental impacts on energy use and GHG emissions.</li> <li>• Transit agencies have plans to make extensive capital investments in the next 10 years, including buying thousands of transit buses. Because many of these equipment investments will be in place for 10 or more years, delays in technology availability will mean that less efficient equipment is purchased, which would result in a long delay before adoption of more efficient technologies.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Transit agencies are looking for reliable vehicles and technologies that offer low operating costs, are durable, and can fit into their agencies' operational needs. NYSERDA's development and demonstration activities will result in new and rigorously tested products and services that reduce transit agency operating expenses, allowing budgets to stretch further, and help transit agencies offer better services to their riders.</li> <li>• NYSERDA's program has the potential to help transit agencies create value for their riders by reducing operating costs, allowing for lower-cost service or service expansion. With respect to MTA in particular, the program has the potential to create value for ratepayers, utilities, and grid operators through reduced system costs.</li> <li>• If the technologies and associated energy savings anticipated in this plan are fully realized, MTA alone could save more than \$50 million per year in operating expenses from reducing its traction electricity use (which makes up about 75% of MTA's total electricity use) by about 750 million kWh and its peak load by about 100 MW. This would reduce its greenhouse gas emissions by 400,000 metric tons annually. Similarly, broad deployment of electric transit buses could reduce GHG emissions by more than 250,000 metric tons per year. Revenue increases from increased ridership that could result from improved operations could amount to \$20 million per year and reduce GHG emissions from more efficient buses and fewer automobile trips by more than 50,000 metric tons annually.</li> <li>• New product developers are looking for both working capital in support of product development and, often more importantly, facilitation of product demonstrations with transit agencies, which often lead directly to sales. As New York State accounts for about 40% of all transit ridership in the United States, proving a product that meets the needs of New York State transit agencies can be the cornerstone of a multi-million-dollar product launch.</li> </ul>

13.2.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement and Customer Discovery</b>	<ul style="list-style-type: none"> <li>• NYSERDA has already begun working with MTA to identify its operating divisions' greatest needs and possibilities for energy saving products. MTA staff is eager to work with NYSERDA in an expanded capacity and has already shared many ideas for collaborations that can start in the next year. NYSERDA is familiar with many technology developers and vendors who have worked with MTA and has talked to them to better understand obstacles involved. NYSERDA will also reach out to other transit agencies in other parts of the US and world to try to identify best practice technologies and their manufacturers that are not currently in use in NYS.</li> <li>• NYSERDA recently completed a survey of technology use in small- and mid-sized NYS transit agencies that has informed its program development. Findings include significant opportunities to improve energy use and service provision through joint purchasing, driver feedback software, technologies</li> </ul>
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	<p>that reduce travel times, better data use and software development, and a general need for in-service demonstration funding.</p> <ul style="list-style-type: none"> <li>• NYSERDA has met with and continues to develop its relationships with other NYS transit agencies, including Capital District Transportation Authority (CDTA), Niagara Frontier Transportation Authority (NFTA), Westchester Bee-Line, and others, to identify their largest obstacles to improved energy efficiency and increased ridership and how NYSERDA might help them address these obstacles. NYSERDA also intends to work closely with NYSDOT and the New York Public Transit Association (NYPTA) to coordinate activities and identify opportunities that span multiple transit agencies.</li> <li>• MTA has an existing program that works with companies with technologies that offer promising energy savings potential. They do not provide funding to these companies but often provide feedback and advice. MTA generally refers these companies to NYSERDA to learn about potential funding opportunities. Continuing to work with these companies will help ensure that NYSERDA programs are addressing appropriate targets.</li> </ul>
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13.2.4 Theory of Change

<p><b>Technology Opportunities and Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Lack of dedicated budget and process for product development and demonstration.</b> Large investments are required to develop, demonstrate and deploy new public transit innovations. Transit agencies have few opportunities to develop and test new technologies and approaches to improving energy efficiency and enhancing operations to serve more riders and reduce GHG emissions from transportation. They have limited data on actual performance of new technologies, which stifles their willingness to invest. Federal agencies have limited budgets for R&amp;D and do not often focus on the R&amp;D needs of NYS transit agencies. Facilitating demonstrations of efficiency measures and developing technologies and tools that improve efficiency, reliability and customer experiences will help transit agencies justify investing in these innovative approaches to generating GHG emission reductions. Reducing the cost of developing products and establishing faster, easier demonstration project protocols will bring down the cost and time to introduce new products. Generating reliable data from in-service demonstrations will help transit agencies become confident enough in the technologies’ benefits to make further investments.</li> <li>• <b>Logistical hurdles.</b> Electric buses are beginning to be introduced in transit fleets around the country but NYS transit agencies are unlikely to invest until they are shown to address their technical and logistical needs and charging infrastructure is standardized. Demonstrated, validated, and cost-effective electric buses and associated charging infrastructure will lead to NYS adoption.</li> <li>• <b>Technology integration and procurement challenges.</b> Subway cars, rail cars and buses do not currently incorporate the state of the art technologies in areas such as vehicle light weighting, efficient drivetrains, and traction power technologies, causing them to use more energy than similar subway cars and buses in other transit systems. Procurement practices that favor energy-efficient solutions, new technical breakthroughs, and the integration of existing efficient technologies in use elsewhere into NYS agencies’ standard operations will help achieve NYS’s goals.</li> <li>• <b>Operational and partnership/financing challenges.</b> Administrative barriers that could be overcome through either operational adjustments or public-private partnerships stop many activities and technologies that might make economic sense from making it into transit operations. Few demonstrations of innovative approaches to transit agencies’ operational challenges (such as new approaches to vehicle automation or partnerships facilitated by third-party ownership of energy</li> </ul>
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	<p>efficiency assets) are conducted and there are few sources of funding for this research. Successful pilots of operational changes and innovative partnership and financing relationships will lead to larger rollouts of these approaches.</p>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA engages public transit agencies’ operations divisions in product development and demonstration efforts from the start, then it will result in easier logistics for demonstration projects, shorter development timelines, and more successful product adoptions.</li> <li>• If NYSERDA works with partners to design well-planned, rigorous demonstrations of new technologies, then transit agencies will be more likely to accelerate adoption.</li> <li>• If projects conduct in-service demonstration and validation of the benefits and ease of operation of transit technologies that are in use elsewhere, such as electric buses and lightweight train cars, then they will be able to find more willing buyers at NYS transit agencies and increase adoption in NYS.</li> <li>• If NYSERDA supports product refinements by technology providers who have products that need to be adapted to specific and unique procurement requirements of NYS transit operators, then this will help them introduce the products into NYS more quickly and at a more competitive price.</li> <li>• If transit agencies try alternative REV-like business models for the purchase and operation of energy-saving transit investments, such as third-party ownership of assets that can provide outside revenue streams or participation in microgrids/power delivery on transit agencies’ rights of way, then this will reduce payback periods and eliminate operational obstacles for energy efficient technologies.</li> <li>• If NYSERDA supports the development of innovations that increase bus reliability and convenience through introducing new technologies and improving system performance, then transit agencies that implement these innovations will increase their per-bus ridership rate and generate GHG emission reductions.</li> </ul>
<p><b>Activities</b></p>	<ul style="list-style-type: none"> <li>• <b>Solicit and support new product development and demonstration opportunities</b> <ul style="list-style-type: none"> <li>○ NYSERDA will work with transit agencies to identify their core needs and barriers, performance and price targets, operational and maintenance requirements, and key opportunities they see for improvements in their operations and energy use</li> <li>○ NYSERDA will develop a prioritized list of promising technologies that may benefit from support or in-service demonstration partners</li> <li>○ NYSERDA will work with transit agencies and product developers to establish an approved demonstration protocol to streamline administrative burdens around demonstration projects</li> <li>○ NYSERDA will fund product development projects that advance and commercialize new technologies that help NYS transit agencies become more energy efficient. NYSERDA will also fund demonstration projects to test new and underutilized energy-saving transit products in operation in NYS.</li> <li>○ NYSERDA will fund product “adaptation” projects to customize energy-saving products for NYS transit operators’ special operational requirements.</li> </ul> </li> <li>• <b>Provide expert consultations to transit agencies</b> <ul style="list-style-type: none"> <li>○ NYSERDA will work with transit agencies to develop procurement specifications for new products that encourage competition and open-source standards wherever possible.</li> <li>○ NYSERDA will advise transit agencies directly or contract with experts to help the agencies find solutions to logistical and operational barriers to new technology adoption.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• <b>Develop new public/private business models</b> <ul style="list-style-type: none"> <li>○ NYSERDA will work with MTA, the New York Power Authority (NYPA), Con Edison, and third-party service providers to study and demonstrate alternative ownership/financing models and revenue streams for MTA assets, such as energy storage and microgrids, which would make it easier for MTA and its partners to invest in energy-saving technologies.</li> <li>○ NYSERDA will support transit agencies to identify private financiers who are willing to finance large-scale implementation of successfully demonstrated products.</li> </ul> </li> <li>• <b>Facilitate broad acceptance of demonstrated technologies and support their adoption into regular deployment channels</b> <ul style="list-style-type: none"> <li>○ NYSERDA will share information with NYPA, NYSDOT, and FTA about successfully demonstrated products and to inform them in their development of financing packages and project implementation support for transit agencies to broadly deploy products.</li> <li>○ NYSERDA will investigate opportunities to provide aggregate purchasing opportunities for transit agencies that can use similar energy-saving technologies.</li> <li>○ NYSERDA will develop case studies and “how to” materials to share amongst transit agencies to facilitate replication of successful demonstrations and encourage project partners to present at conferences to support information sharing and technology transfer.</li> </ul> </li> <li>• <b>Support the use of new technologies and services</b> <ul style="list-style-type: none"> <li>○ NYSERDA will support the implementation of operating technologies, such as data collection and communication systems, and system performance improvements, such as reconfiguring bus routes to improve travel times, that improve rider experiences and increase utilization of existing assets.</li> <li>○ NYSERDA will work with transit agencies statewide to pilot behavioral approaches that make taking transit easier, faster, and more cost-effective.</li> </ul> </li> </ul> <p>Projects will be selected through competitive solicitations. Co-funding is required for technology development and demonstration projects, and proposers are responsible for identifying sources of co-funding at the time they submit proposals. All projects will seek to advance technologies and strategies that can be replicated at a larger scale and in a cost-effective manner. Target technologies and operational strategies will be evaluated regularly and adjusted, with input from partners, as needed based on a “test/measure/adjust” approach.</p>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue first competitive solicitation for the development and demonstration of public transportation technologies.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with projects awarded in first competitive solicitation for the development and demonstration of public transportation technologies.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue second competitive solicitation for the development and demonstration of public transportation technologies.</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• Initiate project to identify ways to update transit agency procurement processes so that they explicitly value energy savings from efficient transit technologies.</li> </ul> <p><u>Milestone 5 (2019)</u></p>



	<ul style="list-style-type: none"> <li>• Contract with projects awarded in second competitive solicitation for the development and demonstration of public transportation technologies.</li> </ul> <p><u>Milestone 6 (2019)</u></p> <ul style="list-style-type: none"> <li>• Issue third competitive solicitation for the development and demonstration of public transportation technologies.</li> </ul> <p><u>Milestone 7 (2020)</u></p> <ul style="list-style-type: none"> <li>• Contract with projects awarded in third competitive solicitation for the development and demonstration of public transportation technologies.</li> </ul> <p><u>Milestone 8 (2020)</u></p> <ul style="list-style-type: none"> <li>• Issue fourth competitive solicitation for the development and demonstration of public transportation technologies.</li> </ul> <p><u>Milestone 9 (2021)</u></p> <ul style="list-style-type: none"> <li>• Contract with projects awarded in fourth competitive solicitation for the development and demonstration of public transportation technologies.</li> </ul>
<b>Goals Prior to Exit</b>	<p>NYSERDA will have accomplished its goals with this program when:</p> <ul style="list-style-type: none"> <li>• Technology providers have performed successful in-service demonstrations of products that achieve the efficiency gains targeted through this program (25% or more improvements in rail and bus efficiency)</li> <li>• These energy-efficient products are cost-competitive with other products as part of regular transit agency procurements and are commercially available</li> <li>• One or more transit agencies have been able to integrate these new technologies into their operations and logistics such that there is still a reasonable return on investment for the transit agency</li> <li>• NYPA or other third-party financiers are willing to finance transit agencies' purchases of the demonstrated energy-efficient products</li> </ul> <p>NYSERDA's program will bring products through the demonstration phase. This program's involvement is expected to be completed before the products are fully adopted and deployed. The program will try to facilitate future adoption of technologies beyond initial successful demonstrations beyond NYSERDA's involvement through three main channels:</p> <ul style="list-style-type: none"> <li>• Sharing information with NYPA, NYSDOT, and FTA to support the development of financing packages and project implementation support for transit agencies to deploy successfully demonstrated products on a large scale. These other organizations, not NYSERDA, would facilitate product deployment.</li> <li>• Helping transit agencies identify private financiers who are willing to finance large-scale implementation of successfully demonstrated products.</li> <li>• Helping transit agencies identify third party partners willing to act as service providers who, through arrangements that generate benefits for both partners, agree to fund, own, and/or operate a large-scale implementation of successfully demonstrated products.</li> </ul>

13.2.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• NYSERDA's work with MTA will include close collaborations with utilities, primarily NYPA and Con Edison. Many elements of the program, in particular wayside energy storage, electric rail efficiency, electric buses, and microgrids, will create joint value for MTA and its utility partners by generating valuable services for both the MTA and the utility.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Con Edison also works closely with MTA, as MTA’s electricity use is one of the largest loads on its distribution wires. Con Edison has partnered with NYSERDA in MTA’s initial feasibility studies and demonstration projects in wayside energy storage, electric buses, and microgrids and intends to continue its involvement. To date, they have provided partial funding (to match NYSERDA funds) for select projects and have served as advisors. They do not fund product development work and they do not have a dedicated program to fund demonstrations, as NYSERDA is proposing to do.</li> <li>• NYPA has a very limited R&amp;D budget that it has used for transit-related projects. NYPA will be involved primarily as an advisor in product demonstration projects, particularly those involving electric transit buses. NYPA is currently co-funding a project with MTA on overcoming barriers to incorporating electric buses into its fleet but has a limited budget for these types of research projects. NYPA’s main role has been funding the deployment of energy-efficient technologies for electrified rail that have been developed by NYSERDA, and they will continue to do so. They primarily provide financing and operational support to roll out proven technologies that make MTA’s operations more energy-efficient, including rail heaters, lighting products, wayside energy storage, and other advances. NYSERDA and NYPA will continue to explore opportunities for collaboration and co-funding to develop and deploy innovative technologies and strategies in this critical NYC load pocket.</li> </ul>
<b>Utility Interventions in Target Market</b>	NYPA and Con Edison have worked with MTA in the past and continue to work with MTA, although their focus has typically been on deploying commercially available energy efficient products to reduce MTA’s energy use in its facilities, not on their traction power energy use. NYSERDA’s High Performing Grid program awarded funds to MTA to do a wayside energy storage project in April 2017, in partnership with Con Edison.

13.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this initiative is shown in Table 7. The annual expenditure projection is included in Table 8. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only. While no specific breakdowns can be provided at this time because of the uncertainty around technical and commercial progress in the various activity areas, it is anticipated that most of the budget will be put toward research related to electrified rail and electric bus systems.

**Table 7: Annual Innovation & Research Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
Research and Technology Studies/ Development/ Demos Sub-Total	\$4,750,000	\$4,250,000	\$3,500,000	\$3,000,000	\$3,000,000	\$18,500,000
<b>Total</b>	<b>\$4,750,000</b>	<b>\$4,250,000</b>	<b>\$3,500,000</b>	<b>\$3,000,000</b>	<b>\$3,000,000</b>	<b>\$18,500,000</b>

**Table 8: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>Total</b>
<b>Total</b>	3%	11%	19%	16%	16%	11%	11%	8%	5%	100%

### 13.2.7 Progress and Performance Metrics

Table 9 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 9. Initiative Specific Metrics**

Indicators <sup>8</sup>		Baseline (Before/Current)	2019 (Cumulative)	2022 (Cumulative)
Activity/Outputs	Number of projects initiated	0	17	33
	Number of companies supported	0	13	21
	Number of transit procurements assisted	0	2	5
	Number of third-party partnerships facilitated	0	2	5
Outcomes	Private Investment/Leveraged Funds (\$ millions)	\$0	\$17	\$42
	Products Commercialized	0	1	4
	Revenue (\$ millions)	\$0	\$0.5	\$5
	Replications from Demonstration Projects	0	2	10

In addition to the above outcomes, NYSERDA will also qualitatively track progress toward the following broad outcomes:

1. Demonstration of cost-effective strategies to increase rail efficiency by 25%:  
This is done by reducing the weight of rail cars, improving the traction power system, and capturing energy from regenerative braking with wayside energy storage
2. Demonstration of cost-effective strategies to improve bus efficiency by 25%:  
This is done through advances including, but not limited to, more efficient drivetrains and light weighting
3. In-service demonstration and initial purchases of electric transit buses by NYS transit agencies
4. Improved bus system energy use and GHG emissions per passenger mile
5. Demonstration of novel financing and partnership models to accelerate implementation of new and improved technologies

Benefits shown in Table 10 and Table 11 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Due to the nature of the activities, estimating energy savings

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<sup>8</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

impacts at this stage is difficult because the specific technologies that will be supported are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

**Table 10. Direct Impacts**

Primary Metrics <sup>9</sup>		2018	2019	2020	2021	2022	TOTAL
Energy Efficiency	MWh Annual	--	--	--	--	--	--
	MWh Lifetime	--	--	--	--	--	--
	MMBtu Annual	--	--	--	--	--	--
	MMBtu Lifetime	--	--	--	--	--	--
	MW	--	--	--	--	--	--
Renewable Energy	MWh Annual	--	--	--	--	--	--
	MWh Lifetime	--	--	--	--	--	--
	MW	--	--	--	--	--	--
CO2e Emission Reduction (metric tons) Annual		--	--	--	--	--	--
CO2e Emission Reduction (metric tons) Lifetime		--	--	--	--	--	--
Customer Bill Savings Annual (\$ million)		--	--	--	--	--	--
Customer Bill Savings Lifetime (\$ million)		--	--	--	--	--	--
Private Investment (\$ million)		\$8.00	\$9.00	\$9.00	\$8.00	\$8.00	\$42.0

**Table 11. Annual Projected Initiative Participation**

	2018	2019	2020	2021	2022	Total
Participants <sup>10</sup>	9	8	6	5	5	33

### 13.2.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>The proposed initiative will focus on electric energy efficiency for rail, electrification of bus service, and improved efficiency and use of traditional buses that run on diesel and natural gas. Savings for all three of these components are anticipated to be provided at approximately \$5 of NYSERDA spending per ton of carbon.</li> <li>Expanding the focus to include bus GHG emission reductions allows the program to take a statewide approach, as electrified rail only has a significant footprint downstate. With regard to bus electrification, the switch to electric buses will</li> </ul>
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<sup>9</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

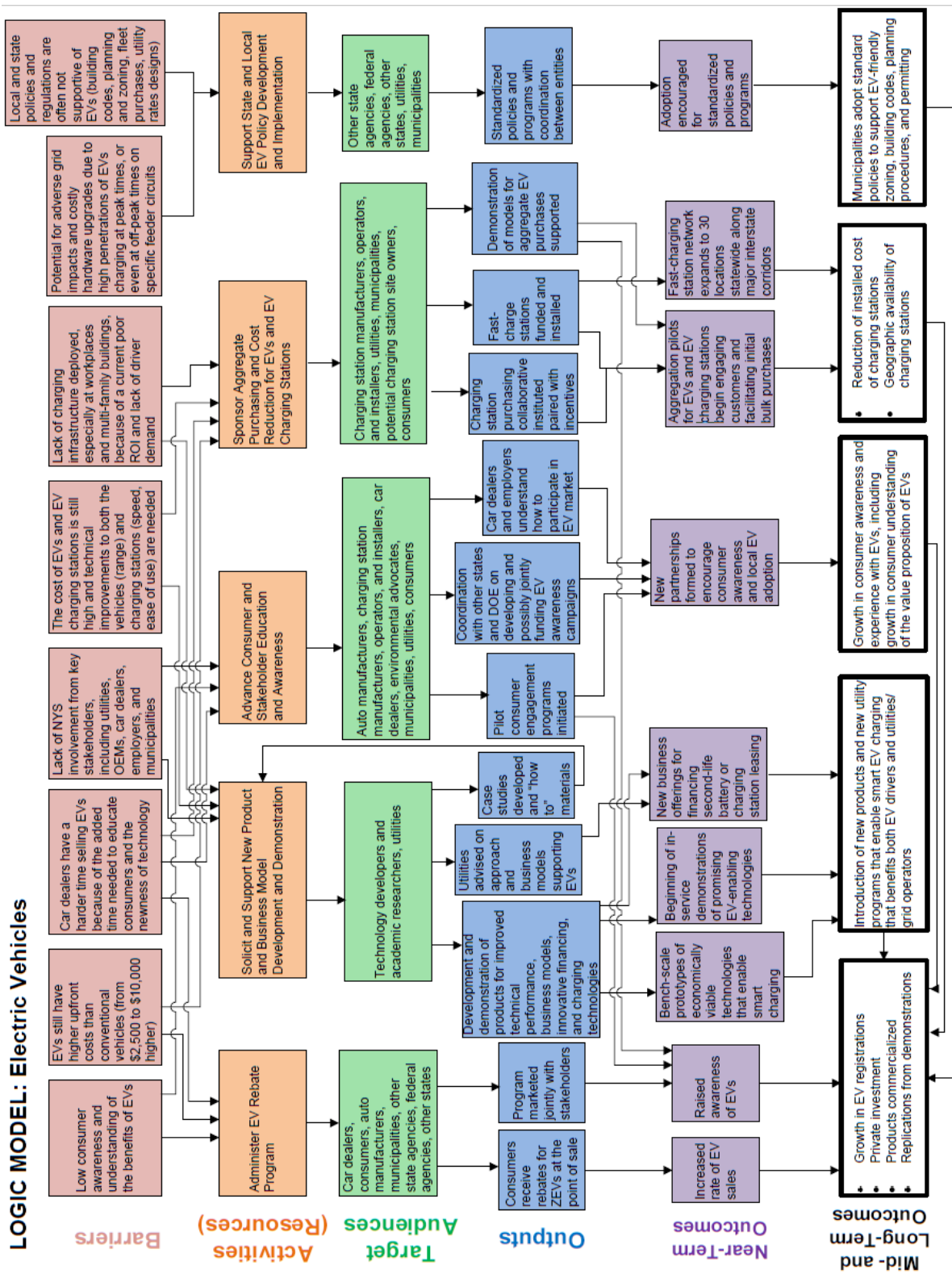
<sup>10</sup> Participants defined as those receiving an award through a NYSERDA solicitation.

	<p>generate substantial greenhouse gas emission reductions compared to the use of diesel buses. While electric transit buses present a strong opportunity for GHG emission reductions, they will result in greater electricity consumption. However, electric buses can provide benefits to the electric grid despite this increased usage. Ideally most electric bus charging can occur overnight, which means electric buses have the potential to level load curves and increase load factors by adding electricity demand during off-peak times.</p> <ul style="list-style-type: none"> <li>• Moreover, replacing diesel buses with electric buses and expanding transit use can substantially reduce emissions of carbon dioxide, particulate matter, black carbon, and methane, resulting in significant air quality improvement leading to health and climate benefits. Expanded, more affordable transit options can also benefit New Yorkers’ access to jobs, improve public health, and contribute to economic development.</li> </ul>
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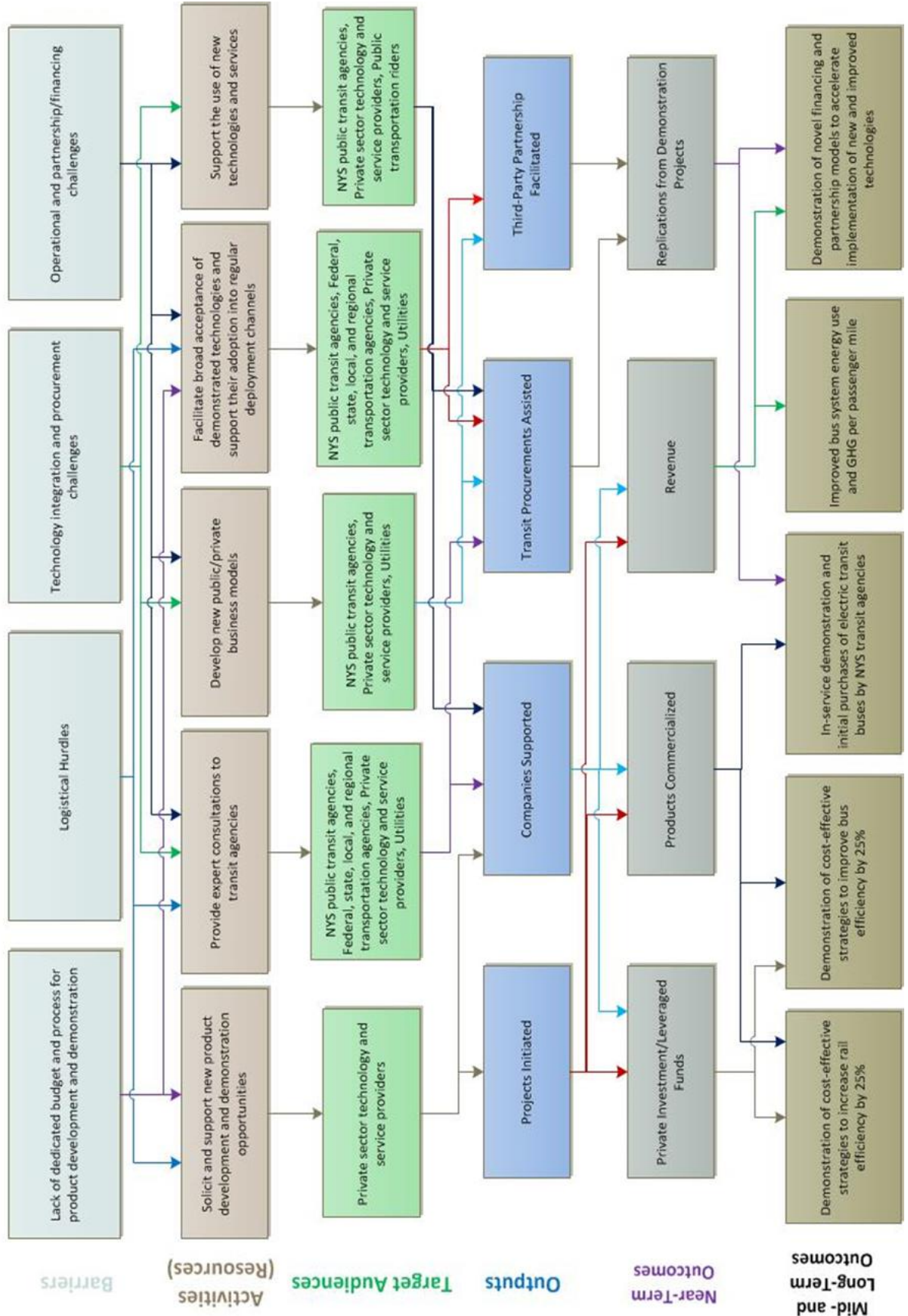
13.2.9 Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• NYSERDA will monitor standard activity/output metrics including number of projects initiated and completed by type, private investment, etc.</li> <li>• Additional program-specific metrics include new vendors selling to transit agencies, public-private partnerships for energy services, ease-of-ridership tools available for transit riders, potential operational cost savings</li> <li>• For any new technology developments launched under the program, on a yearly basis, NYSERDA staff and contractor will reassess the Technology and Commercialization Readiness Levels for each project in the portfolio. <ul style="list-style-type: none"> <li>○ Examples – technical impasse, pivot point, critical milestone.</li> </ul> </li> <li>• NYSERDA will assess the portfolio of projects annually with regard to goals, metrics, outputs and outcomes to determine whether projects should continue to the next phases, how much promise their research and similar research continues to show, and whether the program should continue on the same trajectory or refocus.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation draws on the theory of change of the related logic model and will include baseline and longitudinal measurement of key indicators of success.</li> <li>• Baseline measurements of key outputs and outcomes listed above will follow initiative approval and will address indicators including transit ridership and financial investment levels in transit. In these areas, NYSERDA will first utilize existing information and will fill gaps in information as needed and feasible for appropriate baselining.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change will occur once the initiative is underway. Sources of data include public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul> <p><b><u>Impact Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• A broad demonstration project impact evaluation will include projects from this area and will examine benefits of demonstration projects, rate of and success factors associated with replication, and benefits of replication projects. Cost savings will be quantified as part of this study.</li> </ul>
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# Appendix A – Logic Models



# LOGIC MODEL: Public Transportation and Electrified Rail



# Appendix B – Investment Plan Review Supplement<sup>1</sup>

## Electric Vehicles Rebate

### Results to Date – Metrics

The Electric Vehicle Rebate initiative benefit metrics are currently lagging behind cumulative current targets through Q2 2017, ranging from 36% to 48% of the various targets. This lag can be attributed to a later than anticipated program launch and greater than expected EV purchases occurring without applying for the rebate. Additional information can be found in NYSEERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2020)	% of Total Target through Initiative Completion (2020)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	57,791	57,791	-	57,791	125,000	46%	1,430,000	4%
	MMBtu Lifetime	-	577,912	577,912	-	577,912	1,250,000	46%	14,300,000	4%
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	Annual Tons	-	2,384	2,384	-	2,384	6,700	36%	76,730	3%
	Lifetime Tons	-	23,844	23,844	-	23,844	67,000	36%	767,300	3%
Customer Bill Savings (millions)	Annual Dollars	-	\$0.04	\$0.04	-	\$0.04	*	-	*	-
	Lifetime Dollars	-	\$0.36	\$0.36	-	\$0.36	*	-	*	-
Private Investment (millions)	Dollars	-	\$43.33	\$43.33	-	\$43.33	\$90.00	48%	\$1,027.00	4%
Participants	Participants	-	1,238	1,238	-	1,238	2,563	48%	29,250	4%

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSEERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

	Indicators	Baseline	2019 Target	2022 Target	June 2017 Actual <sup>2</sup>
			(Cumulative)	(Cumulative)	(Cumulative)
Activity/Outputs	# of rebates issued	N/A	38,000	46,000	1,248
	% of rebate recipients completing follow-up surveys	N/A	75%	80%	TBD

<sup>1</sup> As this report includes performance through Q2 2017 and the Public Transportation and Electrified Rail Initiative was filed in Q3 2017, that initiative is not included herein.

<sup>2</sup> Outputs with “TBD” in the June 2017 Actual column were not yet measured as of the end of June but will have progress included in future reporting.



### Performance Against Key Milestones

The Electric Vehicle Rebate initiative has achieved its milestone of program launch. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
✓	2016	EV Rebate Program Launch.

### Plan for Continuation/Modification/Termination

The Electric Vehicles Rebate initiative was updated in June 2017 to provide current data on the number of EVs and charging stations in the baseline data in the initiative specific metrics table. The timing of Milestone 1 was also updated to the reflect actual launch date of the EV Rebate Program, as well as the timing of the committed budget and direct benefits to account for the later than anticipated launch of the EV Rebate Program. Following these modifications, the initiative continued as planned. NYSERDA will monitor the metrics progress to determine if it continues to be impacted by EV purchases without rebates. If warranted, the metrics values will be updated in the next annual review.

## Electric Vehicles Innovation

### Results to Date – Metrics

The Electric Vehicle Innovation Initiative has not yet made progress toward its private investment and participant enrollment targets as the program is anticipated to launch in Q3 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2021)	% of Total Target through Initiative Completion (2021)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	*	-	*	-
	Lifetime Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	*	-	*	-
	Lifetime Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Dollars	-	-	-	-	-	\$3.70	-	\$31.70	-
Participants	Participants	-	-	-	-	-	6	-	33	-

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA's current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	2022 Target	June 2017 Actual
		(Cumulative)	(Cumulative)	(Cumulative)
Number of product development and demonstration projects initiated	0	21	33	0
Number of product development and demonstration companies supported	0	15	22	0
Number of industry stakeholders engaged in consumer awareness programs	0	20	50	6
Number of aggregate charging station purchase participants	0	150	400	0

### Performance Against Key Milestones

The Electric Vehicles Innovation initiative has not yet achieved any of its current milestones as the program has not yet launched. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
	2017	Support the launch of new business offerings for charging station leasing.
	2017	Issue first competitive solicitation for the development and demonstration of EV-enabling technologies.
	2017	Contract with projects awarded in first competitive solicitation for the development and demonstration of EV-enabling technologies.
	2017	Initiate aggregation pilots for EVs and EV charging stations, which will begin engaging customers and facilitating initial bulk purchases.

### Plan for Continuation/Modification/Termination

The Electric Vehicle Innovation initiative has not yet launched, and as such there are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative for progress against 2017 metrics, outputs, and milestones following program launch to determine if any changes are needed.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Agriculture

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan: Agriculture Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
August 18, 2016	Original Issue	Original Issue
November 1, 2017	Filed Advancing Agricultural Energy Technologies initiative	Multiple

## 14 Agriculture

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NYSERDA seeks to address energy efficiency opportunities in the agricultural sector that focus on providing trusted information and build on strengthening relationships with farm partners. To overcome barriers that are impeding progress, the initiatives will seek to address the risk aversion experienced by the owners and operators that energy efficiency could interrupt their agricultural business and processes, lack of trust in the energy efficiency technology to deliver the intended benefits, lack of in-house expertise or time to dedicate to energy improvements, and cost and finance sensitivity.

The first initiative described in this Chapter is Greenhouse Lighting and Systems Engineering, which aims to target energy-related improvements in greenhouse system operations by optimizing energy efficiency, crop yield and quality. The goal will be to establish a Consortium that will become financially self-sufficient by bringing together academia and marketplace knowledge and experience to develop new control systems, lighting products and technical services to increase the adoption of the new technologies in the greenhouse industry.

The second initiative described in this Chapter is Advancing Agriculture Energy Technologies. The goal will be to demonstrate advanced, underused, or emerging technologies or processes to illustrate and document the value proposition of technologies for targeted energy use on farms.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

# 14.1 2030 Greenhouse Lighting and Systems Engineering

## 14.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Overall interest from consumers in locally-grown food is increasing, and to support this demand in New York, with its relatively short growing season, greenhouses are growing rapidly. The United States Department of Agriculture (USDA) census data<sup>1</sup> shows lettuce and tomato, two profitable crops that are well-suited for greenhouse production, growing in New York 10.6% per year from 2007 to 2012. Since 2012, continued rapid growth in greenhouse product value, acreage, year-round usage and control techniques has been observed, leading to newer greenhouses producing more than twice the yields per acre of low-tech greenhouses.</li> <li>• Greenhouses are more electricity-intensive (electricity use per square foot) overall than other buildings, including food service buildings and hospitals. Much of this is due to lighting. A typical lighting power density for commercial buildings is 1 watt per square foot, but a lettuce greenhouse in the New York climate uses more than ten times that number. A conservative estimate of the electricity used just for lighting in existing New York State greenhouses producing lettuce and tomatoes in 2015 is 313 GWH per year, which equates to 164,662 metric tons of CO<sub>2</sub> annually based on New York’s power generation mix.</li> <li>• Light-emitting diodes (LEDs), unlike traditional high-pressure sodium lighting, could be manufactured to emit a variety of light spectra to meet the needs of specific crops. With the right control systems, even current LEDs marketed to greenhouses can be dimmed, pulsed, and controlled, allowing an unprecedented level of optimization and integration of greenhouse management systems, leading to large energy savings.</li> <li>• More advanced control systems for greenhouses also regulate ventilation, lighting, and CO<sub>2</sub> supplementation. Electricity savings of 70 to 86% (depending on New York State climate zone) are possible through synergistic control of these parameters.</li> <li>• Though potential energy savings are very high, a market gap exists because the market players do not understand the potential opportunity. Growers do not have the expertise to design specialized control systems, nor can the lighting industry do it alone because they do not have the deep and specialized understanding in plant physiology and overall greenhouse systems that is needed to optimize crop production and energy usage. This is why packaged solutions for greenhouse production and energy-use optimization do not exist, system-wide demonstrations have not yet occurred at scale, and teams with cross-cutting expertise have not formed on their own.</li> <li>• The Consortium will develop progressively more advanced control systems that treat greenhouse operations as systems, make market players aware of these systems, develop cross-cutting expertise, and provide training for teams of service providers so that market adoption can occur.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• To facilitate realization of the energy savings potential and address market barriers, NYSERDA will support formation of a Greenhouse Lighting and Systems Engineering (GLASE) Consortium that will synergistically target energy-related improvements to greenhouse system operations (e.g. integrated control of ventilation, lighting, humidity and CO<sub>2</sub> supplementation).</li> <li>• Funding will be provided to Cornell University and Rensselaer Polytechnic Institute (RPI) as core members to advance the Consortium, which will include further membership with the full range of required expertise, including plant biologists,</li> </ul>

<sup>1</sup> Based on New York State-specific data from USDA NAFF Census data 2007-2012, published in 2014

	<p>agricultural engineers, computer software control engineers, and lighting engineers, who together represent world-class expertise on greenhouse operation. Past work performed by core members in this area (including a portfolio of existing patents and proprietary data) forms an in-depth body of knowledge and experience.</p> <ul style="list-style-type: none"> <li>• The Consortium will develop new control systems, lighting products, and technical services, and conduct iterative field testing to demonstrate and refine the systems and products in real-world settings.</li> <li>• Deployment of new lighting products will be pursued through manufacturers in the Consortium, working closely with plant biologists in the Consortium. Manufacturers will also work closely with other Consortium members versed in systems integration and greenhouse-specific engineering, who will deploy control systems and provide ongoing technical services to greenhouses.</li> <li>• The Consortium will achieve the best possible uptake and deployment of solutions by using the core members’ strong industry connections across the LED lighting and greenhouse supply chain with manufacturers, technical service providers, researchers, and through collaboration with specific adoption-ready growers.</li> <li>• NYSERDA will also coordinate with the Consortium to provide NYSERDA-based technical service assistance to growers, and work with NYSERDA outreach contractors to assist in information dissemination.</li> <li>• Successful integration of synergistic greenhouse operations will decrease operating expenses and optimize production, and in so doing increase revenues for New York growers.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Agriculture - GLASE,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• The goal of this initiative is to establish a financially self-sufficient GLASE Consortium to develop new control systems and lighting technologies for greenhouses, and through an aggressive and targeted outreach campaign involving Consortium and industry partners, facilitate the uptake of the new technologies so the benefits may be realized. The GLASE Consortium aims to transform lighting and systems management in the rapidly-growing greenhouse industry by optimizing energy efficiency, crop yield and quality.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<p>This strategy contributes to the goals of the New York State Energy Plan and Clean Energy Standard (CES), including greenhouse gas emission reductions, statewide energy efficiency improvements and growth in the clean energy economy.</p> <p>By making greenhouses more efficient, the initiative will mitigate the increase in electricity demand resulting from New York’s growing greenhouse industry. Through use of better control systems, seasonal greenhouses may also extend their growing season in the spring and fall, or even extend their operations to year-round, which contributes positively to local load factors. These attributes of the program support Renewable Energy Vision (REV) concepts regarding electricity demand and load factors.</p>

14.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market for this initiative is greenhouses and vertical farms <sup>2</sup> , with an initial focus on the fastest growing vegetable and other food crop markets in New York State.
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Botanists with demonstrated expertise in greenhouse and vertical farm crop production, particularly hydroponic production of vegetables</li> </ul>

<sup>2</sup> A vertical farm is a greenhouse system where trays of crops are stacked vertically to maximize production per square foot. Unlike greenhouses, all lighting is artificial; there is no sunlight.



	<ul style="list-style-type: none"> <li>• Engineers with demonstrated success in technologies that integrate greenhouse operating systems, sensors and software, including design and modulation</li> <li>• Lighting designing and manufacturing companies</li> <li>• Potential manufacturers of improved greenhouse control and lighting products</li> <li>• Greenhouse growers</li> <li>• Supermarket produce buyers</li> <li>• Agriculture and lighting engineers</li> <li>• Controlled Environment Agriculture researchers</li> <li>• New York State Department of Agriculture and Markets</li> <li>• Cooperative Extension agents</li> <li>• Small lighting sales companies</li> <li>• Horticulture suppliers</li> <li>• Energy Auditors</li> <li>• Academic and research organizations</li> <li>• Trade associations</li> </ul>
<p><b>Market Readiness</b></p>	<ul style="list-style-type: none"> <li>• The Consortium concept was an outgrowth of prior work sponsored by NYSERDA. In one prior project using commercially-available lighting in an operational greenhouse, the traditional LED luminaires performed below the industry standard: high-pressure sodium luminaires. The LEDs did not meet general manufacturer claims for light intensities or energy efficiencies, nor were their spectra optimized for plant growth. Other NYSERDA work led to development of a lighting software management system and a “virtual grower” greenhouse simulator. In still other work, significant energy savings were achieved by sensing the physiological state of the plant and controlling light delivery. This led to the concept of the need for a consortium that could be used to help specify, develop, demonstrate, and tailor systems to individual plant species, which vary widely in their specific needs.</li> <li>• This would allow LEDs to provide added value to the grower by not only meeting basic grower expectations for energy efficiency and light intensity, but also by providing improved plant responses, including yield and morphology.</li> <li>• The type and level of control of greenhouse operations has only recently been made possible by the unique attributes of LED lighting. However, to fully take advantage of the opportunity for energy savings, improved LEDs must be paired with improved control systems. Advanced greenhouse controls have the potential to lead to vast savings in greenhouse electricity usage. The potential for electricity reduction is conservatively estimated at 70-86% per greenhouse, (depending on the New York climate zone) leading to an estimated 1,915,000 metric tons of greenhouse gas savings by 2030.</li> <li>• If New York’s greenhouse acreage for lettuce and tomatoes grew by a conservative 10.6% per year, it would reach an estimated \$567 million by 2030 (in 2015 dollars). This would represent a 56.7% penetration of the \$1 billion+ New York market for lettuce and tomatoes alone. There is realistic potential for expansion beyond 2030 as these wholesale market values do not include other vegetables and crops.</li> <li>• NYSERDA has spent multiple years investigating the technologies and opportunities unique to the greenhouse market sector, and has fostered relationships with key players to bring a consortium of plant scientists and lighting technology and control specialists together. NYSERDA will use its deep understanding of the issues to help market players understand the large potential benefits that greenhouse systems can provide, and to help develop improved systems that synergistically control electricity use. NYSERDA will also use its existing relationships with market players to bring disparate parties together to form teams of cross-cutting expertise.</li> </ul>
<p><b>Customer Value</b></p>	<ul style="list-style-type: none"> <li>• A successful effort would lead to an overall reduction of 10-16% in total greenhouse operating costs, including electricity and other energy costs (heating) as well as costs for labor, supplies, packaging, delivery, insurance, etc. Greenhouses operate in</li> </ul>

	<p>a highly competitive environment with tight profit margins, and they use more electricity per square foot than other applications (e.g., food service, hospitals, offices, hotels, or schools). One type of greenhouse, a plant factory, uses nearly as much electricity on a watt per square foot basis as data centers, which are among the highest users of electricity. Effective management of electricity expenditures is crucial to remaining profitable and competitive, particularly for this energy-intensive sector. Payback for improved systems ranges from one to three years.</p> <ul style="list-style-type: none"> <li>• It is anticipated benefits to growers will begin to accrue in the first year of the seven-year program with commercial sales of the first generation of control system products. Electricity reductions from lighting alone are targeted at 50% of a greenhouse's current electricity usage. Electricity reductions for overall systems that control not only lighting but also humidity, ventilation and CO<sub>2</sub> levels, are targeted at 70-86% less electricity usage per greenhouse by year seven.</li> <li>• The energy efficiency and crop productivity improvements (shorter growth cycles) resulting from advances in greenhouse systems management will be quantified as avoided production of greenhouse gases (metric tons of CO<sub>2</sub>) and electricity consumption per unit of crop growth.</li> <li>• An additional benefit is expected through growth of new business opportunities in New York State for manufacturing the luminaires to a global greenhouse industry.</li> <li>• Benefits to the consumer that result from production system improvements include fresher, more local products with longer shelf life and improved nutritional value.</li> <li>• If the 10.6% annual growth in lettuce and tomato greenhouse space were to continue, lettuce and tomato crops produced in New York greenhouses would reach a wholesale market value of \$567 million (in 2015 dollars) by 2030. The wholesale value of all lettuce and tomatoes consumed in New York is currently more than \$1 billion. In addition to lettuce and tomatoes, there are many other crops (vegetables, flowers, herbs, berries, etc.) that could be grown in greenhouses, resulting in a total wholesale value for all crops much greater than \$1 billion.</li> </ul>
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### 14.1.3 Stakeholder/Market Engagement

<p><b>Stakeholder/ Market Engagement and Customer Discovery</b></p>	<ul style="list-style-type: none"> <li>• For more than three years, NYSERDA has been collaborating with Cornell and RPI to develop and refine this Consortium concept. NYSERDA has vetted the approach, market assumptions, technology readiness levels, estimates of energy and GHG savings, financial model, and business plan to self-sufficiency. The analysis concluded that there is a high level of technical readiness for the concept. The product development is maturing; the time to market for each individual product has been estimated, and plans are developed so that different products roll out during the seven years that NYSERDA will support the Consortium.</li> <li>• Marketing to potential GLASE Consortium participants will begin with the more than 30 stakeholders, including many important major market players, who have already signed letters of intent expressing interest in joining the GLASE Consortium.</li> <li>• The market for greenhouse system control products manufactured in New York is international and includes many well-known traditional lighting companies. Expansion of the GLASE Consortium to future members will be part of Consortium activities.</li> <li>• Existing greenhouse suppliers have a large network of online and print trade publications which will also be used for marketing. The Consortium will coordinate with the Controlled Environment Agriculture (CEA) Advisory Board, New York's newly-formed greenhouse stakeholder group.</li> <li>• Manufacturing partners will hold an advisory capacity in the Consortium.</li> <li>• Greenhouse growers will also be fully engaged as advisors and as demonstration sites.</li> </ul>
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	<ul style="list-style-type: none"> <li>• NYSERDA staff will also work with New York State Department of Agriculture &amp; Markets and Cornell Cooperative Extension to connect to the in-state market.</li> <li>• NYSERDA will also utilize the Clean Energy Advisory Council (CEAC) as a way to engage with stakeholders, as appropriate.<sup>3</sup></li> </ul>
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#### 14.1.4 Theory of Change

<b>Technology Opportunities and Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• <b>Packaged solutions for greenhouse production and energy-use optimization do not exist.</b> While there are LED technologies that have the potential to improve the energy efficiency and therefore energy costs of greenhouses, they are not tailored to the necessary conditions for enhanced crop production. For example, lighting manufacturers do not specialize in plant physiology, but growers need to synergistically optimize not only lighting but also CO<sub>2</sub>, humidity, and ventilation needs. The Consortium will address this by documenting potential and trending market size, disseminating information, and working with key players to implement solutions.</li> <li>• <b>The full potential of a system-wide approach to greenhouse control has not been fully demonstrated at scale,</b> and market players are not yet aware of the large potential for benefits that greenhouse systems can provide. A major goal of the Consortium is to promote a system-wide approach to greenhouse operation.</li> <li>• <b>The industry currently lacks cross-cutting expertise in greenhouse system solutions.</b> More service provider teams will be needed in the greenhouse industry who can integrate lighting with the other parameters to optimize plant health and energy use. The Consortium can help bring these partners together and train them in specialized applications.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If greenhouse operators implement innovations that improve and customize their ability to control lighting, ventilation and CO<sub>2</sub> systems for their specific crops, then they will save 70 to 86% of their electricity costs, depending on their New York climate zone.</li> <li>• If influential manufacturers and end-users are involved in the Consortium, then they will participate as commercialization partners and demonstration sites that accelerate adoption of new innovations beyond the 18 acres of greenhouses targeted for 2019.</li> <li>• If the GLASE Consortium is successful in disseminating information, then paid memberships will occur, resulting in a financially self-sustaining Consortium that continues after the NYSERDA-funded milestones end.</li> <li>• If the GLASE Consortium is successful in forming and training teams with cross-cutting expertise in specialized applications of greenhouse control systems, then those teams will be able to assist growers in implementation of packaged solutions that optimize energy usage.</li> </ul>
<b>Activities</b>	<p>NYSERDA will contract with Cornell University and RPI to form and advance the GLASE Consortium. In doing so, NYSERDA will:</p> <ul style="list-style-type: none"> <li>• <b>Form and Grow Consortium.</b> Assist Consortium with the design and organizational structure, and draft documents. Monitor Consortium activities, including: formalizing relationships with those who have expressed interest in joining the Consortium and delineating specific activities and roles for each; recruiting new members; targeting influential large manufacturers of luminaires; in order to achieve financial sustainability, finalizing the business model and growing Consortium membership to balance costs and income to achieve financial self-</li> </ul>

<sup>3</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

	<p>sustainability after year seven; including mechanisms to support partnerships, membership fees, fee-based trainings and services, and royalties and licenses of patentable products.</p> <ul style="list-style-type: none"> <li>• <b>Establish Scientific Advisory Panel.</b> Establish a panel within the Consortium. Also work with existing advisory panels in New York’s newly-formed Controlled Environment Agriculture trade group<sup>4</sup>, as appropriate, to identify areas of need/opportunity, vet potential solutions, offer guidance on optimal path to market, provide a source of technical and market intelligence, and serve as a pool of potential demonstration partners.</li> <li>• <b>Technical Activities.</b> Monitor work of the Consortium as it develops new lighting products as well as new control strategies and services for light, CO<sub>2</sub> and humidity. Work is anticipated to include: optimizing lighting by automating dimming, pulse-width modulation, and integrating combinations of appropriate wavelengths for optimal crop growth; use of CO<sub>2</sub> enhancement in greenhouses; investigation of LED use to alter plant physiology and morphology as appropriate to increase yield or the production of chemical compounds that increase crop value; design of novel prototype luminaires for greenhouses; and development of software that includes whole greenhouse systems management integrated with light and CO<sub>2</sub> regulation. New products will be tested in small and large pilot settings, and provisional patents will be filed.</li> <li>• <b>Deployment Support Activities.</b> Assist the Consortium with the continual education and outreach to growers and the lighting industry, specifically targeting companies within New York State to assemble and market novel luminaires. Fact sheets, case studies and social media products will publicize the results of the program to growers, lighting manufacturers and others, and highlight participation by various stakeholders. This information will help Consortium members and others better understand best practices and the economics of improved control systems, as well as assist with new member recruitment. Trade association meetings and industry conferences targeting the greenhouse industry will be used to network with key market constituents. Training will be provided to help service providers target the specialized needs of growers. NYSERDA will utilize its Environmental Research Program’s Science Advisors for agriculture to provide guidance on market uptake. NYSERDA and the Consortium will work closely with Cornell Cooperative Extension, an experienced provider of assistance to farmers, to disseminate information. NYSERDA will also coordinate this effort with the existing NYSERDA Agricultural Energy Audit program, which performs energy audits for farms. The Consortium will develop and maintain a data warehouse to assist in data dissemination, as well as survey members and non-members to track market adoption rates, associated savings, and product lifespans.</li> </ul>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2016)</u></p> <ul style="list-style-type: none"> <li>• Contract with core Consortium members.</li> </ul> <p><u>Milestone 2 (2016)</u></p> <ul style="list-style-type: none"> <li>• Review and approve Scientific Advisory Panel structure.</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>• Review and approve Consortium business plan to attain financial self-sustainability in 2023.</li> </ul>

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<sup>4</sup> The Controlled Environment Agriculture trade group is a voluntary information exchange organization with a broad mission of promoting opportunities in controlled environment agriculture.

	<p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• Monitor small (6,000 square feet) pilot demonstration of a basic light and shade control system.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>• Publish case study of demonstration.</li> </ul> <p><u>Milestone 6 (2019)</u></p> <ul style="list-style-type: none"> <li>• Monitor small (6,000 square feet) pilot demonstration of CO<sub>2</sub> supplementation integrated with the light and shade control system.</li> </ul> <p><u>Milestone 7 (2019)</u></p> <ul style="list-style-type: none"> <li>• Monitor large (20,000 square feet) pilot demonstration of a basic light and shade control system.</li> </ul> <p><u>Milestone 8 (2019)</u></p> <ul style="list-style-type: none"> <li>• Publish case study of demonstrations.</li> </ul> <p><u>Milestone 9 (2020)</u></p> <ul style="list-style-type: none"> <li>• Monitor small (6,000 square feet) pilot demonstration of efficient LED lights integrated with the CO<sub>2</sub> supplementation and light and shade control system.</li> </ul> <p><u>Milestone 10 (2020)</u></p> <ul style="list-style-type: none"> <li>• Monitor large (20,000 square feet) pilot demonstration of CO<sub>2</sub> supplementation integrated with the light and shade control system.</li> </ul> <p><u>Milestone 11 (2020)</u></p> <ul style="list-style-type: none"> <li>• Publish case study of demonstrations.</li> </ul> <p><u>Milestone 12 (2021)</u></p> <ul style="list-style-type: none"> <li>• Monitor large (20,000 square feet) pilot demonstration of efficient LED lights integrated with the CO<sub>2</sub> supplementation and light and shade control system.</li> </ul> <p><u>Milestone 13 (2021)</u></p> <ul style="list-style-type: none"> <li>• Publish case study of demonstration.</li> </ul> <p><u>Milestone 14 (2021)</u></p> <ul style="list-style-type: none"> <li>• Formal training offered to service providers.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• Availability of products in the marketplace that can reduce electricity costs (and concomitant carbon emissions). Savings in an individual greenhouse up to 70 to 86% (depending on New York climate zone) are targeted.</li> <li>• The Consortium is self-funding through partnerships, membership fees, fee-based trainings and services, and royalties and licenses of patentable products.</li> <li>• Demonstrated electricity savings are achieved through synergistic solutions for greenhouse systems. Up to four hardware and software products and up to three services will be commercialized at program’s end. There are approximately eight provisional patents filed by the Consortium.</li> <li>• In addition to the direct savings from the pilots, there are indirect savings resulting from market penetration of improved control systems and lighting technologies in New York tomato and lettuce greenhouse acreage of at least 25%.</li> </ul>

### 14.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>Utilities may be able to identify specific greenhouses with high energy bills or specific geographic areas with large loads and work collaboratively with the Consortium to address those needs.</li> <li>NYSERDA will also take advantage of the CEAC Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>Utilities currently do not have similar interventions specifically targeted at this market segment, however customers may be able to take advantage of utility incentive programs for energy efficiency improvements at commercial and industrial facilities.</li> </ul>

### 14.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

NYSERDA’s commitment of funds in this case is to a Consortium who will distribute assistance and information to current and potential participants on NYSERDA’s behalf. These activities will occur over a longer period of time than is evident from the committed budget and benefits shown here. NYSERDA will continually monitor performance and report actual progress.

**Table 1: Annual Innovation & Research Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Total</b>
Research and Technology Studies/Development/Demos	\$4,250,000	-	-	\$4,250,000
Implementation Support	\$450,000	-	-	\$450,000
Tools, Training, and Replication	\$300,000	-	-	\$300,000
Total	\$5,000,000	-	-	\$5,000,000

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
Total	5%	20%	20%	19%	17%	11%	6%	3%	100%

### 14.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market

conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

	<b>Indicators<sup>5</sup></b>	<b>Baseline (Before/Current)</b>	<b>2019 (Cumulative)</b>	<b>2022 (Cumulative)</b>
<b>Activity/ Outputs</b>	Greenhouse area used for pilot testing	0	26,000 square feet	26,000 square feet
	Number of paid Consortium memberships	0	20	25
	Number of products developed	0	2	4
	Number of services developed	0	2	3
	Number of product variations tested in pilot systems	0	5	8
	Number of case studies developed	0	2	4
<b>Outcomes</b>	Average market penetration of improved technologies in New York greenhouse acreage in the lettuce and tomato sectors	0%	22%	25%
	Number of provisional patents filed	0	2	8
	Reduction in greenhouse electricity use in New York	0	Up to 50% reduced electricity usage per greenhouse, depending on NYS climate zone	Up to 70-86% reduced electricity usage per greenhouse, depending on NYS climate zone
	Number of acres of greenhouses in New York (beyond pilot participants) adopting the improved technologies	0	18	23
	Consortium remains viable after NYSERDA milestones are completed	n/a		Projections for Year 8 financials show positive cash flow. Consortium has 25-30 paying members.

<sup>5</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 4. Direct Impacts<sup>6</sup>**

Primary Metrics <sup>7</sup>		2016	2017	2018	TOTAL
Energy Efficiency	MWh Annual	3,470	-	-	3,470
	MWh Lifetime	34,700	-	-	34,700
	MMBTu Annual	-	-	-	-
	MMBTU Lifetime	-	-	-	-
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		1,830	-	-	1,830
CO2e Emission Reduction (metric tons) Lifetime		18,300	-	-	18,300
Customer Bill Savings Annual (\$ million)		\$0.29	-	-	\$0.29
Customer Bill Savings Lifetime (\$ million)		\$2.92	-	-	\$2.92
Private Investment (\$ million)		\$9.46	-	-	\$9.46

**Table 5. Annual Projected Initiative Participation**

	2016	2017	2018	2019	2020	Total
Participants (Paid Consortium members)	0	5	10	5	5	25

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. Many interrelated factors impacting indirect benefits (e.g., potential electricity reduction, growth in greenhouse acreage in NY, or market penetration of improved technologies) may vary from projected values. Thus, rather than claim the full and very significant amount of indirect benefits that NYSERDA believes may accrue from this investment, as discussed on other sections of this investment plan, NYSERDA has applied some additional conservatism to the indirect benefit targets in Table 6. Actual indirect benefits may exceed targets shown in Table 6. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The

<sup>6</sup> NYSERDA's commitment of funds in this case is to an implementor who will put the funds to use on NYSERDA's behalf over a longer period of time (seven years) than is evident from the committed budget and benefits shown in this plan (benefits will be acquired over a period of 10 years). NYSERDA will monitor performance and report actual progress.

<sup>7</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 10-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer bill savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.



values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 6. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	112,000	278,000	364,000
	MMBtu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		59,000	146,000	191,000

#### 14.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>This initiative is not being delivered on a fuel neutral basis. The focus is electric lighting, ventilation and controls.</li> </ul>
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#### 14.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>Routine reporting on energy savings to date, and progress against identified annual energy savings goals will be collected and reviewed. Private sector and federal funding leverage will be evaluated.</li> <li>The Consortium operations and success, including its ongoing research, will be evaluated annually together with input from the advisory panel with regard to set goals, metrics, outputs and outcomes. Redirecting (as needed) will ensure continued progress against goals.</li> <li>Annually assess mix of market participants in the Consortium and determine if outreach strategies have to be updated to attract more members from specific market sectors.</li> <li>Survey growers and manufacturers on barriers, perceived benefits and their willingness to participate in the Consortium and/or adopt new products or technologies.</li> <li>Annually gather market characterization data from Controlled Environment Agriculture trade association and USDA, as available.</li> <li>Track over time the number of non-Consortium members participating in outreach activities.</li> </ul> <p><b><u>Agriculture – GLASE Strategy Measurement &amp; Verification</u></b></p> <ul style="list-style-type: none"> <li>As part of the implementation strategy, all pilot sites will undergo intense measurement and verification of electricity savings, which will be used to calculate CO<sub>2</sub> savings. Data will be analyzed to increase the understanding of product performance and iteratively improve greenhouse control systems.</li> </ul>
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**Market Evaluation**

- Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of market success.
- Baseline measurements of key performance indicators will occur within one year of strategy approval, including current market penetration of control systems in greenhouses, current product lifespans and current crop production yields.
- Regular (e.g., annual) updates to key performance indicators and measurement of market change, including level of market adoption (replication into non-pilot facilities), and the associated benefits.
- Sources of data will include pilot data, public and commercially available data, data from New York's Controlled Environment Agriculture trade association, and primary data collection through surveys of key market actors.

**Impact Evaluation/Field Verification**

- As noted above, the implementation of pilots will include intense measurement and verification of electricity savings, which will be used to calculate CO<sub>2</sub> savings. Independent impact evaluation/field verification will rely on measurement and verification conducted as part of the pilot activities and will verify the results of this analysis as needed.
- Replication of improved technologies into other greenhouses in New York State, beyond pilot participants, and the resultant energy benefits will also be subject to independent impact evaluation review. Methodology will be determined, as appropriate, based on the level of adoption and technologies involved.
- Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.

## 14.2 Advancing Agricultural Energy Technologies

### 14.2.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• The agriculture sector (comprised of animal farms and on-farm crop production – herein referred to as “farms”), with its over 35,000 farms, contributes \$5.4 billion annually to the State’s economy. These facilities also account for approximately 7.2 million acres of farmland, roughly one-quarter of the State’s land area.<sup>8</sup></li> <li>• Total energy use on farms accounts for approximately 9% of farm expenses, or approximately \$450 million in annual expenses. Total energy costs vary from farm to farm. Approximately 45% of dairy farms spend between \$5,000 and \$25,000 annually on utilities, which includes electricity, phone, internet and water, while roughly 10% spend greater than \$25,000.<sup>9</sup></li> <li>• The agriculture sector operates under tight margins and farms try to reduce operating expenses to maintain profitability and long-term farm viability. While energy efficiency projects represent a strong cost saving opportunity, identifying what improvements could lower utility expenses, as well as how and where to obtain the appropriate level of technical and financial assistance, can be onerous for farms to navigate.</li> <li>• The Clean Energy for Agriculture Task Force (CEATF), created by Governor Andrew Cuomo and comprised of leading agricultural organizations, farms, universities, individuals, and state agencies active in the State’s agriculture sector, developed a Strategic Plan that identified numerous strategies to address barriers and assist farms.<sup>10</sup> This initiative will address the Technology Advancement and Research and Development Opportunities for Clean Energy and Managing Greenhouse Gas Impacts strategy by implementing a process to identify, highlight, and evaluate barriers and opportunities for technology advancement for clean energy and GHG reduction in agricultural applications.</li> <li>• NYSERDA currently offers assistance to the agriculture sector through the following initiatives: the Agriculture Energy Audit Program and Anaerobic Digester Gas to Electricity Program in the Resource Acquisition chapter, the Greenhouse Lighting and Systems Engineering (GLASE) Consortium approved in the Agriculture Chapter, and a revised Agriculture Energy Audit component of FlexTech, that will be issued in 2019 via the Multi-Sector Solutions Chapter, as well as the development and distribution of an agriculture best practice guide.</li> </ul>
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<sup>8</sup> United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) census data for 2012.

<sup>9</sup> Ibid

<sup>10</sup> Clean Energy for Agriculture Task Force (CEATF) Strategic Plan, prepared by Energy & Resource Solutions, March 2017 (nyserderda.ny.gov/CEATF-Plan)

<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• NYSERDA will identify and demonstrate advanced, underused, or emerging technologies and processes to determine those that provide cost-effective energy and process efficiency.<sup>11</sup> Underused or emerging technologies are defined as commercially available technologies that are not currently standard practices at farms in NYS.</li> <li>• NYSERDA will collect, analyze, and verify demonstration site data to support the business case for the technologies and share the information with the market. NYSERDA will use existing resources that are trusted in the agricultural community (e.g., Cornell Cooperative Extension), as well as webinars, workshops, and events, to disseminate the information.</li> <li>• For a visual representation of this strategy, please refer to the flow chart entitled “Logic Model: Advancing Agricultural Energy Technologies,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Increase the number of farms adopting underused or emerging energy efficiency technologies.</li> <li>• Increasing communication and market awareness of clean energy technologies.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	This strategy contributes to the goals of the New York State Energy Plan and Clean Energy Standard (CES), including 40% statewide greenhouse gas emission reductions and 600 TBTU of statewide energy efficiency improvements. The 2015 New York State Energy Plan highlights the importance of energy efficiency and calls on NYSERDA to “seek to address the diverse set of remaining barriers with new programs and strategies that unlock the potential of energy efficiency to reduce operating costs, spur investment, and create jobs throughout the State”.

14.2.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market for this initiative is all New York State farms, with an initial focus on higher energy consuming sub-sectors such as dairy farms.
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Farm equipment vendors and suppliers</li> <li>• Farm owners</li> <li>• Agricultural industry consultants and partners</li> <li>• Soil and Water Districts</li> <li>• County Agricultural Business Centers</li> <li>• New York State Department of Agriculture and Markets</li> <li>• New York Farm Bureau</li> <li>• United States Department of Agriculture</li> <li>• Cornell Cooperative Extension</li> <li>• Clean Energy for Agricultural Task Force</li> <li>• New York State investor-owned utilities</li> <li>• Energy Auditors</li> <li>• Trade Associations</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• In the past, NYSERDA has demonstrated what were, at the time, advanced, underused, or emerging energy-efficiency technologies for dairy farms, which went on to become best practices. The agriculture sector has been more willing</li> </ul>

<sup>11</sup> Some potential technologies, such as non-conventional cow cooling technologies and ozone laundry, are identified in “Energy Efficiency in New York State Agriculture: Summary of Energy Efficiency Programs and Research Opportunities”, NYSERDA Report June 2015. (<https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Other-Technical-Reports/energy-efficiency-in-new-york-state-agriculture.pdf>) Technologies will not be limited to those identified in the study, it is anticipated that other technologies will be identified through market participant outreach.

	<p>to install new technologies when their peers and neighbor have had successful demonstrations, making peer-to-peer sharing a valuable tool for farm uptake of energy efficiency technologies.</p> <ul style="list-style-type: none"> <li>Farms and farm supply vendors have indicated, through interviews and feedback on past NYSERDA programs, that providing unbiased information, case studies and illustrating energy efficiency opportunities to the farm sector through a variety of trusted entities and approaches would provide assurance to pursue energy improvements. Farms suggest that case studies highlighting effective best practices and technologies are a successful way to encourage implementation.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>Provision of straightforward technical and financial information about advanced, underused, or emerging energy-efficiency technologies, including the cost to implement, potential savings, payback, and other cost benefits, assist farms in making investment decisions which can provide energy bill savings.</li> <li>Reduced customer acquisition time and costs for service providers and equipment suppliers make it easier to sell new technologies, facilitating market adoption.</li> </ul>

14.2.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>Through the CEATF's working groups, NYSERDA has investigated and obtained marketplace feedback confirming the value of and need for assisting farms in improving energy efficiency, making clean energy decisions and advancing technologies.<sup>12</sup></li> </ul>
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14.2.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li><b>Seasonality.</b> The timeframe to provide information to farms to make energy efficiency improvements often competes with other priorities. Working with the agricultural community and leveraging the opportune times to deliver workshops, webinars and other outreach will improve the chance of obtaining the businesses' attention, increasing the likelihood that an energy efficiency project will move forward.</li> <li><b>Lack of understanding of the benefits of energy and process efficiency.</b> The benefits of energy and process efficiency, particularly for emerging or underused technologies, are often not made clear to the broader farm community. Delivering reliable information on the technology and benefits will enable businesses to understand all the potential benefits various energy efficiency improvements can deliver, making them more apt to adopt energy improvements.</li> <li><b>Limited capital for investment.</b> Given the tight margins that farms operate under, farms are constantly making decisions on where to use their limited financial resources. Providing necessary technical information that includes financial criteria such as payback can assist farms in their decision-making process to invest in energy efficient technologies.</li> </ul>
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<sup>12</sup> The working groups consists of NYSERDA, several NYS farms, Cornell University, Cornell Cooperative Extension, New York State Department of Agriculture & Markets, New York State Department of Environmental Conservation, New York Gas & Electric, National Grid, Northeast Dairy Producers, New York Cow Power Group and NYS Pollution Prevention Institute.

	<ul style="list-style-type: none"> <li>• <b>Risk aversion.</b> Farms tend to be risk averse in implementing new technologies. Assurance that energy efficiency technologies will not disrupt operations or affect product quality will enable farms to more readily accept and implement the improvements.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If underused or emerging farm energy-efficient technologies and processes are identified, demonstrated, and proven effective, and coupled with guidance on how to obtain financial assistance, then farms will adopt the technology to reduce their energy costs.</li> </ul>
<b>Activities</b>	<ul style="list-style-type: none"> <li>• Identify and demonstrate advanced, underused, or emerging technologies and processes to determine those that provide cost-effective energy and process efficiency opportunities <ul style="list-style-type: none"> <li>○ Issue a competitive solicitation to select approximately 20 teams of a technology vendor and farm establishment willing to be the site of a demonstration and for whom the technology fits a need.</li> <li>○ Provide technical assistance through contractors to collect and verify data from demonstration projects. Host sites, with the assistance of technical service providers, will collect information to compare energy use data in base case and post installation scenarios to determine the effectiveness and efficiency of the technology.</li> </ul> </li> <li>• Collect, analyze, and verify demonstration site data to support the business case for the technologies and share the information with the market <ul style="list-style-type: none"> <li>○ Identify and implement appropriate channels and strategy for dissemination of business case scenarios for successful underused or emerging technology and process efficiency improvements. Target the most active and trusted sources within each sub-sector to disseminate the information to the market.</li> <li>○ Develop case study materials to illustrate successful underused and emerging energy efficiency technologies vetted through demonstration projects that were ultimately installed at a farm.</li> <li>○ Disseminate case studies to the relevant farms. Host open house events on a farm to showcase their successful demonstration and invite farms suitable for replication.</li> <li>○ Guide the agriculture sector to available financial resources by assisting farms in finding possible financial implementation assistance and other incentives available from the utilities, federal agencies (such as USDA) and other available sources.</li> </ul> </li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>• Identify technologies to demonstrate.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue solicitation to select teams of technology vendor and farms to demonstrate technologies.</li> </ul> <p><u>Milestone 3 (2019)</u></p> <ul style="list-style-type: none"> <li>• Contract with teams to demonstrate underused and emerging technologies.</li> </ul> <p><u>Milestone 4 (2020)</u></p> <ul style="list-style-type: none"> <li>• Publish and disseminate business case scenarios that support underused and emerging technology implementation.</li> </ul> <p><u>Milestone 5 (2021)</u></p> <ul style="list-style-type: none"> <li>• Perform targeted outreach of successful business case scenarios to farms suitable for implementing the demonstrated technology.</li> </ul>

<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>Reliable market sources compile, develop and maintain current information on advanced clean energy technologies for use by local information-exchange networks.</li> <li>Advanced technologies are installed by farms outside of demonstration projects.</li> <li>Agriculture vendors and suppliers use energy efficiency as a tool to sell their products.</li> </ul>
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#### 14.2.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>Utilities will be invited to be participants in the selection committee to ensure on-going collaboration efforts and technologies meet their needs. NYSERDA will share data from underused and emerging technology demonstrations and information on the value proposition of implementing the underused and emerging technology with utilities. This data can be used by utilities to expand their incentive offerings.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>Utility prescriptive and custom incentive programs for farms currently exist in the market through investor owned utilities. With this initiative, NYSERDA can provide the information on technologies once successfully demonstrated. This information will help the utilities expand their incentive program's prescriptive measure lists to reflect the more advanced technologies as they are proven, or can be used as the basis for new customer incentives to support new technologies and approaches.</li> </ul>

#### 14.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 7: Annual Market Development Budget Allocation – Commitment Basis**

<b>Budget</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
Research and Technology Studies/Development/Demos	\$0	\$750,000	\$750,000	\$750,000	\$750,000	\$0	\$3,000,000
Tools, Training, and Replication	\$20,000	\$0	\$65,000	\$45,000	\$45,000	\$45,000	\$220,000
Implementation Support	\$0	\$145,000	\$125,000	\$145,000	\$125,000	\$0	\$540,000
Sub-Total	\$ 20,000	\$895,000	\$940,000	\$940,000	\$920,000	\$45,000	\$3,760,000

**Table 8: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
<b>Total</b>	1%	1%	7%	18%	25%	23%	18%	7%

### 14.2.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 9. Initiative Specific Metrics**

Indicators <sup>13</sup>		Baseline (Before/Current)	2022 (Cumulative)
<b>Activity/ Outputs</b>	Number of farm sites hosting demonstration projects	0	50
	Number of case studies developed and disseminated	0	10
	Number of open houses hosted	0	2
<b>Outcomes</b>	Number of farms knowledgeable of energy efficiency opportunities for underused or emerging technologies	0	100

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 10. Direct Impacts**

Primary Metrics		2019	2020	2021	2022	TOTAL
Energy Efficiency	MWh Annual	410	410	410	410	1,642
	MWh Lifetime	6,160	6,160	6,160	6,160	24,630
	MMBtu Annual	-	-	-	-	-
	MMBTU Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		216	216	216	216	864
CO2e Emission Reduction (metric tons) Lifetime		3,240	3,240	3,240	3,240	12,960
Customer Bill Savings Annual (\$ million)		\$0.06	\$0.06	\$0.06	\$0.06	\$0.239
Customer Bill Savings Lifetime (\$ million)		\$0.90	\$0.90	\$0.90	\$0.90	\$3.58
Private Investment (\$ million)		\$0.19	\$0.19	\$0.19	\$0.19	\$0.750

<sup>13</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics. These values reflect metrics for this initiative only, and does not include any prior NYSERDA demonstration project efforts which focused on different technologies.



**Table 11. Annual Projected Initiative Participation**

	2019	2020	2021	2022	Total
Participants <sup>14</sup>	5	5	5	5	20

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term because of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 12. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	1,810	4,020
	MMBtu Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		-	951	2,110

#### 14.2.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>This initiative is not being delivered on a fuel neutral basis. The focus is on potential electric saving through the installation of advanced, underused, or emerging efficiency technologies.</li> </ul>
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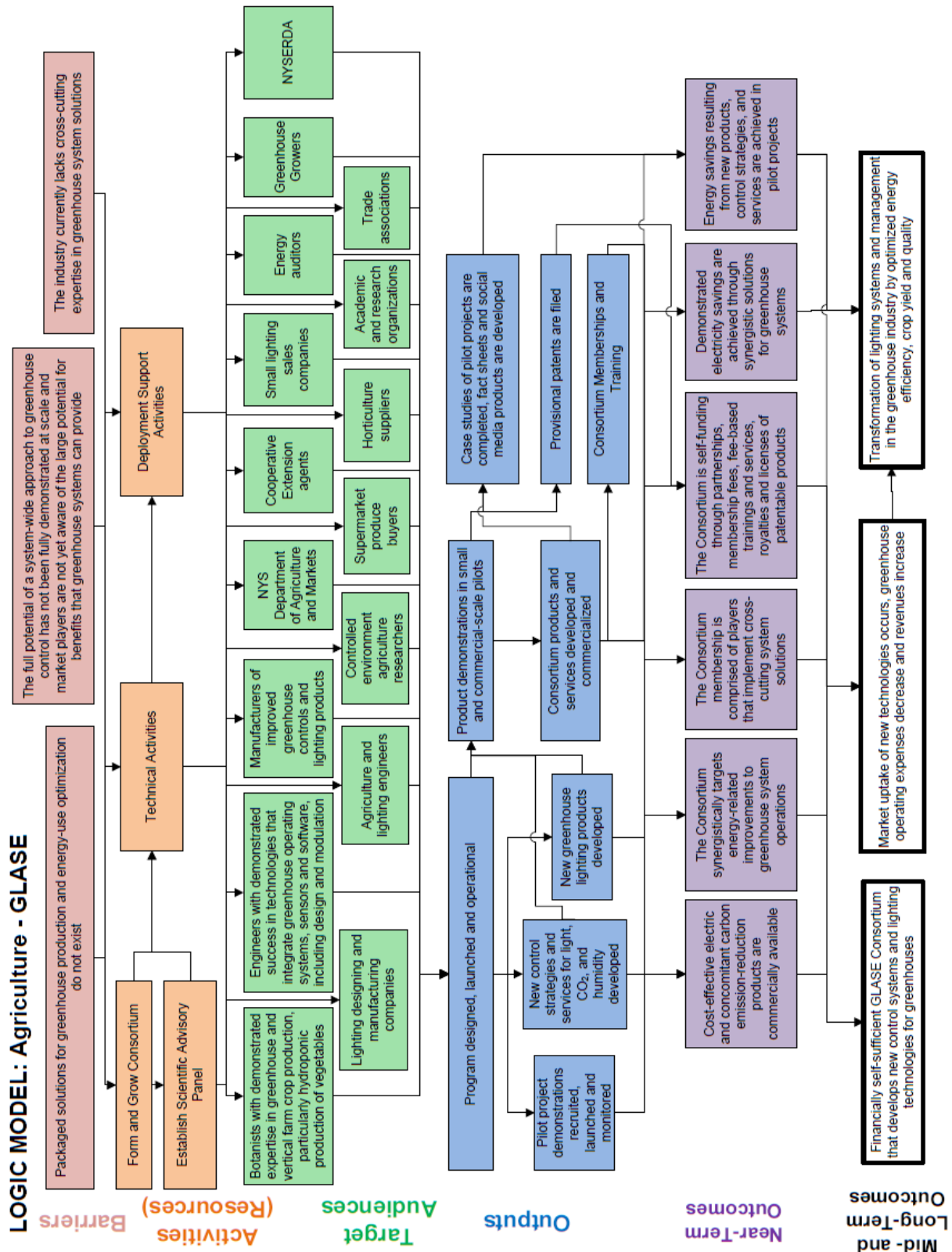
#### 14.2.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>Collect, analyze and report on progress of the initiative by comparing progress against identified goals on a regular basis (i.e., quarterly, bi-annually).</li> </ul>
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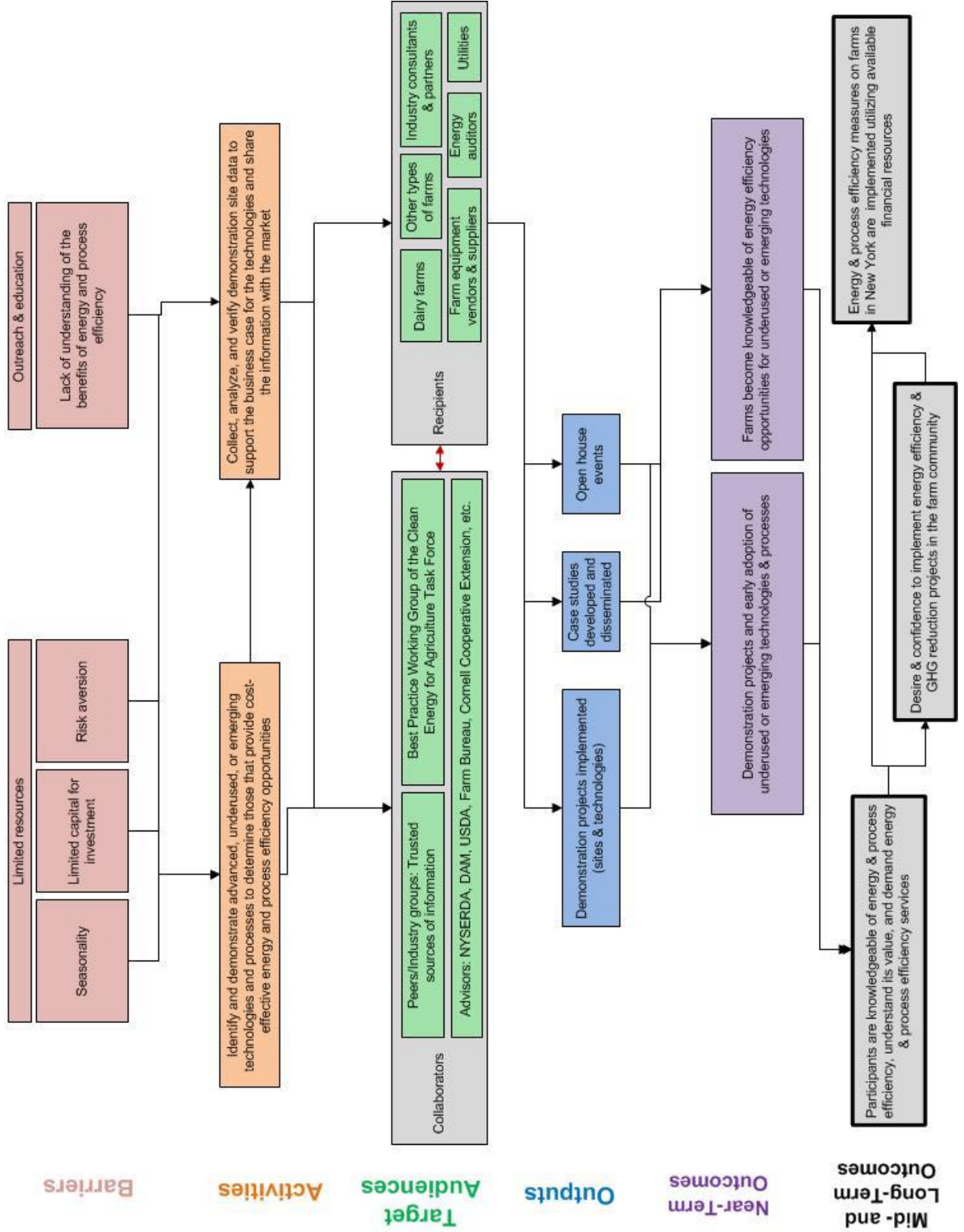
<sup>14</sup> Participants are teams selected to demonstrate advanced or underused technologies.

	<ul style="list-style-type: none"> <li>• Annually assess the number of demonstration projects to determine if this outreach strategy is effective in attracting interest and confidence in energy and process efficiency improvements in the agriculture and farm sector.</li> <li>• Insights as to how the initiative can be optimized will be gathered and applied to future initiative design to ensure greatest market impacts within the identified market sectors.</li> <li>• Aggregate and analyze data from NYSERDA-supported projects to verify realized energy savings and persistence of savings. <ul style="list-style-type: none"> <li>○ Survey farms on barriers, perceived benefits and their willingness to implement underused and emerging technology.</li> </ul> </li> </ul> <p><u>Market Evaluation</u></p> <ul style="list-style-type: none"> <li>• Market evaluation will draw on the logic model and will include baseline measurements of key market indicators. Regular longitudinal measurements (e.g., annual or biennial) will include updates of the baseline metrics as well as additional measurements to assess market change resulting from the initiative.</li> <li>• Key market indicators will include, but not be limited to, the rate at which underused or emerging technologies are adopted and replicated by participants and non-participants and knowledge of and confidence in the benefits of underused or emerging approaches and technologies.</li> <li>• As appropriate, the market evaluation will leverage sector-level market studies as well as publicly and commercially available data to inform the tracking of key market indicators.</li> </ul> <p><u>Impact Evaluation/Field Verification</u></p> <ul style="list-style-type: none"> <li>• Evaluation M&amp;V will be conducted according to the International Performance Measurement and Verification Protocol (IPMVP) method(s) most appropriate given the measures promoted by this initiative. Data from the impact evaluation can be used to help lend confidence in the market, especially among other end users.</li> <li>• Evaluation M&amp;V of direct savings will focus on areas of greatest impact and will draw upon project-level data collected by the program.</li> <li>• Depending on the extent of replication identified in market evaluation activities, impact evaluation may be conducted on a sample of replication projects to assess outcomes.</li> </ul>
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# Appendix A – Logic Models



# LOGIC MODEL: Advancing Agricultural Energy Technologies



## Appendix B – Investment Plan Review Supplement<sup>1</sup>

### 2030 Greenhouse Lighting and Systems Engineering (GLASE) Initiative

#### Results to Date – Metrics

The GLASE benefit metrics are all on track with their cumulative current targets through Q2 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2022)	% of Total Target through Initiative Completion (2022)
Energy Efficiency	MWh Annual	-	-	-	3,470	3,470	3,470	100%	3,470	100%
	MWh Lifetime	-	-	-	34,700	34,700	34,700	100%	34,700	100%
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	Annual Tons	-	-	-	1,826	1,826	1,830	100%	1,830	100%
	Lifetime Tons	-	-	-	18,258	18,258	18,300	100%	18,300	100%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$0.29	\$0.29	\$0.29	101%	\$0.29	101%
	Lifetime Dollars	-	-	-	\$2.91	\$2.91	\$2.92	100%	\$2.92	100%
Private Investment (millions)	Dollars	-	-	-	\$9.46	\$9.46	\$9.46	100%	\$9.46	100%
Participants	Participants	-	-	-	-	-	3	-	25	-

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	2022 Target	June 2017 Actual
			(Cumulative)	(Cumulative)	(Cumulative)
Activity/Outputs	Greenhouse area used for pilot testing	0	26,000 square feet	26,000 square feet	0
	Number of paid Consortium memberships	0	20	25	0
	Number of products developed	0	2	4	0
	Number of services developed	0	2	3	0

<sup>1</sup> As this report includes performance through Q2 2017 and the Advancing Agricultural Energy Technologies Initiative was filed in Q4 2017, that initiative is not included herein.

	Number of product variations tested in pilot systems	0	5	8	0
	Number of case studies developed	0	2	4	0

Performance Against Key Milestones

The GLASE initiative has made good progress toward its current milestones. Current milestones that are not yet complete are in progress. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓	2016	Contract with core Consortium members.
✓	2016	Review and approve Scientific Advisory Panel structure.
	2017	Review and approve Consortium business plan to attain financial self-sustainability in 2023.

Plan for Continuation/Modification/Termination

The GLASE initiative has been progressing following the activities and timeline laid out in the investment plan. There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Low- to Moderate-Income Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 13, 2017

Clean Energy Fund Investment Plan: LMI Chapter		
Revision Date	Description of Changes	Revision on Page(s)
August 18, 2016	Original Issue	Original Issue
December 30, 2016	<u>Single Family LMI Residential</u> : Revised Table 16 to correct error due to rounding of MWh annual target values for 2016, 2017 and 2018, implying a measure life that is significantly less than the actual measure life.	Multiple
June 23, 2017	<p><u>RetrofitNY</u>: Tables 2, 3, 4, 8 and 10 have been revised to reflect shift in timing of budget and benefits.</p> <p><u>REVitalize</u>: Tables 2 and 3 have been revised to reflect shift in timing of budget. Milestones 1, 5, and 6 have been updated to reflect updated timeframe for completion.</p> <p><u>LIFE</u>: Tables 6 and 10 have been updated to reflect 2016 actual participants, and to add a participant value for 2025, which was left blank in error in the original filing, increasing the total number of participants.</p> <p><u>Single Family LMI Residential</u>: Program was moved from Resource Acquisition Transition Chapter; additional content has been added to align with the format of the LMI Chapter. Program has been extended through 2021, with increased funding for the additional years. Additional funds have also been added to meet increasing demand, and to support improvement data management and marketing and outreach, and the benefit estimates have increased accordingly. Tables 13, 14, 15, 16, and 17 have been updated to reflect these revisions and 2016 actual values.</p> <p><u>LMI Multifamily</u>: Program was moved from Resource Acquisition Transition Chapter; additional content has been added to align with the format of the LMI Chapter. Program has been extended through 2021, with funding for the additional years. The program has been revised to remove the Targeted Option due to lack of market demand, and to increase the incentive level and lower the project minimum savings threshold for the Comprehensive Option. Additional funds have also been added to support the Solutions Provider Network. Tables 18, 19, 20 and 21 have been updated to reflect these revisions, 2016 actual values, and a shift in timing of the budget and benefits for the High-Performance offering.</p> <p><u>Appendices B and C</u>: Revised to reflect the revised budget and benefit values in 2016, 2017, and 2018 in line with the changes described above.</p>	Multiple
July 17, 2017	<u>LMI Multifamily</u> : Table 18 updated to reflect revised 2016 budget value.	53
October 5, 2017	Added Low Income Community Solar initiative	Multiple
November 13, 2017	Revised Appendix B and C to reflect New Construction Chapter LMI funding and benefits, as filed on November 1, 2017.	71, 72



## 15 Low- to Moderate-Income

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For the purpose of targeting CEF investments and maintaining alignment with state and federal energy and housing programs, NYSERDA defines the low-income market segment as households with annual incomes at or below 60% of the State Median Income (SMI), and the moderate-income market segment as households with an annual income between 60% and 80% of the SMI or the Area Median Income (AMI), whichever is greater.<sup>1</sup> Together these form the Low- to Moderate-Income (LMI) market segment, which in New York State is large and diverse. Approximately 40% of households (more than 3 million) in the state have an annual income that is less than 80% of SMI, and nearly 2.3 million of these households have incomes below 60% of the SMI.<sup>2</sup> Many of these households spend a disproportionate share of their annual income on energy bills<sup>3</sup> relative to higher income New Yorkers. In addition, LMI households often lack the time, financial resources<sup>4</sup>, and information necessary to invest in or gain access to energy efficiency upgrades or renewable energy systems, even though they often stand to benefit the most from them. Affordable housing providers, community organizations, and other actors that serve LMI customers face similar obstacles. For instance, affordable housing owners and developers often lack the capital to invest in high performance or clean energy improvements to their buildings, while community-based organizations often do not have access to resources and technical expertise necessary to develop solutions for addressing the energy affordability issues faced by community members. In addition to energy affordability issues, LMI customers and communities can face challenges associated with the health impacts of inefficient and deteriorating building stock that stem from the lack of resources to invest in regular maintenance and improvement. For the State to accomplish the broad goals of its Reforming the Energy Vision (REV) strategy, it is important that solutions to increase adoption of clean energy options for LMI customers be developed.

Under the CEF, NYSERDA will implement a comprehensive, three-pronged strategy for improving energy affordability and access to clean energy solutions for LMI communities, customers, and building owners. The first two components of the strategy are 1) traditional incentive, or standard offer programs and 2) market development interventions, which together are aimed at addressing the financial, informational, and technical barriers associated with LMI projects and enable LMI communities to gain greater access to clean energy through service providers and community organizations. In addition to reducing energy burden and increasing access to clean energy solutions for LMI customers, NYSERDA will seek to capture the important co-benefits of clean energy, such as health and environmental impacts, through these interventions. The third component of the strategy is meaningful NYSERDA coordination with other state agencies to

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<sup>1</sup> WAP, HEAP, and utility bill payment assistance programs have established an income eligibility threshold of 60% of the SMI, while eligibility for housing assistance under the United States Department of Housing and Urban Development (HUD) extends to 80% of the SMI or AMI.

<sup>2</sup> 2013 American Community Survey.

<sup>3</sup> According to the 2015 Home Energy Affordability Gap, by Fisher, Sheehan, and Colton, energy burdens can exceed 30% of annual income for many low-income New Yorkers compared to 6% or less for higher income New Yorkers.

<sup>4</sup> Including credit profiles.

maximize the impact and reach of various publicly-funded LMI energy and housing programs currently administered by New York State<sup>5</sup>.

## 15.1 The LMI Portfolio Overview

Over the first three years of the CEF, NYSERDA will invest a minimum of \$234.5 million in the LMI market segment<sup>6</sup>, per the CEF Order. The CEF investments include funding for the standard offer incentive programs, filed as part of the Resource Acquisition Transition Chapter, and funding for market development initiatives that will advance innovative approaches to scale the market for clean energy improvements, provide communities with resources necessary to reduce costs of service delivery, and improve awareness and education among customers and service providers.

The CEF LMI portfolio builds on established LMI energy efficiency and renewable energy programs administered under the Energy Efficiency Portfolio Standard (EEPS) and NY-Sun. As NYSERDA transitioned from EEPS to the CEF, these standard offer programs were approved for a March 1, 2016 start date by the Public Service Commission to maintain continuity of services to LMI customers as the CEF was developed.<sup>7</sup> Under the CEF, the standard offer programs will be supplemented with market development initiatives that will seek to further increase the adoption of clean energy solutions in the LMI market segment and increase energy affordability for LMI customers. The following sections provide a comprehensive overview of the CEF LMI portfolio, however NYSERDA also expects that CEF investments in the Communities, Single Family, Multifamily, and New Construction portfolios will also make positive contributions to LMI communities and customers.

### 15.1.1 NY-Sun<sup>8</sup>

In April 2014, the Public Service Commission provided NYSERDA authorization to allocate \$13 million in NY-Sun funding to increase opportunities for low and moderate-income customers to participate in solar photovoltaic (PV) programs. In November 2015, NYSERDA launched the Affordable Solar initiative, which provides financial incentives to LMI customers to offset the installation costs associated with rooftop PV. In December 2016, NYSERDA launched the Affordable Solar Predevelopment and Technical Assistance Program, which provides funding to address resource gaps and solve market barriers, including the development of solar installations serving

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<sup>5</sup> Including the Weatherization Assistance Program (WAP) and Low-Income Housing Tax Credit, administered by NYS Homes and Community Renewal, and the Home Energy Assistance Program (HEAP), administered by NYS Office of Temporary and Disability Assistance.

<sup>6</sup> The \$234.5 million investment includes costs associated with program implementation, incentives, NYSERDA administration, and the associated New York State Cost Recovery Fee.

<sup>7</sup> Case Numbers 14-M-0094, 10-M-0457, 07-M-0548, 03-E-0188; Order Extending Clean Energy Programs, Issued and Effective December 11, 2015.

<sup>8</sup> Case Number 03-E-0188: Order Authorizing Funding and Implementation of the Solar Photovoltaic MW Block Programs, Issued and Effective April 24, 2014. While NY-Sun operates as a distinct portfolio within the CEF, its LMI component description is included here to provide a complete picture of the current LMI initiatives funded during this timeframe. The \$13 million in NY-Sun funding identified is in addition to the minimum 3-year CEF investment mentioned above.

multifamily affordable housing, as well as community solar installations serving LMI households. For additional detail on these NY-Sun LMI investments, please refer to the NY-Sun Operating Plan.

The Low-Income Community Solar initiative proposes a direct intervention in the community solar market to ensure significant low-income customer participation with meaningful benefits. In addition, NYSERDA will continue to engage stakeholders and develop interventions to support community solar projects and business models that are more broadly inclusive of low income customers, moderate income customers and affordable housing providers to encourage the development of a community solar market that is accessible to these customer segments. NYSERDA's planning has been and continues to be informed by the Clean Energy Advisory Council (CEAC) LMI Clean Energy Initiatives Working Group Report, CDG Low Income Collaborative Report, Value of DER LMI Working Group, and other stakeholder processes.

Broadly, NYSERDA will continue to implement the Affordable Solar Predevelopment and Technical Assistance Program, and will apply the lessons learned from these early efforts and seek to scale up models that are demonstrated effective.<sup>9</sup> Further interventions to be considered for implementation will include:

- Targeted support for community solar projects that serve LMI customers and/or affordable housing providers and meet customer benefit requirements (such as cost savings and favorable subscription terms).
- Customer education to LMI households and affordable housing providers.
- Collaboration with the New York Green Bank and other financing providers to reduce the perceived risk of offering community solar subscriptions to LMI customers, and mobilize the investment of capital in community solar projects serving LMI customers.

### 15.1.2 Standard Offer Programs

On February 29, 2016, the Department of Public Service approved the continued operation of programs from legacy portfolios to the CEF as detailed in the CEF Resource Acquisition Transition Chapter, filed on February 22, 2016. The programs have been moved into the LMI chapter in this revision, which include details on \$162.2 million of standard offer LMI programs that NYSERDA is administering to provide financial support to overcome first cost and incremental cost barriers experienced in the single family, multifamily, and new construction market segments. By addressing critical cost barriers to adopting energy efficiency improvements, these programs will further the goals of the Affordability Policy<sup>10</sup> to improve the energy affordability for low-income energy consumers. These programs, which are application based and open to all eligible customers, are summarized below.

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<sup>9</sup> Affordable Solar Predevelopment and Technical Assistance webpage: [www.nyserdera.ny.gov/aspta](http://www.nyserdera.ny.gov/aspta)

<sup>10</sup> Case 14-M-0565, Proceeding on Motion of the Commission to Examine Programs to Address Energy Affordability for Low Income Utility Customers; Order Adopting Low Income Program Modifications and Directing Utility Filings; May 20, 2016.

### ***Single Family***

NYSERDA's single family residential LMI program provides incentives for whole-house energy efficiency improvements for low and moderate-income homeowners and tenants. The low-income component, EmPower NY, serves households with an annual income less than 60% SMI and provides no-cost energy efficiency upgrades and in-home energy education to eligible customers. The moderate-income component, Assisted Home Performance with ENERGY STAR, serves households with an annual income up to 80% SMI or AMI, whichever is higher, provides incentives for energy efficiency upgrades. This initiative allocates \$134 million for the period 2016-2018 across the two components.

### ***Multifamily***

NYSERDA's LMI component of the Multifamily Performance Program (MPP) addresses cost barriers experienced by owners of low-to-moderate income properties and increases the awareness of and access to energy efficient solutions for LMI properties. MPP offers two options for buildings to improve their energy performance: a comprehensive option that will provide incentives for work scopes designed to achieve at defined threshold for whole-building source energy savings; and a high performance offering that will provide incentives for deep energy retrofit projects. This initiative allocates a total of \$48 million for the period 2016-2021 across the two options.

### ***New Construction***

NYSERDA's new construction program promotes high performance for affordable low-rise and high-rise multifamily new construction projects. Support includes financial incentives to overcome the incremental cost of building to a higher performance threshold, such as passive house or net zero energy standards; providing technical assistance, tools and resources to builders, developers, architects, and engineers on high performance new construction techniques, with an emphasis on integrated design solutions and pre development cost reductions; and strengthening the capacity of clean energy partners in the building design, construction, and performance verification. This initiative allocates a total of \$21 million for the period 2016-2018. An additional Market Development chapter was filed on November 1, 2017 with New Construction funding through 2020, which allocates an additional \$27 million in funding to low-to-moderate income new construction efforts.

#### **15.1.3 Market Development Initiatives**

As demonstrated by the continuation of its standard offer programs, NYSERDA will maintain incentive programs to address first cost and other barriers associated with LMI clean energy projects throughout the CEF. These programs will be continuously assessed and modified, where necessary to increase impact, enhance operational efficiencies, and leverage other LMI focused initiatives administered in New York State. While standard offer incentive programs will continue to be important to reduce energy burdens and increase access to clean energy options for LMI customers and communities, a sole focus on incentive programs that buy down the cost associated with clean energy improvements will not lead to scale in the LMI market segment, due to the

relatively high cost of clean energy projects<sup>11</sup> and the fact that the transactions occur on a project by project basis. As such, NYSERDA will administer a series of market development initiatives targeted at scaling clean energy adoption in the LMI market segment; reducing soft costs associated with clean energy projects, such as those connected to customer acquisition and project planning; developing innovative models for project finance and community ownership of distributed energy resources (DER); and increasing energy awareness amongst customers and service providers. Detail on the market development initiatives identified to-date is in section 15.2; additional initiatives will be included in later revisions to this Chapter.<sup>12</sup>

To ensure that CEF interventions effectively deliver clean energy solutions to LMI customers and communities and that the State is best able to leverage coordination across publicly-funded programs, NYSERDA will work to improve the collective understanding of the LMI energy landscape including customers, building owners, and service providers. As included in the Market Characterization and Design Chapter, filed on April 1, 2016, this will include: research on relevant demographic, housing, and energy end-use and cost information; information gathering and integration of data efforts with New York State agencies that maintain relevant data to better understand program penetration and the unmet need for energy services; and research on the motivations and barriers associated with building owners and service providers to understand where CEF investments can help to overcome obstacles in deploying clean energy solutions more broadly. This effort will help to identify trends, gaps, and opportunities for CEF investments and other New York State activities for the LMI market segment.<sup>13</sup> NYSERDA will explore these opportunities with stakeholders and the Clean Energy Advisory Council (CEAC)<sup>14</sup> LMI Clean Energy Initiatives Working Group (CEAC LMI Working Group) and file a supplement to this Chapter when LMI interventions and associated investments become ready for deployment.

#### 15.1.4 Enhanced Statewide Coordination

In addition to the standard offer energy efficiency programs administered by NYSERDA, New York State administers energy bill payment assistance and weatherization programs for low and moderate-income customers, which all together total roughly \$500 million a year. The recent Energy Affordability policy<sup>15</sup> is expected to provide an additional \$248 million a year in utility bill reductions to low-income customers. On average, these programs provide service to approximately 1.5 million households a year, far fewer than the 2.3 million households that are income eligible. NYSERDA will work with New York State agencies and utilities to develop cohesive strategies,

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<sup>11</sup> For example, a whole-house energy efficiency retrofit can exceed \$4,000.

<sup>12</sup> The New Construction Chapter, filed on November 1, 2017 also contains LMI Market Development funding. As the initiative is similar to the market rate offering, the initiative is described there.

<sup>13</sup> As outlined in the Market Characterization and Design Chapter, NYSERDA expects that the initial research and data gathering activities to be complete by Q1 in 2017. The research on motivations and barriers of service providers and building owners will commence in 2017.

<sup>14</sup> The Clean Energy Advisory Council was established by the Public Service Commission through an Order in the Clean Energy Fund Proceeding (Case 14-M-0094. et al, Proceeding on Motion of the Commission to Consider a Clean Energy Fund, Order Authorizing the Clean Energy Fund Framework, filed January 21, 2016).

<sup>15</sup> Case 14-M-0565, Proceeding on Motion of the Commission to Examine Energy Affordability for Low Income Utility Customers; Order Adopting Low Income Program Modifications and Directing Utility Filings; May 20, 2016.

aligning the CEF with these programs and deploying public funds in a manner that will result in the greatest number of households served and maximize energy, bill cost reduction, and environmental impacts.

In addition, NYSERDA will work with state and public housing agency partners to leverage housing programs and policies to advance clean energy solutions in affordable housing stock, and to achieve important health and environmental justice benefits through CEF investments.

Table 1 provides a summary of the key coordination activities that NYSERDA will undertake.

**Table 1. Summary of Statewide Coordination Efforts**

Organizations	Nature of Coordination
Low-Income Energy Program Interagency Task Force <sup>16</sup>	<ul style="list-style-type: none"> <li>• Development of a cohesive approach to serve low-income energy customers across the programs administered by New York State agencies to reduce redundancy and increase coordination, effectiveness, and impact for the customer.</li> </ul>
NYS Department of Environmental Conservation	<ul style="list-style-type: none"> <li>• Explore opportunities to improve energy and health outcomes in environmental justice communities.</li> </ul>
NYS Department of Health (DOH)	<ul style="list-style-type: none"> <li>• Develop an approach to quantify the health outcomes and healthcare cost reductions associated with energy efficiency improvements.</li> <li>• Explore opportunities for developing a programmatic approach for addressing energy efficiency and healthy homes improvements for low-income customers.</li> </ul>
NYS Department of Public Service (DPS)	<ul style="list-style-type: none"> <li>• Alignment of the CEF initiatives with the goals of the Energy Affordability policy, which may include further targeting of energy efficiency services to high use utility customers.</li> </ul>
NYS Homes and Community Renewal (HCR)	<ul style="list-style-type: none"> <li>• Exploring systematic improvements to policies and processes that will ensure the benefits of clean energy are embedded upstream of tenants and building owners, such as: <ul style="list-style-type: none"> <li>○ exploring opportunities to increase energy performance requirements associated with the Low-Income Housing Tax Credit and the Qualified Allocation Plan;</li> <li>○ the development of a Green Physical Needs Assessment, in coordination with other key stakeholders including housing authorities;</li> <li>○ exploring the development of underwriting criteria for high performance new construction projects, based on reduced operational costs; and</li> <li>○ piloting model based utility allowances in New York, in coordination with other key stakeholders.</li> </ul> </li> <li>• Alignment between WAP and EmPower NY to reduce overlap and administrative burden for the agencies, service providers, and customers.</li> </ul>
NYS Office of Temporary and Disability Assistance	<ul style="list-style-type: none"> <li>• Maximize the reach of HEAP<sup>17</sup> funds through increased consumer education and targeted efficiency services.</li> </ul>
Utilities	<ul style="list-style-type: none"> <li>• Enhancement of the customer referral process for energy efficiency services through EmPower NY, to prioritize customers with highest consumption history and greatest potential for impact.</li> <li>• Exploring alternate models for providing service to LMI customers, while adding customer value.</li> </ul>

<sup>16</sup> The Low-Income Energy Program Task Force was formed by the Office of the Governor in May 2016 to bring together the New York State agencies responsible for administering low-income energy programs for the purpose of developing a cohesive strategy for serving LMI energy customers, increasing coordination, and sharing information.

<sup>17</sup> The Home Energy Assistance Program (HEAP) is a federally funded program that assists low-income New Yorkers with the cost of heating their homes. HEAP also offers an emergency benefit for households in a heat or heat related energy emergency.

## 15.2 LMI Market Development Initiatives<sup>18</sup>

The RetrofitNY and REVitalize initiatives did not meet their 2016 projected targets due to a later than anticipated program start date. It is anticipated the initiatives will still achieve their total projected benefits, however the projected budget and benefits have been updated to reflect 2016 activity and a shifting of activity into future years. In addition, LIFE participants for 2016 have been updated to reflect actual numbers and a number has been added for 2025 as that year was left blank in error in the original filing. The result is an increase in the total number of participants in the LIFE initiative.

### 15.2.1 RetrofitNY

New York State's existing affordable multifamily buildings offer great potential for energy savings and greenhouse gas emissions reductions. While traditional energy efficiency programs targeted at multifamily buildings have been able to reduce on-site energy consumption by up to 30%, these efforts have been unable to unlock the full potential for improving the energy performance of these buildings. Greater building performance, on the order of 70% of on-site energy consumption reductions, can be achieved by undertaking a deep energy retrofit, which consists of super-insulating the shell, installing high efficiency heating, ventilation, and air-conditioning (HVAC) equipment, and lighting, among other upgrades.

Despite the significant benefits of conducting deep energy retrofits on multifamily buildings, there are several barriers to scaling deep energy retrofits in the affordable multifamily building market segment. The deep energy retrofits currently being done are complex, not replicable, and are not cost effective. Many affordable building owners face capital constraints that result in tradeoffs between basic structural and operational improvements against improvements to energy performance, making it difficult to undertake significant energy efficiency improvements. In addition, deep energy retrofits can be highly disruptive for tenants, making it difficult for building owners undertake such a project because most multifamily affordable housing units in the State are occupied.

Retrofitting occupied buildings on a large scale requires innovative solutions that enable deep energy retrofits while the tenants remain in their apartments. However, cost effective solutions that can be implemented on a large scale currently do not exist in the United States. Through RetrofitNY, NYSEDA will seek to develop simplified, scalable solutions for conducting deep energy retrofits in tenanted multifamily units through a design competition and market development activities, such as the development of financing and business models to foster deep energy retrofits in New York State's affordable multifamily building market segment.

Affordable multifamily housing is a logical starting point for the implementation of RetrofitNY because the regulated housing portfolio in New York State is large and provides for a natural

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<sup>18</sup> This section will be updated as additional market development initiatives are developed under the CEF. Additional LMI funding can be found in the New Construction Chapter, filed on November 1, 2017.



aggregation of similarly constructed buildings, relative to market rate building stock, which tends to be more diverse. Approximately 660,000 affordable housing units in the state are either publicly owned or subsidized by a regulatory or financing agencies, presenting a unique opportunity to create demand for retrofit solutions by aggregating a large number of units to be renovated, as further described in the Intervention Strategy and Activities section of this document. The fact that the affordable housing building stock tends to be more uniform, further enables the design of retrofit solutions that will be replicable. In addition, the development of retrofit solutions to achieve deep energy savings and associated finance models will provide the potential for affordable building owners to avoid the tradeoff between structural or operational improvements and energy upgrades by providing a mechanism for including the value of the energy savings in the capital refinance process, allowing building owners to finance a retrofit package through the energy savings.

In addition to building performance and the potential for innovative finance solutions, the solutions implemented will have positive impacts on building resiliency and tenant comfort and health. As a result, RetrofitNY will put the affordable housing sector at the forefront of the New York clean energy revolution, and allow LMI communities to first benefit from more a more comfortable and healthier living environment.

**Overview**

<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA seeks to harness the collective market power of affordable housing organizations in New York to entice the architecture, engineering, and construction industry to collaborate on the cutting-edge design and widespread deployment of cost-effective deep retrofit solutions in multifamily buildings.</li> <li>• The goal of this initiative is to create a self-sustaining marketplace for these retrofits in tenanted multifamily buildings in New York. While public subsidies will be needed to develop, build, and test the initial retrofit packages, it is anticipated that once tested and proven, these solutions will be implemented on a large scale with little to no subsidy.</li> <li>• To create this market, NYSERDA will:             <ul style="list-style-type: none"> <li>○ Define high-level criteria that the architecture, engineering, and construction industry will need to meet to create the retrofit solutions.</li> <li>○ Create the demand side of a new market for deep-energy retrofits by aggregating a large number of units that will commit to implement the solutions to be designed.</li> <li>○ Organize a design-build and implementation competition to select and test the best solutions through implementation. Using lessons learned from the first installation, NYSERDA will organize subsequent rounds of the competition to improve the solutions until they meet all predefined criteria, and adapt them to additional building types. To ensure replicability, scale and impact, NYSERDA is analyzing New York’s affordable housing portfolios to identify the most prevalent building typologies in the state.</li> <li>○ In parallel with the development of the technical solutions, NYSERDA will help create an enabling environment for large scale implementation by identifying and addressing regulatory issues, facilitating the development of new private sector financing products, and developing the New York supply chain for high-efficiency building components.</li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>○ NYSERDA will promote broad adoption of these deep-retrofit solutions as preservation strategies for the affordable housing stock, and encourage their adoption across the multifamily housing market.</li> <li>● For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: RetrofitNY,” which can be found in Appendix A</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>● The overall goal of this initiative is to create a self-sustaining market for deep-energy retrofits in New York State to ensure the mass implementation of deep-energy retrofit solutions across building types and different housing market segments. Sub-goals are: <ul style="list-style-type: none"> <li>○ To ensure that affordable housing is prioritized when it comes to developing solutions for enabling the adoption of clean energy solutions.</li> <li>○ To assist the architecture, engineering and construction industry in the development of innovative solutions to significantly improve the energy performance (on the order of a 70% site energy consumption reductions) and the comfort of tenanted multifamily buildings, while limiting disruption to tenants during the construction phase.</li> <li>○ To assist with the development of financing mechanisms and new business models enabling building owners to purchase these solutions with little to no upfront costs.</li> <li>○ To identify and address any regulatory issues that could hinder the implementation of the solutions.</li> </ul> </li> </ul>

**Target Market Characterization**

<b>Target Market Segment(s)</b>	<p>The initial target market consists of affordable housing buildings owned by Public Housing Authorities, and privately owned multifamily affordable housing buildings regulated, financed or subsidized by affordable housing agencies or housing finance agencies such as HCR, New York City Housing and Preservation Development (HPD), the New York State Housing Finance Agency, and the New York City Housing Development Corporation (HDC). NYSERDA will subsequently expand its target market to privately owned unsubsidized multifamily affordable housing buildings.</p> <p>NYSERDA defines existing multifamily affordable housing as buildings in which at least 25% of the units are occupied by households earning not more than 80% of the area or state median income, whichever is higher. Ultimately, NYSERDA expects that market rate multifamily buildings will implement the solutions developed and tested through RetrofitNY. However, NYSERDA will not subsidize the installation of these solutions in market rate buildings.</p>
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>● Public Housing Authorities</li> <li>● NYS Affordable Housing regulatory agencies including HCR and HPD</li> <li>● Housing Finance Agencies including New York State Housing Finance Agency, and HDC</li> <li>● Private building owners</li> <li>● Tenants of affordable housing buildings and LMI communities</li> <li>● Builders, developers, architects, suppliers, engineers, building scientists, and other service providers</li> <li>● Private financing companies, insurance and re-insurance companies, and energy service companies</li> <li>● Philanthropic organizations</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>● New York counts a number of qualified professionals capable of designing and building innovative deep energy retrofit solutions, and a nascent demand for high-efficiency building systems and components has already emerged.</li> </ul>

	<ul style="list-style-type: none"> <li>• An increasing number of private and public lenders are willing to finance energy efficiency projects in New York by underwriting to a portion of the energy cost savings. Major financing and issuance actors have also expressed interest in financing deep-energy retrofits and guaranteeing energy savings for these projects.</li> <li>• The main affordable housing organizations in the state (HCR, HPD, HDC, NYS Public Housing Authority Directors Association (NYSPHADA) and New York City Housing Authority (NYCHA)) have expressed a strong interest in participating in this new approach and in implementing the solutions to be designed.</li> <li>• The process and key components of this initiative have been successfully implemented in the Netherlands through a program called Stroomversnelling, also referred to as Transition Zero. Interviews of numerous New York based industry actors and stakeholders indicate that this approach can be successfully implemented in New York.</li> <li>• A number of deep-energy retrofits have been successfully implemented in the US. However, there are no clear retrofit techniques to deliver deep energy savings for tenanted multifamily buildings at scale. Deep-energy retrofits are one-off custom projects and costs per unit remain prohibitively high.</li> </ul>
<p><b>Customer Value</b></p>	<p><u>Value to LMI Tenants:</u></p> <ul style="list-style-type: none"> <li>• The tenants of the retrofitted units will benefit from an improved quality of life. Their apartments will be more comfortable thermally and acoustically.</li> <li>• The indoor air quality will also be improved, providing health benefits like a reduction in the frequency and severity of respiratory afflictions.</li> <li>• Rents will be more likely to remain at affordable levels because building owners implementing the retrofit solutions with the assistance of Affordable Housing Regulatory and Financing Agencies will have an incentive to sign or renew a regulatory agreement.</li> </ul> <p><u>Value to Affordable Building Owners:</u></p> <ul style="list-style-type: none"> <li>• Participating building owners will see the quality and value of their buildings increase while bearing only a fraction of the cost of the improvements implemented on their buildings.</li> <li>• Maintenance and operation costs (e.g., utility costs) will be reduced.</li> <li>• The comfort of the tenants will be improved, which will likely reduce tenant complaints and tenant turn over.</li> </ul> <p><u>Value for Public Housing Authorities and Affordable Housing Regulatory and Financing Agencies:</u></p> <ul style="list-style-type: none"> <li>• The retrofit solutions developed will serve as an important tool for the preservation of affordable housing units throughout the State by lowering and stabilizing energy costs and improving building quality. They will allow Public Housing Authorities and Affordable Housing Agencies to: <ul style="list-style-type: none"> <li>○ Significantly improve the quality of the renovations they conduct on distressed buildings for a similar or lower cost per unit.</li> <li>○ Improve the quality and value of the buildings in their portfolio.</li> <li>○ Benefit from reduced maintenance and operation costs.</li> <li>○ Offer new opportunities to renew existing or sign additional regulatory agreements.</li> </ul> </li> </ul> <p><u>Value to the Architecture, Engineering, and Construction Industry and Other Trades Involved in the Retrofits:</u></p> <ul style="list-style-type: none"> <li>• These companies and professionals will benefit from the creation of a new, long-term multi-billion-dollar market that will provide new business opportunities less dependent on the economic cycles affecting the current real estate market.</li> </ul>

	<ul style="list-style-type: none"> <li>• Designing and implementing innovative solutions will also provide them with the opportunity to differentiate themselves from their competitors.</li> </ul>
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**Stakeholder/Market Engagement**

<b>Stakeholder/Market Engagement</b>	<p><u>Engagement To-Date:</u></p> <ul style="list-style-type: none"> <li>• Conducted an in-depth assessment of the Stroomversnelling program, after which this initiative is modeled.</li> <li>• Confirmed interest for this initiative at the highest level of the key affordable housing organizations in the state: HCR, Public Housing Authorities throughout the state and NYSPHADA, HPD, HDC, and NYCHA.</li> <li>• Interviewed several dozen key actors in the architecture, engineering, and construction industry, as well as building science experts and developers to confirm interest and readiness to design the necessary solutions.</li> <li>• Further assessed feasibility through discussions with Passive House NY, Passive House Institute US, Urban Green Council and Enterprise Community Partners.</li> <li>• Gathered feedback on the initiative and the strategy from key organizations with a focus on energy efficiency and energy policy the American Council for an Energy-Efficient Economy (ACEEE), the Environmental Defense Fund (EDF), the Natural Resources Defense Council (NRDC), the Rocky Mountain Institute (RMI), and the Pace Climate and Energy Center.</li> <li>• Held preliminary discussions on potential financing solutions with key actors from the financing, insurance, and re-insurance sectors.</li> </ul> <p><u>Further Engagement:</u></p> <ul style="list-style-type: none"> <li>• Conduct research with building owners and tenants to confirm the key criteria to be met by deep-energy retrofit solutions.</li> <li>• Conduct outreach to ensure that qualified companies and individuals participate in the design competition.</li> <li>• Continue working with Public Housing Authorities that are not covered under System Benefit Charge (SBC) programs (e.g., NYCHA) to implement solutions on their portfolio of buildings via their utilities and partners.</li> <li>• NYSERDA will also utilize the CEAC LMI Working Group to engage with stakeholders, as appropriate.</li> </ul>
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**Theory of Change**

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Deep-energy retrofits in multifamily buildings are currently not cost effective, are complex, not easily replicable, and are highly disruptive for tenants.</li> <li>• High-efficiency building components necessary for conducting retrofits are not readily available in the US.</li> <li>• Regulatory and code barriers exist: This makes the implementation of deep-energy retrofits more complex and costly. For example, building or retrofitting a building to a high-level of efficiency might require obtaining a number of code variances.</li> <li>• Typical financing may not be available: The more comprehensive scopes of work required to reduce the energy consumption of a multifamily building beyond 50% typically have a longer payback period. Traditional lenders are not yet ready to bear this risk over 20 years.</li> </ul>
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<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If simplified solutions to conduct deep-energy retrofit are developed, then more buildings will be retrofitted to a high level of efficiency.</li> <li>• If potential demand for deep-energy retrofits is aggregated, clearly demonstrating to the industry that a large potential market exists for deep-energy retrofits in existing multifamily buildings, then the industry will invest the time and resources required to develop comprehensive deep-energy retrofit solutions.</li> <li>• If solutions are built and tested through pilots, then the industry will streamline the solutions reducing costs and improving performance.</li> </ul>
<p><b>Activities</b></p>	<p>To create a self-sustaining marketplace for the deep-energy retrofits of tenanted multifamily buildings in New York State, NYSERDA will:</p> <ol style="list-style-type: none"> <li>1. <u>Define the Criteria Needed for Retrofits</u> <ul style="list-style-type: none"> <li>• In cooperation with Affordable Housing and LMI stakeholders, NYSERDA will determine basic criteria to be met by retrofit packages to be created by the industry.</li> <li>• Criteria could include<sup>19</sup>: very high level of building energy performance; enhanced health, comfort and building aesthetic; limited disruption to tenants during construction; cost effectiveness; guaranteed energy savings over a long period of time.</li> </ul> </li> <li>2. <u>Create Demand by Aggregating a Large Number of Units to be Renovated</u> <ul style="list-style-type: none"> <li>• Through direct engagement of Public Housing Authorities and owners of large portfolios or affordable buildings, NYSERDA will create the demand side of the market by aggregating a large number of units, starting with the affordable housing sector where regulatory agencies can play a facilitating role, that will commit to implementing the solutions.</li> <li>• NYSERDA will work with HCR, HPD and HDC as well as other agencies, Public Housing Authorities, and private owners of large portfolio across the state to secure the appropriate demand.</li> </ul> </li> <li>3. <u>Organize and Run the Design-Build Competition</u> <ul style="list-style-type: none"> <li>• The potential for a large, new market will motivate the industry to answer a competitive solicitation and engage in several rounds of a design-build and implementation competition focused on predetermined buildings from affordable housing portfolios in New York.</li> <li>• The best solutions will be selected and tested through implementation on the specified buildings. Initial demonstration projects will be implemented on building types that have a large number of similar buildings (in terms of size, age, construction materials, etc.) located in the State.</li> <li>• NYSERDA will carefully monitor implementation and results in terms of energy savings, construction costs, comfort, and disruption to tenants during construction.</li> <li>• Using lessons learned from the first round of installations, NYSERDA will organize subsequent rounds of the competition to improve the solutions until they meet all predefined criteria, and adapt them to additional building types. The number of rounds of the competition will be based on the progress of the solution designs.</li> <li>• NYSERDA will fund part of the incremental implementation costs for the selected solutions: Part of the typical capital improvements currently funded or financed by Affordable Housing agencies for the preservation of multifamily buildings very often include energy related improvements such as facade and</li> </ul> </li> </ol>

<sup>19</sup> The criteria will be finalized with the affordable housing and LMI stakeholders, as part of the development of this initiative. It is critical that the owners and managers of affordable housing portfolios provide input on the design criteria because the design solutions must be acceptable to them.

	<p>roof repairs, as well as boiler and window replacement. The funds dedicated to these improvements can be reallocated to cover part of costs of the solutions designed through the design-build competition. NYSERDA will also seek to utilize existing and new financing products to finance part of the incremental costs with the energy savings. NYSERDA will then fund the share of the incremental costs not covered by financing products available at the time of the retrofit. NYSERDA’s financial contribution will decrease over time as the cost of the solutions is reduced and more financing products become available, until NYSERDA financial support is no longer needed.</p> <p>In parallel to the development of technical solutions, NYSERDA will help create an enabling environment for large scale implementation of the designed solutions through activities 4, 5 and 6.</p> <p>4. <u>Develop Supply Chain of High Efficiency Components</u></p> <ul style="list-style-type: none"> <li>• Building components and systems required for a deep energy retrofit are not always readily available in New York and are often imported from Europe. NYSERDA will work with manufacturers and distributors of the components and systems used in the implemented deep energy retrofit solutions to ensure their availability in the New York market.</li> </ul> <p>5. <u>Identify and Address Regulatory Barriers</u></p> <ul style="list-style-type: none"> <li>• NYSERDA will identify regulatory issues such as restrictive building codes and owner/tenant split incentive concerns.</li> <li>• In collaboration with the relevant state and city agencies as well as utility companies, NYSERDA will work to minimize or eliminate these barriers, and facilitate a streamlined installation of the designed retrofit solutions.</li> </ul> <p>6. <u>Develop Financial Solutions to Finance the Retrofits</u></p> <ul style="list-style-type: none"> <li>• In conjunction with the New York Green Bank, NYSERDA will convene a Financing Working Group and will work closely with stakeholders from the financing industry to develop private sector financing products that can be integrated with the existing affordable housing financing programs to provide project level support.</li> </ul> <p>7. <u>Leverage Philanthropic Funding and Other Grants</u></p> <ul style="list-style-type: none"> <li>• NYSERDA will engage philanthropic organizations and other potential partners to broaden application of this initiative to non-SBC customers, and allow for a faster implementation.</li> </ul>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1(2016)</u></p> <ul style="list-style-type: none"> <li>• Criteria to be met by technical solutions are defined.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Sufficient potential demand for deep energy retrofits is aggregated.</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>• Competitive solicitation for the first round of the design-build competition is released.</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• One or more solutions are built and tested through the design-build competition.</li> </ul> <p><u>Milestone 5 (2020)</u></p> <ul style="list-style-type: none"> <li>• Solution(s) are adapted to additional building typologies.</li> </ul> <p><u>Milestone 6 (2020)</u></p>

	<ul style="list-style-type: none"> <li>Financial products that are adapted to affordable housing entities' processes and are compatible with federal and state rules that apply to affordable housing are developed and made available.</li> </ul> <p><u>Milestone 7 (2022)</u></p> <ul style="list-style-type: none"> <li>Retrofit solutions are integrated in the public housing authorities' and affordable housing regulators' preservation strategies.</li> </ul> <p><u>Milestone 8 (2025)</u></p> <ul style="list-style-type: none"> <li>Retrofit solutions are cost effective and NYSERDA subsidies are no longer necessary.</li> </ul> <p><u>Milestone 9 (2025)</u></p> <ul style="list-style-type: none"> <li>Building components and systems required for deep energy retrofits are readily available in the New York market.</li> </ul> <p><u>Milestone 10 (2025)</u></p> <ul style="list-style-type: none"> <li>Financing solutions exists for building owners to purchase these solutions with minimal upfront cost.</li> </ul> <p><u>Milestone 11 (2025)</u></p> <ul style="list-style-type: none"> <li>Solutions are implemented on non-Affordable Housing buildings without subsidy.<sup>20</sup></li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>Solutions meeting all defined criteria are available for building owners to purchase and install.</li> <li>Financing solutions exist for building owners to purchase these solutions with minimal upfront cost.</li> <li>As a result, a self-sustaining market for retrofit packages exists and NYSERDA financial incentives are no longer needed to implement the retrofits.</li> </ul>

**Relationship to Utility/REV**

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>The investor owned utilities are integral to the initiative and will be involved in the development of the initiative. NYSERDA anticipates having utility representation on each of the working groups to be formed: technical, financing and regulatory. Lessons learned from this effort could also be applied by the New York Power Authority (NYPA), the Long Island Power Authority (LIPA), and PSEG Long Island in their service territories.</li> <li>NYSERDA will also engage utilities on the potential to leverage the work done through RetrofitNY to inform REV Demonstration projects as follows: <ul style="list-style-type: none"> <li>Demonstrate the benefits that deep-energy retrofits can provide to the grid through reduced load in capacity constrained areas, active demand management, peak load reduction, and potential distributed generation opportunities;</li> <li>Help develop new utility revenue streams and business models based on the deep energy retrofit solutions that will be designed and deployed through the initiative; and,</li> </ul> </li> </ul>
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<sup>20</sup> As retrofit solutions become more advanced and cost effective to the point where they can be widely implemented without public subsidy, they will become applicable to a number of building types, including market rate multifamily buildings.

	<ul style="list-style-type: none"> <li>○ Potentially play a central role in developing mechanisms to address owner/tenant split incentive issues.</li> <li>● NYSERDA will work with the CEAC LMI Working Group Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	The New York utilities offer multiple programs to improve the energy efficiency of multifamily affordable housing buildings. However, no utility program currently exists to enable deep energy retrofits as defined for this initiative.

**Fuel Neutrality**

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>● Energy use and carbon emissions associated with heating and hot water represent the majority of potential savings in the multifamily sector. Approximately 75% of the sector relies on gas or oil for heat and hot water.</li> <li>● Except for the 25% of the multifamily buildings across New York State that use electricity for heat, an electric only initiative would not entice the industry to create solutions that will significantly reduce heating and domestic hot water consumption. GHG emissions reduction would therefore be limited.</li> <li>● Offering Retrofit NY on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$105 per ton of carbon, compared to a cost of \$310 per ton of carbon in an electric only scenario.</li> </ul>
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**Performance Monitoring and Evaluation Plans**

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>● The solutions proposed by the industry through the design-build competition will be carefully evaluated. They will be implemented only if there is a strong degree of confidence that they will perform as projected.</li> <li>● The solutions will then be tested on specific buildings through demonstration projects.</li> <li>● The frequency and number of design-build competition rounds and demonstration projects will be adjusted, depending on how the tested solutions perform as compared to the pre-defined criteria to be met.</li> </ul> <p><u>Measurement &amp; Verification (M&amp;V) Strategy</u></p> <ul style="list-style-type: none"> <li>● Validate projected energy performance of the selected industry designed solutions.</li> <li>● Validate energy savings through pre-construction energy consumption assessment of the buildings on which solutions will be tested, at least one (1) year of post-retrofit energy monitoring, and several years of post-retrofit utility bill analysis.</li> <li>● Test and monitor pre-and post-retrofit thermal comfort and indoor air quality.</li> <li>● Assess tenant and building owner satisfaction.</li> </ul> <p><u>Market Evaluation</u></p> <p>Surveys and interviews will be conducted to provide real-time insights and support systematic evaluation of the intervention, including its effectiveness for</p>
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	<p>participating buildings and the number of owners using the solutions available in the market. The effects of NYSERDA’s activities to build up the supply chain of high efficiency components, develop financing solutions, and address the identified regulatory barriers will also be assessed through market evaluation.</p> <p>A sample of multifamily LMI and market rate buildings and industry players will be selected for surveys to determine if barriers to retrofitting multifamily buildings have been overcome.</p> <p><u>Impact Evaluation/Field Verification</u></p> <ul style="list-style-type: none"> <li>• Evaluation M&amp;V will be conducted for a sample of participating buildings, according to the International Performance Measurement &amp; Verification Protocol (IPMVP) method(s) most appropriate given the retrofits made. Evaluation M&amp;V will rely heavily on the program M&amp;V strategy, data, and findings to validate program estimated savings.</li> <li>• Depending on the extent of replication identified in Market Evaluation, impacts will be examined for a sample of replication projects to ascertain the level of savings.</li> <li>• Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</li> </ul>
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15.2.2 REVitalize<sup>21</sup>

Governor Cuomo’s REV initiative is providing New York consumers and communities with new opportunities to participate in their energy future. Policy and regulatory developments such as community distributed generation and Community Choice Aggregation (CCA) will result in the proliferation of DER and provide consumers and communities with unprecedented control over how they use and source energy, including community ownership of DER. However, LMI and environmental justice (EJ) communities often lack the technical expertise and financial resources to plan for, develop, and implement a community-scale clean energy project, preventing these communities from fully taking advantage of the opportunities provided by REV and necessary to realizing its success. In addition, these communities are often disproportionately affected by the risks of climate change and have lacked avenues to address problems of resiliency and environmental justice posed by traditional electric power infrastructure.

**Overview**

<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• Through the REVitalize initiative, NYSERDA will support LMI and EJ communities across the state with the tools and information they need to implement a community-scale clean energy project and participate in a REV-enabled future.<sup>22</sup></li> </ul>
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<sup>21</sup> The Fuel Neutrality section that is included in other CEF Investment Plan Chapters is not included for the REVitalize initiative because it is not relevant for a community-energy planning effort.

<sup>22</sup> As a compliment to the Clean Energy Communities initiative, REVitalize provides an avenue for community-based organizations to receive assistance with the implementation of community-scale clean energy projects, while the Clean Energy Communities initiative is targeting clean energy adoption at the municipal level.

	<ul style="list-style-type: none"> <li>• NYSERDA will issue a competitive Request for Proposals (RFP) for five LMI communities to receive funding for technical assistance<sup>23</sup> for the development of a community planning model and to implement a flagship community-scale clean energy project, such as a community shared solar array or local micro grid.</li> <li>• NYSERDA will also provide toolkits for the communities to use, which will be refined based on the results of the community planning and project implementation efforts.</li> <li>• Results from REVitalize projects will be used to foster technology transfer and replication of planning and implementation processes in similar communities so that best practices are scaled statewide.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: REVitalize,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<p>The primary goals of REVitalize are to:</p> <ul style="list-style-type: none"> <li>• encourage a bottoms-up approach to community energy planning that integrates considerations for the community’s energy needs, e.g., energy affordability, environmental justice, and economic and workforce development;</li> <li>• develop a replicable framework for conducting LMI community energy planning, focused on a cornerstone community-scale clean energy project;</li> <li>• to develop templates and toolkits to aid in the project planning process and ensure best practice adoption statewide; and</li> <li>• identify innovative models for community ownership and finance of DER, which can be applied to similar community energy projects; and build capacity of community-based organizations to carry out local clean energy priorities in the context of REV-enabled programs and projects.</li> </ul>

**Target Market Characterization**

<b>Target Market Segment</b>	The REVitalize initiative will target community-based organizations representing LMI or EJ communities as project leads, who in turn are expected to engage with renewable energy and clean energy service providers to develop and implement a community-based project. LMI customers and communities themselves are also expected to participate in locally-developed energy planning processes funded by REVitalize.
<b>Market Participants<sup>24</sup></b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Community-based organizations</li> <li>• LMI residents and customers</li> <li>• Technical consultants</li> <li>• Project developers</li> <li>• Financiers and foundations</li> </ul>
<b>Market Readiness</b>	The following indicators signal that the REVitalize initiative will have success in spurring clean energy planning and development in LMI and EJ communities:

<sup>23</sup> Technical assistance may include community engagement activities, identification of community energy needs and existing resources, development of the implementation plan and business model, testing of tools, and selection of a project developer.

<sup>24</sup> NYSERDA expects that community-based organizations will organize a proposal for a community energy project and hire a technical consultant to aid in the project planning process, including community engagement activities, identification of community energy needs and existing resources, development of the implementation plan and business model, testing of tools, and selection of a project developer. Project developers will work with the community-based organization and technical consultant to deliver the project, and work to attract interest from the financing and foundation communities to help finance the project.

	<ul style="list-style-type: none"> <li>• Regulatory developments in New York State encourage and allow for community net metering and local ownership of DER;</li> <li>• Community Choice Aggregation is generating significant interest in the development of locally-sourced and owned distributed generation;</li> <li>• The Governor’s Office and NYSERDA have worked with four community-based organizations, the New York City Environmental Justice Alliance, PUSH Buffalo, the Point, and UPROSE, to develop a first phase REVitalize concept for philanthropic funding, which has been awarded to the community groups by the New York Community Trust. New York Community Trust awarded the funding to the community groups in June 2016. Based on their planning process, these community groups will provide feedback and recommendations to NYSERDA for the purposes of informing the further development of REVitalize.</li> <li>• LMI and EJ communities have demonstrated their interest in participating in their clean energy future, as evidenced by their active party status in many of the REV proceedings;</li> <li>• the feasibility phase of NY Prize resulted in 83 proposals, indicating an interest in community-scale energy projects, focused on microgrids;</li> <li>• the RMI eLab LEAP initiative on LMI energy issues drew significant interest from LMI stakeholders and community groups; the concept of LMI community-led clean energy planning and project development was highlighted as a priority for stakeholders.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• While LMI and EJ communities are interested in taking greater control over their energy use and protecting against the risks of climate change, they are often under-resourced and lack the technical expertise to effectively develop and implement a community-scale clean energy project that addresses a wide range of community priorities, from environmental justice to workforce and economic development. Through REVitalize, LMI and EJ community groups will be provided with: <ul style="list-style-type: none"> <li>○ An opportunity to receive funding for the technical assistance necessary to conduct community-level planning and project development; and</li> <li>○ A toolkit to aid in the planning for a community-scale clean energy project; and</li> <li>○ Support to develop models for innovative project finance and ownership.</li> </ul> </li> </ul>

**Stakeholder/Market Engagement**

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA has engaged several market actors on the concept of community-led clean energy planning within LMI and EJ communities, as follows: <ul style="list-style-type: none"> <li>○ As part of the RMI eLab LEAP initiative, stakeholders from across the LMI energy landscape in New York identified the lack of financial resources and technical expertise as the primary barrier preventing community-based organizations from undertaking community-scale energy projects;</li> <li>○ NYSERDA staff engaged several community-based and EJ organizations, including the New York City Environmental Justice Alliance, PUSH Buffalo, the Point, and UPROSE, on the need for community-led energy planning activities and the lack of financial and technical resources available in their communities.</li> <li>○ Philanthropic organizations, such as the New York Community Trust, and the JPB Foundation, have expressed interest in supporting community groups to undertake planning and implementation for a community-scale clean energy project and a desire to leverage NYSERDA’s activities.</li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>• NYSERDA will also utilize the CEAC LMI Working Group to engage with stakeholders, as appropriate.</li> </ul>
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**Theory of Change**

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• Community-based organizations that serve as effective channels to LMI and EJ customers and communities often lack the financial and technical resources to engage in community energy planning, business model and financing development, and project implementation.</li> <li>• The perception among community-based organizations is that the process for planning for and implementing a community-scale clean energy project can be complicated and time consuming.</li> <li>• Finance and ownership models for community-scale clean energy projects are still relatively unknown and untested in the context of LMI and EJ communities.</li> <li>• Tools and resources to aid in the community engagement and planning process are not readily available, or are not crafted with the specific needs of LMI and EJ community groups in mind.</li> </ul>
<p><b>Testable Hypothesis</b></p>	<ul style="list-style-type: none"> <li>• If LMI community based organizations gain access to technical assistance and planning resources for flagship clean energy projects, then those projects are more likely to be implemented.</li> <li>• If a replicable framework for community energy planning and project development, including finance and ownership models, can be developed, then <ul style="list-style-type: none"> <li>○ LMI and EJ communities will be empowered to undertake and implement community-scale clean energy projects, and</li> <li>○ External funding will be invested in clean energy project implementation.</li> </ul> </li> <li>• If NYSERDA-funded templates and standardized tool kits provide an actionable path for community energy planning, then more community-based organizations will undertake community-scale projects and LMI project implementation can be scaled across the state.</li> </ul>
<p><b>Activities</b></p>	<p><u>Provision of technical support.</u></p> <ul style="list-style-type: none"> <li>• Funding will be made available to community-based organizations through a competitive RFP for technical support to undertake community energy planning efforts and develop a community-scale clean energy project. It is expected that funding will be awarded to five community-based organizations through the RFP process.</li> <li>• The technical assistance provided will include support for community engagement processes, assist in identifying the community's energy needs and available resources, and identify possible business models for project ownership and finance, and assist in project implementation.</li> </ul> <p><u>Development of tools and replicable models.</u></p> <ul style="list-style-type: none"> <li>• NYSERDA will develop tools and resources, such as case studies and guides, to aid in the community planning efforts, which will be tested by the five community groups.</li> <li>• Models for finance and community ownership of DER will be developed as a result of the community energy planning and project implementation efforts.</li> </ul> <p><u>Technology transfer of tools and models.</u></p> <ul style="list-style-type: none"> <li>• NYSERDA will open source the tools, resources, and models developed through this initiative.</li> <li>• NYSERDA will conduct technology transfer activities such as hosting webinars, presentations, and working with associations and other channels to communicate the results and potential for community energy projects to LMI or EJ communities, financiers, and project developers.</li> </ul>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2017)</u></p>

	<ul style="list-style-type: none"> <li>Issue a competitive solicitation seeking proposals for a community energy planning effort that benefits LMI communities and residents.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>Selection of five communities to receive financial and technical support, contract development, and contract execution by Q4 2017.</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>Commencement of community planning activities, development of community plan, testing of the toolkit.</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>Community-scale clean energy project development and implementation started.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>NYSERDA receives feedback from community groups and on the toolkit.</li> </ul> <p><u>Milestone 6 (2019)</u></p> <ul style="list-style-type: none"> <li>Completion of five community energy projects.</li> </ul> <p><u>Milestone 7 (2019)</u></p> <ul style="list-style-type: none"> <li>NYSERDA refines toolkit and conducts technology transfer to communicate effective models of finance and ownership, as well as the toolkit.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>Tools and resources to facilitate the planning and development of replicable community-scale energy projects in LMI and EJ communities are developed and widely available.</li> <li>The potential for community-led clean energy planning and project development is realized by community groups, developers, and financiers.</li> <li>The models for project planning, ownership, and finance demonstrated by the five communities are replicated by 75 additional LMI or EJ communities across the state.</li> </ul>

***Relationship to Utility/REV***

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>To effectively plan for a community-energy project, communities will need access to energy data and load characteristics for the community.</li> <li>Utilities will be able to identify preferential sites for community DER projects, based on load characteristics within the utility territory. Based on input from the utilities, NYSERDA will include a preference for projects that provide load reduction and system benefits to the local grid in service of REV policy objectives in the RFP.</li> <li>Utilities may also be able to identify LMI communities or community-based organizations that have an interest in developing a community DER project.</li> <li>NYSERDA will also take advantage of the CEAC LMI Working Group Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	The New York utilities do not have any similar offering to this market.

## Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>NYSERDA's approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>• The tool kits developed will be tested and improved through the five community energy planning projects. The toolkits will be further refined by NYSERDA based on the experiences and results of the communities during implementation phases of REVitalize.</li> <li>• The method of technology transfer will be assessed regularly and adjusted to identify and reach the most LMI and EJ communities.</li> </ul> <p><u>Market Evaluation</u></p> <p>Market Evaluation draws on the theory of change of the related logic model and will include a longitudinal measurement of key progress indicators. In these areas, NYSERDA will first utilize existing information and will fill gaps in information as needed and feasible. NYSERDA will attempt to measure the influence of the technology transfer activities to determine:</p> <ul style="list-style-type: none"> <li>• The number of LMI and EJ communities that undertake community energy planning activities and implement community-scale clean energy projects as a result of the technology transfer; and</li> <li>• The number of LMI customer that benefit from the community-scale clean energy projects supported directly through pilots and that result from the technology transfer activities.</li> </ul> <p><u>Impact Evaluation/Field Verification</u></p> <ul style="list-style-type: none"> <li>• Impact evaluation will involve M&amp;V of the energy impacts of the five community-scale clean energy projects that are supported directly through this pilot, according to the IPMVP method(s) most appropriate given the retrofit design implemented. Data from Field Verification/Impact Evaluation can be used to help lend confidence to the market.</li> </ul>
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### 15.2.3 Low-Income Forum on Energy (LIFE)<sup>25</sup>

The Low-Income Forum on Energy (LIFE) was created in 1998 to provide a venue for the consideration of low-income energy issues during the Public Service Commission's policy shift to a deregulated electric industry. For 18 years, the LIFE initiative has supported information exchange and collaboration amongst the organizations and individuals that serve low-income consumers through a series of efforts including meetings, conferences, webinars, and newsletters. Many of these organizations and individuals serve moderate income consumers as well, so LIFE effectively supports LMI consumers.

The LMI energy landscape in New York State is complex, with nearly 3 million LMI households in New York State, with 2.3 million households considered low-income; several publicly funded programs and initiatives that provide services to these customers; and an expansive network of

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<sup>25</sup> The Fuel Neutrality section that is included in other CEF Investment Plan Chapters is not relevant to the LIFE initiative, as it is an awareness and outreach initiative, and is therefore not included.

service professionals that work to help LMI energy customers make ends meet. In addition, New York’s electricity industry is undergoing a dramatic transformation under Governor Cuomo’s REV initiative. Regulatory and policy changes to the energy marketplace promise new opportunities for energy customers and communities to gain more control over how they use and source energy. However, many LMI customers and service providers are currently unaware of how they can participate in REV and how it will benefit them.

As New York State continues to seek opportunities to improve energy affordability and access to clean energy for LMI customers and communities, the dynamic and expansive LMI landscape warrants a venue for stakeholders to discuss the State’s evolving energy policy, updates to programs, and to share best practices and innovative solutions to serving low-income consumers.

**Overview**

<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• NYSERDA will partner with the NYS DPS to provide a venue for information exchange, hands on workshops, and collaboration amongst individuals and organizations that serve low-income energy customers in a REV enabled clean energy future.</li> <li>• Monthly webinars and newsletters will provide stakeholders with an opportunity for continuous engagement, regional meetings and statewide conferences provide stakeholders with the opportunity to engage in hands-on workshops, information sharing, and networking.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: LIFE: Low-Income Forum on Energy (Education and Awareness Initiative),” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<p>The goals of the LIFE initiative are to:</p> <ul style="list-style-type: none"> <li>• Encourage an interactive exchange of information and collaboration among the programs and resources that serve LMI energy customers.</li> <li>• Provide a venue for service providers and policy makers to learn about emerging energy issues, identify best practices, and provide networking opportunities for those in the low-income energy field.</li> <li>• Identify the full range of low-income energy issues, and best practices and innovative solutions for addressing them.</li> </ul>

**Target Market Characterization**

<b>Target Market Segment</b>	The target market segments include individuals and organizations that either provide service directly to LMI energy customers or administer programs or set policies that have implications for low-income energy customers.
<b>Market Participants</b>	<p>LIFE workshop, webinar, and conference participants include:</p> <ul style="list-style-type: none"> <li>• Social service workers</li> <li>• Utility representatives</li> <li>• Community-based organizations</li> <li>• Advocates</li> <li>• Contractors</li> <li>• Weatherization agencies</li> <li>• Installers</li> <li>• Affordable housing developers</li> <li>• Representatives from local and state government</li> <li>• Program administrators</li> </ul>

<b>Market Readiness</b>	As evidenced by the level of attendance at LIFE events, there is a sustained and growing level of interest from the target market for the information provided. Regional meetings draw an average of 50 attendees and statewide conferences draw over 300 attendees.
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• No other professional development opportunities focused specifically on the breadth of low-income energy issues covered by LIFE currently exist.</li> <li>• According to participant evaluations of the 2016 LIFE Statewide Conference, 89% of respondents would attend a LIFE event in the future and nearly ¾ of the 42 workshops were rated a 4 out of 5. In addition, the following comments were provided by participants: <ul style="list-style-type: none"> <li>○ “The sessions I attended were very informative a lot of information to share with low-income residents.”</li> <li>○ “Thank you for another wonderful LIFE Conference. It is always an inspiring, energizing gathering of committed professionals! Everything was wonderful.”</li> <li>○ “Each year the workshops seem to be getting better and better.”</li> <li>○ “This was the best conference I have attended in several years!”</li> </ul> </li> </ul>

**Stakeholder/Market Engagement**

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• The LIFE contact list contains over 5,000 individuals that represent human service providers, contractors, builders, developers, installers, community-based organizations, state and local government, and program administrators that have indicated an interest in LMI energy issues.</li> <li>• There is great interest in LMI energy issues, in the context of REV, as is evidenced by the active participation of LMI energy and environmental justice stakeholders in the PSC proceedings.</li> <li>• NYSEDA will also utilize the CEAC and the CEAC LMI Working Group to engage with stakeholders, as appropriate.</li> </ul>
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**Theory of Change**

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Knowledge gaps on LMI energy issues among service providers, program administrators, policy makers, and advocates.</li> <li>• A changing energy policy landscape with uncertainty amongst service providers, administrators, policy makers, and advocates.</li> <li>• Limited resources for providing solutions for LMI energy consumers.</li> <li>• Program and resources that are administered independently from one another and often require coordination at the community or household level.</li> <li>• High degree of staff turnover in the human service field and few sources of professional development and education on low-income energy issues available.</li> </ul>
<b>Testable Hypothesis</b>	If a venue for information exchange and collaboration among individuals and organizations that provide services to LMI energy consumers is provided, then knowledge transfer will occur and service providers will increase their knowledge and improve the quality of service provided to LMI energy consumers.
<b>Activities</b>	<p>The activities that will be undertaken through the LIFE initiative include:</p> <ul style="list-style-type: none"> <li>• Develop and host annual conferences and meetings to bring together stakeholders in the LMI energy field to discuss emerging issues, best practices, program updates, and consumer protections.</li> <li>• Host a monthly webinar series to feature content on emerging energy issues, best practices, program updates, and consumer protections.</li> <li>• Develop and distribute an electronic newsletter monthly to highlight LMI energy issues.</li> </ul>



<b>Key Milestones</b>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue a competitive solicitation for program support.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Implement a series of regional meetings across the state in Q2 of 2017.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Implement a statewide conference in Q2 of 2018.</li> </ul> <p><u>Milestone 4 (2019)</u></p> <ul style="list-style-type: none"> <li>• Issue a competitive solicitation for program support or issue a contract extension for existing implementation services.</li> </ul> <p><u>Milestone 5 (2019)</u></p> <ul style="list-style-type: none"> <li>• Implement a series of regional meetings across the state in Q2 of 2019.</li> </ul> <p><u>Milestone 6 (2020)</u></p> <ul style="list-style-type: none"> <li>• Implement a statewide conference in Q2 of 2020.</li> </ul> <p><u>Milestone 7 (2021)</u></p> <ul style="list-style-type: none"> <li>• Implement a series of regional meetings across the state in Q2 of 2021.</li> </ul> <p><u>Milestone 8 (2022)</u></p> <ul style="list-style-type: none"> <li>• Issue a competitive solicitation for program support or issue a contract extension for existing implementation services.</li> </ul> <p><u>Milestone 9 (2022)</u></p> <ul style="list-style-type: none"> <li>• Implement a statewide conference in Q2 of 2022.</li> </ul> <p><u>Milestone 10 (2023)</u></p> <ul style="list-style-type: none"> <li>• Implement a series of regional meetings across the state in Q2 of 2023.</li> </ul> <p><u>Milestone 11 (2024)</u></p> <ul style="list-style-type: none"> <li>• Issue a competitive solicitation for program support or issue a contract extension for existing implementation services.</li> </ul> <p><u>Milestone 12 (2024)</u></p> <ul style="list-style-type: none"> <li>• Implement a statewide conference in Q2 of 2024.</li> </ul>
<b>Goals Prior to Exit</b>	The LIFE initiative will be administered throughout the full term of the CEF. The topics addressed through the forum will continually evolve, based on regulatory and market developments.

***Relationship to Utility/REV***

<b>Utility Role/Coordination Point</b>	<ul style="list-style-type: none"> <li>• All the Investor-Owned Utilities are members of the LIFE Steering Committee and provide insight and guidance on the development of LIFE activities.</li> <li>• Utilities use the initiative as a platform for communicating information on their bill payment assistance and other programs to service providers.</li> <li>• Through their participation in the initiative, utilities can engage and coordinate with the other program administrators and service providers that sit on the Steering Committee.</li> </ul>
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	<ul style="list-style-type: none"> <li>• NYSERDA will also take advantage of work with the CEAC LMI Working Group Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	The New York utilities do not have any similar offering to this market, however all utilities have bill payment programs serving low-income consumers which are integrated into the information sharing conducted through LIFE.

**Performance Monitoring and Evaluation Plans**

<b>Performance Monitoring &amp; Evaluation Plan</b>	To monitor the progress of the LIFE initiative, NYSERDA staff solicit feedback from stakeholders attending LIFE events using participant surveys. Results from the surveys are used to refine the structure of the meetings and to develop content for future meetings. In addition, NYSERDA periodically surveys newsletter recipients and webinar attendees to assess the effectiveness of the outreach.
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15.2.4 Healthy Homes Feasibility Study <sup>26</sup>

Energy, housing, and health services for LMI households and communities are rarely synchronized to realize the potential co-benefits associated with healthy homes interventions, which would include measures such as air sealing and ventilation to improve air quality and control moisture and mold. When implemented, these interventions can improve occupant health, reduce energy bills, and improve the comfort and safety of the home. In addition to the positive outcomes for occupants, statewide administrative efficiencies may be achievable by braiding energy and health program resources in service of joint outcomes, such as reductions in health care costs incurred by Medicaid and administrative costs associated with disparate LMI energy and housing programs.

To facilitate an integrated approach to addressing energy, housing, and health improvements, more work is necessary to quantify and validate the health benefits and healthcare cost savings associated with healthy homes interventions; to evaluate the statewide infrastructure available to deliver an integrated approach; and to assess currently available funding and identify alternative sources of funding that can be used for integrated energy, housing, and health projects. To advance this concept in New York State, NYSERDA will conduct a feasibility study to explore the potential for developing an integrated energy, housing, and health service delivery model for LMI customers in New York.

**Overview**

<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• NYSERDA will conduct a feasibility study to assess the implementation of an integrated energy, housing, and health services delivery model. If the study reveals the potential for a successful implementation of an integrated model, NYSERDA will advance a CEF initiative for funding the implementation of a series of pilots to test the administration of an integrated model and to validate the benefits to the occupants</li> </ul>
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<sup>26</sup> Due to the nature of this initiative, elements described in other CEF Investment Plan Chapters such as: Customer Value Goals Prior to Exit, Utility Intervention in Target Market, Fuel Neutrality, and Performance Monitoring & Evaluation Plan are either addressed through the description of the Feasibility Study or are not relevant and therefore not included.

	<p>and overall return on investment related to healthcare and administrative cost savings.</p> <ul style="list-style-type: none"> <li>• Through this initiative, NYSERDA expects to explore and validate the health benefits and healthcare cost savings associated with clean energy and housing improvements; the identification of options for implementing a statewide energy, housing, and health intervention strategy; and the identification of potential innovative funding mechanisms that could support an integrated model.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Healthy Homes Feasibility Study,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Establish joint energy and health benefits as primary considerations when undertaking an energy or housing improvements in LMI communities.</li> <li>• Reduce the administrative barriers associated with publicly funded energy, housing and health programs to allow for an integrated approach to serving LMI homes with a comprehensive set of energy and housing interventions.</li> <li>• Validate healthcare cost savings and other health impacts associated with an integrated delivery model so that these cost savings are recognized.</li> <li>• Identify additional funding mechanisms, including direct Medicaid funding as well as social impact financing mechanisms, to support an integrated model.</li> </ul>

**Target Market Characterization**

<b>Target Market Segment</b>	The market actors that the feasibility study and potential pilot will target include New York State agencies (NYSERDA, NYS Homes and Community Renewal, and New York State Department of Health), service providers such as energy efficiency and home improvement contractors, affordable housing owners and managers, and medical service providers including hospitals and care providers.
<b>Market Participants</b>	The primary participants in the feasibility study will be NYSERDA, NYS Homes and Community Renewal, and NYS Department of Health. The participation of additional participants in a pilot project – including target communities and participating homes, funders, and service providers - will be determined in the feasibility study.
<b>Market Readiness</b>	A window of opportunity for this initiative has been provided with the New York State Medicaid Redesign Team (MRT) establishing a goal of reducing healthcare costs by 25% by May 2019. Reducing healthcare costs associated with chronic conditions, such as asthma, through healthy home interventions will contribute to the MRT’s goals under the Delivery System Reform Incentive Program (DSRIP).

**Stakeholder/Market Engagement**

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• There are several community-scale pilots across New York State that are working to coordinate existing resources to implement healthy homes improvements for LMI communities. NYSERDA hosts quarterly meetings with the organizations involved in these pilots to understand the barriers and opportunities associated with implementation, which will inform a statewide energy, housing, and health initiative. Feedback from the organizations that are involved in the community-scale pilots indicates that it is time consuming and difficult to coordinate resources that are administered separately. This results in additional administrative time and completion of projects at a slower pace. Furthermore, current pilots lack common measures of success and would benefit from an integrated approach across the state.</li> <li>• The Governor’s Office, HCR and DOH have joined NYSERDA in expressing an interest to explore the feasibility of implementing a statewide energy,</li> </ul>
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	<p>housing, and health initiative. HCR and DOH will be primary partners with NYSEERDA on the feasibility work and any potential pilot that results from the feasibility study.</p> <ul style="list-style-type: none"> <li>• A number of foundations have expressed interest in supporting NYSEERDA's work should the feasibility research justify a pilot intervention.</li> <li>• NYSEERDA will also utilize the CEAC LMI Working Group to engage with stakeholders, as appropriate.</li> </ul>
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**Theory of Change**

<p><b>Market Barriers Addressed</b></p>	<p>The feasibility study will assess the statutory and infrastructure barriers associated with the development of an integrated service delivery model including:</p> <ul style="list-style-type: none"> <li>• New York's Medicaid 1115 Waiver and the state's ability to offer in-home health education via non-clinicians.</li> <li>• Lack of infrastructure to support an integrated energy, housing, and health services delivery model.</li> <li>• Lack of funding to support capital improvements required prior to energy or health interventions.</li> <li>• Lack of skilled workers to deliver a holistic suite of energy and health education services.</li> </ul>
<p><b>Activities</b></p>	<ul style="list-style-type: none"> <li>• Conduct project feasibility research including the identification and assessment of the key opportunities and barriers to the implementation of an integrated health and energy services delivery model in New York and the likelihood of the project's eventual success.</li> <li>• Conduct the following research: <ul style="list-style-type: none"> <li>○ The possibility and likelihood of Medicaid reimbursement for an initial pilot project, including health and energy efficiency home improvements, and the opportunities for a longer-term model.</li> <li>○ Collect medical cost data and energy and housing intervention cost data provided by State of New York agencies.</li> <li>○ Prepare medical cost savings projections and aggregate return on investment calculations for the State of New York for in-home asthma resident education and combined energy efficiency and asthma trigger reduction housing interventions as well as for other housing interventions to reduce home-based environmental health hazards.</li> <li>○ The technical feasibility of the agreed upon prescriptive interventions having the desired benefits in terms of reductions in asthma episodes, asthma related doctor visits, hospitalizations and emergency room visits, reductions in household injuries and other illnesses, reductions in medical and energy costs, or other positive outcomes.</li> <li>○ The economic feasibility of the intervention operation on a per unit basis and at scale based on projections of medical and energy cost-savings derived from medical cost data and housing and energy intervention cost estimates provided by the state agencies.</li> <li>○ Payment mechanism feasibility through various payment mechanisms which may utilize public funds from state Medicaid or others that require federal approval for matching dollars in their use for a pilot or full program operations.</li> <li>○ Project linkage and possible integration with New York State Medicaid Redesign Team (MRT), MRT Supportive Housing Initiative, and New York State DSRIP among other programs.</li> <li>○ Identify and assess other possible funding mechanisms and project resources for preventive health-based housing interventions to reduce</li> </ul> </li> </ul>

	<p>home-based environmental health hazards such as Pay For Success, Social Impact Bonds, Title V funding, Aging in Place Initiatives, etc.</p> <ul style="list-style-type: none"> <li>○ An assessment of current Green and Healthy Homes Initiative (GHHI) projects in New York and elsewhere, as a basis for informing the development of a statewide delivery model.</li> <li>○ Research to assess New York’s capacity to implement a statewide program under which public and private insurers reimburse costs associated with preventive health education and environmental hazard and asthma trigger reduction.</li> <li>○ Research existing health, safety, housing, and energy efficiency programs in New York and make recommendations for inclusion of the programs in a pilot project based upon their available funding; services offered; geographic target areas; client eligibility requirements, compatibility of client enrollment and referral processes as it pertains to coordinating energy, health, and housing programs; contractor accreditation and certification requirements; and contractor and inspector training capacity among other key factors.</li> <li>○ A gap analysis of the data collected by health, safety, housing, and energy efficiency programs intended to identify opportunities to create consistency in data collected to support an integrated health, energy, and housing delivery model.</li> <li>○ Research, in cooperation with NYSERDA, HCR, DOH, and other agencies, additional funding resources that could be leveraged and integrated with a pilot project.</li> <li>● Development of a pilot for testing a statewide integrated service delivery model, based on the findings of the feasibility study.<sup>27</sup></li> </ul>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>● Complete feasibility study and decide on whether to continue with the pilot design and implementation phase.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>● Begin the pilot design phase, if NYSERDA and NYS agency partners decide to go forward.<sup>28</sup></li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>● Pilot design is complete.</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>● Commencement of pilot activities.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>● Preliminary determination of health benefits and healthcare cost savings.</li> </ul> <p><u>Milestone 6 (2021)</u></p> <ul style="list-style-type: none"> <li>● Dissemination of pilot results which may include peer-reviewed papers, presentations at conferences, and a white paper to share with potential long-term funders including Medicaid, HUD, Foundations, and others.</li> </ul>

<sup>27</sup> If NYSERDA and its partners decide to pursue the implementation of a statewide pilot, NYSERDA will file a supplement to this Investment Plan to include specific activities, outcomes, and funding commitments associated with the pilot.

<sup>28</sup> Ibid.

**Relationship to Utility/REV**

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>Utilities are aware of which low-income customers rely on medical or life-sustaining equipment. This information may serve as a way to target homes that are good candidates for a healthy homes improvement. The potential for utility coordination in a healthy homes pilot, including assessing potential customer confidentiality issues, will be assessed in the feasibility study.</li> <li>NYSERDA will utilize the CEAC LMI Working Group and Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in the Target Market</b>	The New York utilities do not have any similar offering to this market.

**15.2.5 Budgets & Expenditures**

An annual commitment budget for all activities included in this chapter is shown in Table 2. The annual expenditure projection is included in Table 3. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only. See Appendix B for a compilation of LMI budgetary allocations for the first three years of the CEF, including the market development initiative budgets presented below as well as the standard offer LMI initiative budgets filled as part of the Resource Acquisition Transition Chapter.

**Table 2: Annual Market Development Budget Allocation – Commitment Basis**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
<b>RetrofitNY</b>											
Direct Incentives and Services	\$0	\$5,525,000	\$5,525,000	\$5,000,000	\$4,400,000	\$3,300,000	\$1,750,000	\$500,000	\$0	\$0	\$26,000,000
Implementation Support	0	\$888,000	\$652,000	\$417,750	\$417,750	\$569,500	\$469,500	\$469,500	\$469,500	\$150,000	\$4,503,500
Sub-Total	\$0	\$6,413,000	\$6,177,000	\$5,417,750	\$4,817,750	\$3,869,500	\$2,219,500	\$969,500	\$469,500	\$150,000	\$30,503,500
<b>REVitalize</b>											
Direct Incentives and Services	\$-	\$325,000	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$325,000
Tools, Training, and Replication	\$-	\$275,000	\$125,000	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$400,000
Sub-Total	\$-	\$600,000	\$125,000	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$725,000
<b>LIFE</b>											
Implementation Support	\$0	\$245,000	\$75,000	\$184,000	\$162,000	\$97,000	\$122,000	\$145,000	\$195,000	\$75,000	\$1,300,000
Sub-Total	\$0	\$245,000	\$75,000	\$184,000	\$162,000	\$97,000	\$122,000	\$145,000	\$195,000	\$75,000	\$1,300,000
<b>Healthy Homes Initiative</b>											

Research and Technology Studies/ Development / Demos	\$-	\$215,000	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$215,000
Sub-Total	\$-	\$215,000	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$215,000
<b>Total</b>	<b>\$-</b>	<b>\$7,473,000</b>	<b>\$6,377,000</b>	<b>\$5,601,750</b>	<b>\$4,979,750</b>	<b>\$3,966,500</b>	<b>\$2,341,500</b>	<b>\$1,114,500</b>	<b>\$664,500</b>	<b>\$225,000</b>	<b>\$32,743,500</b>		

**Table 3: Annual Expenditures Projection**

Expenditures	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total
<b>RetrofitNY</b>	0%	19%	20%	18%	16%	13%	7%	3%	2%	2%	0%	0%	100%
<b>REVitalize</b>	0%	21%	37%	35%	7%	0%	0%	0%	0%	0%	0%	0%	100%
<b>LIFE</b>	0%	10%	11%	11%	10%	9%	10%	12%	10%	10%	7%	0%	100%
<b>Healthy Homes Feasibility Study</b>	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

### 15.2.6 Progress and Performance Metrics

Tables 4 through 7 provide program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in each initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 4. Initiative Specific Metrics- RetrofitNY**

Indicators <sup>29</sup>		Baseline (Before/Current)	2019 (Cumulative)	2025 (Cumulative)
Activity/ Outputs	Number of units committed by affordable housing organizations and private owners	0	50,000	100,000
	Number of valid solutions evaluated by the competition jury	0	5	15
	Funding and financing committed by the private sector	\$0	\$605,000	\$1,410,680,000
	Number of retrofit packages tested through pilots	0	1	4
	Number of units retrofitted or in the pipeline	0	430	100,000
Outcomes	Number of cost effective retrofit solutions available in the market	0	0	2 or more

<sup>29</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

**Table 5. Initiative Specific Metrics- REVitalize**

<b>Indicators<sup>30</sup></b>		<b>Baseline (Before/Current)</b>	<b>2019 (Cumulative)</b>	<b>2025 (Cumulative)</b>
Activity/ Outputs	Number of LMI and EJ communities undertaking clean energy planning efforts	0	5	80
	Number of toolkits developed to reduce the learning curve associated with community energy planning in LMI and EJ communities	0	1-3	1-3
Outcomes	Use of tools by LMI and EJ communities in community energy planning	0	1-3	1-3
	Reduction in time necessary to plan and implement a community-scale clean energy project in LMI and EJ communities	1-2 years	6-12 months	6-12 months
	Number of LMI/EJ customers benefitting from community-scale clean energy projects	0	1,000	16,300

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<sup>30</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.



**Table 6. Initiative Specific Metrics- Low-Income Forum on Energy**

Indicators		Baseline (Before/Current)	2019 (Cumulative)	2025 (Cumulative)
Activity/ Outputs	Number of meetings and conferences	1 conference every other year and 7 annual meetings occurring in the alternate years	1 conference and 14 regional meetings	4 biennial conferences and 35 regional meetings
	Number of monthly webinars completed	10 per year	33	93
	Number of monthly newsletters circulated	10 per year	33	93
Outcomes	Number of organizations participating in LIFE initiatives on an annual basis	456	1,317	3,951
	Number of individuals participating in LIFE initiatives on an annual basis	748	2,522	7,629
	Number of unique organizations participating in LIFE initiatives on an annual basis	300	900	2,700
	Number of unique individuals participating in LIFE initiatives on an annual basis	504	1,667	4,536

**Table 7. Initiative Specific Metrics- Healthy Homes Feasibility Study**

Indicators		Baseline (Before/Current)	2019 (Cumulative)	2025 (Cumulative)
Activity/Outputs	Feasibility Study	0	1	1

Benefits shown in Tables 8 through 10 are direct, near term benefits associated with the LMI initiatives.<sup>31</sup> These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. See Appendix C for a compilation of LMI direct impacts for the first three years of the CEF, including the market development initiative impacts presented below as well as the standard offer LMI initiative impacts filled as part of the Resource Acquisition Transition Chapter.

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<sup>31</sup> Due to the nature of the Low-Income Forum on Energy and the Healthy Homes Initiatives, they do not have attributable direct impacts.

**Table 8. Direct Impacts - Retrofit NY**

Primary Metrics <sup>32</sup>		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Energy Efficiency	MWh Annual	-	-	270	342	743	1,620	17,600	37,800	56,700	72,000	187,100
	MWh Lifetime	-	-	5,400	6,840	14,900	32,400	351,000	757,000	1,130,000	1,440,000	3,742,000
	MMBtu Annual	-	-	4,840	6,130	13,300	29,100	315,000	678,000	1,020,000	1,290,000	3,354,000
	MMBtu Lifetime	-	-	96,900	123,000	266,000	582,000	6,300,000	13,600,000	20,400,000	25,800,000	67,130,000
	MW	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	419	530	1,150	2,510	27,200	58,600	88,000	112,000	291,000
CO2e Emission Reduction (metric tons) Lifetime		-	-	8,380	10,600	23,000	50,300	545,000	1,170,000	1,760,000	2,230,000	5,800,000
Customer Bill Savings Annual (\$ million)		\$0	\$0	\$0.08	\$0.10	\$0.22	\$0.49	\$5.3	\$11	\$17	\$22	\$56
Customer Bill Savings Lifetime (\$ million)		\$0	\$0	\$1.6	\$2.1	\$4.5	\$10	\$105	\$227	\$340	\$432	\$1,122
Private Investment (\$ million)		\$0	\$0	\$0	\$0.6	\$2.6	\$6.2	\$77	\$210	\$450	\$664	\$1,411

<sup>32</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

**Table 9. Direct Impacts - REVitalize**

Primary Metrics <sup>33</sup>		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-	-	-	-
	MMBTU Annual	-	-	-	-	-	-	-	-	-	-	-
	MMBTU Lifetime	-	-	-	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	1,760	1,230	-	-	-	-	-	-	-	2,994
	MWh Lifetime	-	35,200	24,700	-	-	-	-	-	-	-	59,880
	MW	-	1.4	1	-	-	-	-	-	-	-	2.4
CO2e Emission Reduction (metric tons) Annual		-	926	649	-	-	-	-	-	-	-	1,575
CO2e Emission Reduction (metric tons) Lifetime		-	18,500	13,000	-	-	-	-	-	-	-	31,500
Customer Bill Savings Annual (\$ million)		\$-	\$ .28	\$ .20	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$ .48
Customer Bill Savings Lifetime (\$ million)		\$-	\$ 5.56	\$ 3.90	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$ 9.46
Private Investment (\$ million)		\$-	\$ 3.75	\$ 2.13	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$ 5.88

<sup>33</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

**Table 10. Annual Projected Initiative Participation**

Initiative	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
RetrofitNY	Number of units retrofitted	-	170	170	200	500	1,000	10,000	20,000	30,000	37,960	100,000
REVitalize <sup>34</sup>	Number of communities undertaking clean energy projects	-	5	-	-	-	-	-	-	-	-	5
LIFE	Number of individuals reached	187	763	778	794	810	826	842	859	876	894	7,629
Healthy Homes Feasibility Study	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Benefits shown in Tables 11 and 12 represent the estimated indirect market effects expected to accrue over the longer term as a result of these investments and follow on market activity.<sup>35</sup> The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 11. Estimated Indirect Market Impact - Retrofit NY**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	28,400	407,000
	MMBTU Cumulative Annual	-	509,000	7,290,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual			44,000	630,000

**Table 12. Estimated Indirect Market Impact - REVitalize**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTU Cumulative Annual	-	-	-
Renewable Energy	MWh Cumulative Annual	18,000	44,900	44,900
	MW	14	36	36
CO2e Emission Reduction (metric tons) Cumulative Annual		9,450	23,600	23,600

<sup>34</sup> NYSERDA expects that an additional 75 community energy projects will be supported through replication.

<sup>35</sup> The Low-Income Forum on Energy and Healthy Homes Initiative do not have attributable indirect energy impacts.

## 15.3 Standard Offer Programs

### 15.3.1 Single Family LMI Residential

NYSERDA's Single Family Residential Low-to-Moderate Income Program (Single Family LMI Program) standard offer program initiative was originally described in the Resource Acquisition Transition Chapter. As LMI efforts will be continuing beyond the near-term timeframe outlined in that chapter, the initiative has been moved here to provide a comprehensive picture of NYSERDA's LMI activities. The program has also been extended through 2021, with corresponding budget and benefit increases.

The values in the budget and performance sections have been updated to reflect 2016 actuals, as well as updating the timing for the overall budget and performance metrics to reflect actual program uptake rates. Additional funding has been added for increased projects for both low income and moderate income based on increasing demand, and to meet Governor Cuomo's goal of serving 20,000 low income households in 2017. Additional funding has also been added to support improved data management and program evaluations as well as consumer education and awareness activities. Overall MWh and MMBTU savings are expected to increase in accordance with this increase in funding, and the revised benefit values are reflected herein.

The Single Family LMI Program will build on and replace the EmPower NY and Assisted Home Performance with ENERGY STAR programs administered under EEPS and RGGI to provide incentives that address the first cost barrier for low and moderate-income customers to reduce their energy consumption and improve the health, safety, and comfort of their homes. The low-income component (defined as less than 60% of the State Median Income) provides no-cost electric reduction and home performance measures. In-home energy-use education provides customers with additional strategies for managing their energy costs. If the Program determines that additional measures are needed beyond the no-cost services, then cost-shared measures may be available through the low-income program component. Currently, cost-shared measures are available to low income customers through the moderate-income program.

The moderate-income component (defined as up to 80% of the State or Area Median Income, whichever is higher) provides cost-sharing for approved electric reduction and home performance measures that are chosen by the homeowner.

NYSERDA will merge the administration of the two existing programs to provide a more seamless experience for customers as they seek to qualify for incentives based on their income. NYSERDA will also align program technical and performance standards and will meet requirements of the national Home Performance with ENERGY STAR® program. NYSERDA is a sponsor of the Home Performance with ENERGY STAR Program, which helps homeowners improve the energy efficiency and comfort of their homes by using a whole house diagnostic approach to identify and address needed building shell, heating and cooling system, lighting and appliance improvements, while addressing energy-related health and safety needs of the building occupants.

**Overview**

<p><b>Intervention Strategy</b></p>	<p>The Program uses a network of home performance contractors designated as Gold Star Contractors by the Building Performance Institute to complete home energy audits, which includes diagnostic testing and an inventory of the home’s current conditions. The audit allows the contractors to recommend energy efficiency upgrades that are comprehensive, and that maximize the energy savings in each home. Participating contractors are trained and certified to complete the audit and energy efficiency upgrades.</p> <p>For the Low-Income component, and based on the customer’s energy usage and energy audit, the program will determine which measures are installed in the home at no-cost. Additional measures may be needed and offered to the customer with a cost share.</p> <p>For the Moderate-Income component, the participating contractor will recommend energy efficiency, health, and safety improvements to the homeowner. The Program will share the cost of approved measures selected by the customer, with the incentive being paid directly to the contractor to reduce the customer’s contract amount.</p> <p>Funding for incentives will be provided on a first-come, first-served basis.</p> <p>For the Low-Income component, utilities will send referrals to NYSERDA for enrollment. Contractors and other organizations- such as constituency-based organizations, community action agencies, local government agencies, weatherization agencies, and neighborhood housing services- may also bring customers to the Program as funding is available.</p> <p>The Moderate-Income component will be open-enrollment for customers as funding is available.</p>
<p><b>Goals</b></p>	<p>The Single Family LMI Program is designed to reduce the energy use burden (percentage of the household income spent on energy bills) on lower to moderate income households and to capture heating fuel and electricity-related savings in the State’s existing one-to-four family and low-rise multifamily residential buildings.</p> <p>The low-income portion of the program is a critical component of Governor Cuomo’s goal of serving 20,000 low income households with weatherization work in 2017.</p>

**Target Market Characterization**

<p><b>Target Market Segment(s)</b></p>	<p>The target market includes owners and renters of one-to-four family and low-rise residential buildings.</p> <p>The Low-Income component is available to households with income at or below 60% of State Median Income (SMI), or that participate in a utility payment assistance program, that have demonstrated high energy usage or a health, safety, or comfort need that can be addressed through energy efficiency upgrades. Participants must be New York State electricity distribution customers of a participating utility company who pay into the SBC or for 2016, Keyspan Energy Delivery Long Island (KEDLI) customers.</p> <p>The Moderate-Income component is available to households with income up to 80% of Area Median Income (AMI) or SMI, whichever is higher, and that are New York State electricity distribution customers of a participating utility company who pay into the SBC.</p>
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	Projects must include measures approved by NYSERDA and deemed to be cost effective or have important health, safety, or comfort benefits. Projects must be installed by a participating home performance contractor designated a GoldStar Contractor by the Building Performance Institute, and must follow all applicable codes, standards and laws.
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• Independent Home Performance Contractors: Customer recruitment, energy audits, installation, program paperwork and documentation submissions, installation oversight.</li> <li>• Utilities: Provide referrals of low income participants who need energy efficiency services.</li> <li>• Community groups and human services organizations: Provide referrals of LMI participants who need energy efficiency services.</li> <li>• Implementation contractors: Customer eligibility review and application processing, review of project submissions for technical and eligibility review, incentive processing</li> <li>• Software support: Maintains program management database for project processing, automated to the extent possible, and program tracking</li> <li>• Technical support: Technical support for contractors (desk audit and limited field support)</li> <li>• Standards &amp; Quality Assurance: Support industry standards development, conduct field verification of completed projects</li> <li>• Marketing contractor: Development of branded programmatic materials, communications strategies, and technical transfer efforts, e.g. case studies, press releases, etc.</li> </ul>
<b>Market Readiness</b>	The Single Family Residential LMI Programs have been in existence for many years and there are more than 200 qualified contractors providing energy efficiency services through the Program. They continue to be willing and eager to participate in this offering.
<b>Customer Value</b>	Customers who participate in the program receive the benefits of reduced energy bills and increase comfort in their homes.

**Stakeholder/Market Engagement**

<b>Stakeholder/Market Engagement</b>	NYSERDA regularly engages with the network of participating contractors and other stakeholders to continuously improve administrative processes for easy participation and to lower implementation costs. NYSERDA works closely with sister agencies to provide information about the LMI energy efficiency offerings.
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**Theory of Change**

<b>Market Barriers Addressed</b>	<b>Financial barriers.</b> As mentioned in the opening of this chapter, many of the more than 3 million LMI households in the State spend a disproportionate share of their annual income on energy bills relative to higher income New Yorkers, and lack the financial resources, including credit profiles, to invest in energy efficiency upgrades. This program provides financial support to overcome those first cost and incremental cost barriers.
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If financial support is provided to LMI customers, then it will enable them greater access to energy efficiency and associated co-benefits, reducing their energy use and preserving affordability.</li> </ul>

<p><b>Activities</b></p>	<p>For the initial 6-month period through August 2016, the program incentive offerings included the incentives offered under the legacy incentive programs including:</p> <ul style="list-style-type: none"> <li>• For Low Income: <ul style="list-style-type: none"> <li>○ A free home energy audit</li> <li>○ No cost or low cost electric reduction, home performance, and health and safety measures</li> <li>○ Consumer education and energy savings tips</li> </ul> </li> <li>• For Moderate Income: <ul style="list-style-type: none"> <li>○ A free home energy audit</li> <li>○ Consumer incentive of 50% of the cost of the approved energy efficiency measures, up to \$5,000 for a single-family unit, or \$10,000 for a qualified building with two to four units</li> <li>○ Contractor incentive of 5% of the cost of the approved energy efficiency measures</li> <li>○ Contractor incentive of 2% of the cost of approved energy efficiency measures that are referred to another participating contractor of a different trade</li> <li>○ Contractor incentives for targeted electric reduction measures</li> <li>○ Midstream contractor incentives including – Cooperative advertising, equipment incentives, BPI certification and accreditation reimbursement</li> </ul> </li> </ul> <p>On September 1, 2016, the following incentives were retired for the moderate-income component of the program:</p> <ul style="list-style-type: none"> <li>• Contractor incentive of 2% of the cost of approved energy efficiency measures that are referred to another participating contractor of a different trade</li> <li>• Contractor incentives for targeted electric reduction measures</li> <li>• Midstream contractor incentives including – Cooperative advertising, equipment incentives, BPI certification and accreditation reimbursement</li> </ul> <p>NYSERDA implemented the first set of programmatic changes, described below in the Fall of 2016. These changes include: Retirement of the incentives described above</p> <ul style="list-style-type: none"> <li>• Updated pricing for low income services offered at no cost to the customer (effective September 2016)</li> <li>• Reduced incentive structure for moderate income services to \$4,000 for a single-family home and \$8,000 for a 2-4 family home. (effective October 2016)</li> <li>• Streamlined application and project approval processes (additional changes are anticipated to be completed mid 2017)</li> </ul> <p>The effectiveness of efficiency measures and incentives will be evaluated regularly and adjusted as appropriate to best serve the LMI market. Further changes to incentive levels will be announced at least 90 days in advance of implementation.</p> <p>The Program is also supported by the Green Jobs – Green New York Residential Financing Program Customers may also be eligible for incentives for the installation of rooftop solar PV through the Affordable Solar program. NYSERDA staff is actively seeking opportunities to cross promote the solar and efficiency programs, integrating them where possible.</p>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1(2017)</u></p> <ul style="list-style-type: none"> <li>• Host regional contractor meetings to gather stakeholder input</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Competitive solicitation for technical implementation services</li> </ul> <p><u>Milestone 3 (2017)</u></p>



	<ul style="list-style-type: none"> <li>Deploy new low-income referral tracking database</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>Update policies and procedures manual</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>Host regional contractor meetings to gather stakeholder input</li> </ul>
<b>Goals Prior to Exit</b>	Due to the nature of this work and the societal benefits it provides, NYSERDA envisions continuing to pursue this effort for the duration of the CEF or until the need is met by other market participants.

***Relationship to Utility/REV***

<b>Utility Role/Coordination Points</b>	<p>Through EmPower NY, NYSERDA has served as the default provider for low-income energy efficiency services. Utilities refer their payment-troubled low-income customers to EmPower NY for energy efficiency services and in most cases, these customers are also enrolled in the utility rate discount program. NYSERDA expects to continue to receive customer referrals for low-income energy efficiency services and will work with the utilities and New York State Department of Public Service (DPS) Staff to enhance the current referral process with the goal of increasing the impact of utility referrals regarding reducing customer’s energy bills and level of arrears, where applicable.</p> <p>NYSERDA will also work with the utilities to assess the current approaches for providing clean energy services to low-income customers and explore alternate approaches to improve the value of the services to the customer.</p> <p>Additionally, the NY Home Performance Portal offers a flexible project tracking and management tool that is available to participating contractors, customers, CBOs, implementation contractors and financing providers. We will explore offering utilities access to the portal to manage participation of referrals and monitor program participation. This would ensure that customer incentives are not provided on the same measure by both NYSERDA and the utility.</p> <p>As the default provider for low-income energy efficiency services, NYSERDA has relied on utility referrals to identify customers in need of energy efficiency services through EmPower NY. The balance of the projected households served will be referred from several sources including local Departments of Social Service, Offices for the Aging, community-based organizations, and energy efficiency and weatherization contractors.</p>
<b>Utility Interventions in Target Market</b>	NYSERDA’s Program is the primary provider of residential LMI energy efficiency services in CEF territory. Various utilities are considering options serve the LMI sector. NYSERDA will work with utilities on opportunities to coordinate offerings.

***Fuel Neutrality***

<b>Fuel Neutrality</b>	Consistent with the CEF, NYSERDA intends to offer the Single Family Residential Low- to-Moderate Income program in a fuel neutral manner, offering incentives to encourage more efficient use of all fuel types. This will help develop the market at the scale needed to achieve New York State’s clean energy goals. Offering the program on a fuel neutral
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	basis will allow us to achieve a ton of carbon savings at a cost of \$3,059, compared to a cost of \$3,157 in an electric only scenario. <sup>36</sup>
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**Performance Monitoring and Evaluation Plans**

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>Overall, NYSERDA will regularly review program participation and project performance to determine whether changes in incentives or eligible projects are needed to improve efficacy of program implementation. In addition to program metric and performance tracking, stakeholder input will be solicited and discussed on a periodic basis.</p> <p><b><u>Test-Measure Adjust Strategy</u></b></p> <p>It is anticipated that quality assurance will be provided at a 15% inspection rate for Low Income home performance services and moderate-income home performance services, and a 10% inspection rate for low-income, electric reduction only services. Contractors with high quality scores and who prove to have well defined and effective internal quality assurance and quality control practices may benefit from a lower inspection rate. The Program average inspection rate will not be reduced to less than 5%</p> <p><b><u>Program M&amp;V</u></b></p> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation will include baseline and longitudinal measurement of key indicators of programmatic and broader market success.</li> <li>• Baseline measurements of key market indicators will occur within one year following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These include but are not limited to: number of households served and consumer education activities developed.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: reduced energy use burden on LMI households and increased comfort in their homes.</li> <li>• Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul> <p><b><u>Impact Evaluation /Field Verification</u></b></p> <p>Evaluation M&amp;V will be conducted according to the International Performance Measurement and Verification Protocol (IPMVP) method(s) most appropriate.</p> <ul style="list-style-type: none"> <li>• For projects receiving direct incentives, an independent evaluation effort will verify energy benefits using methods such as pre/post billing analysis (IPMVP Option C). Billing analysis typically includes a census of customers whose utility usage data meets the requirements of the analysis method (e.g., adequate number of actual meter reads during the pre-and post-periods). Where methods other than or in addition to</li> </ul>
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<sup>36</sup> The electric reduction component of the LMI residential program offers targeted electric reduction measures, such as lighting and appliances, to households with high electric usage. Historic program data on low income electric reduction projects was used in this analysis.

	<p>billing analysis are used, a sampling approach is expected to be employed.</p> <ul style="list-style-type: none"> <li>To draw a sample and conduct an analysis that is representative and robust, evaluation M&amp;V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&amp;V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&amp;V review work and rolling M&amp;V samples are two such strategies that may be applied, as appropriate to the program, in developing M&amp;V plans.</li> <li>Consideration will be given to determining the adoption rate of recommended measures for those customers receiving an audit but who do not go through NYSERDA's incentive program. Methods would include surveys and potentially site visits of a sample of program participants.</li> </ul> <p>Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</p>
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### 15.3.1.1 Budgets & Expenditures

An annual commitment budget for all activities is shown in Table 13. The annual expenditure projection is included in Table 14. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only. See Appendix B for a compilation of LMI budgetary allocations for the first three years of the CEF.

**Table 13: Annual Market Development Budget Allocation – Commitment Basis**

Budget		2016	2017	2018	2019	2020	2021	Total
SFR Low Income	Direct Incentives and Services	\$21,885,276	\$33,000,000	\$33,000,000	\$23,170,000	\$23,170,000	\$23,170,000	\$157,395,276
	Implementation Support	\$1,411,601	\$8,483,750	\$100,000	\$790,119	\$790,110	\$790,110	\$12,365,699
	Sub-Total	\$23,296,877	\$41,483,750	\$33,100,000	\$23,960,119	\$23,960,119	\$23,960,110	\$169,760,975
SFR Moderate Income	Direct Incentives and Services	\$7,473,933	\$11,835,000	\$11,835,000	\$7,219,200	\$7,219,200	\$7,219,200	\$52,801,533
	Implementation Support	\$431,747	\$4,591,250	\$400,000	\$425,449	\$425,449	\$425,449	\$6,699,344
	Sub-Total	\$7,905,680	\$16,426,250	\$12,235,000	\$7,644,649	\$7,644,649	\$7,644,649	\$59,500,877
Total		\$31,202,557	\$57,910,000	\$45,335,000	\$31,604,768	\$31,604,768	\$31,604,759	\$229,261,852

NYSERDA intends to monitor progress of the LMI portfolio and will actively consider adjustments for the years 2017 and 2018 to maintain best production and effectiveness.

**Table 14: Annual Expenditures Projection**

Expenditures	2016	2017	2018	2019	2020	2021	2022
<b>Total</b>	9%	22%	22%	22%	14%	6%	5%

### 15.3.1.2 Progress and Performance Metrics

Benefits shown in Tables 15 and 16 are direct, near term benefits associated with the LMI initiatives. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. See Appendix C for a compilation of LMI direct impacts for the first three years of the CEF.

**Table 15. Direct Impacts - Low Income**

Primary Metrics		2016	2017	2018	2019	2020	2021	TOTAL
Energy Efficiency	MWh Annual	3,760	6,030	6,030	4,600	4,600	4,600	29,620
	MWh Lifetime	56,400	90,400	90,400	69,100	69,100	69,100	444,500
	MMBTU Annual	111,000	144,000	144,000	110,000	110,000	110,000	729,000
	MMBTU Lifetime	2,770,000	3,610,000	3,610,000	1,660,000	1,660,000	1,660,000	14,970,000
	MW	-	-	-				-
Renewable Energy	MWh Annual	-	-	-				-
	MWh Lifetime	-	-	-				-
	MW	-	-	-				-
CO2e Emission Reduction (metric tons) Annual		8,220	11,300	11,300	8,650	8,650	8,650	56,750
CO2e Emission Reduction (metric tons) Lifetime		186,000	251,000	251,000	130,000	130,000	130,000	1,078,000
Customer Bill Savings Annual (\$ million)		\$1.94	\$2.70	\$2.70	\$2.07	\$2.07	\$2.07	\$13.55
Customer Bill Savings Lifetime (\$ million)		\$ 42.5	\$58.0	\$58.0	\$31.0	\$31.0	\$31.0	\$251.5
Private Investment (\$ million)		\$-	\$0.75	\$1.5	\$1.15	\$1.15	\$1.15	\$5.69

**Table 16. Direct Impacts – Moderate Income**

<b>Primary Metrics</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	1,190	789	790	489	489	489	4,236
	MWh Lifetime	17,800	11,800	11,900	7,340	7,340	7,340	63,520
	MMBTU Annual	57,400	58,300	58,300	36,100	36,100	36,100	282,300
	MMBTU Lifetime	1,440,000	1,460,000	1,460,000	542,000	542,000	542,000	5,986,000
	MW	-	-	-				-
Renewable Energy	MWh Annual	-	-	-				-
	MWh Lifetime	-	-	-				-
	MW	-	-	-				-
CO2e Emission Reduction (metric tons) Annual		3,890	3,700	3,700	2,290	2,290	2,290	18,160
CO2e Emission Reduction (metric tons) Lifetime		91,300	86,900	87,000	34,400	34,400	34,400	368,400
Customer Bill Savings Annual (\$ million)		\$0.89	\$0.83	\$0.83	\$0.51	\$0.51	\$0.51	\$4.08
Customer Bill Savings Lifetime (\$ million)		\$20.4	\$19.5	\$19.5	\$7.7	\$7.7	\$7.7	\$82.50
Private Investment (\$ million)		\$9.5	\$8.7	\$8.7	\$5.4	\$5.4	\$5.4	\$43.06

**Table 17. Annual Projected Initiative Participation**

<b>Additional Performance Tracking Metrics</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
Participants	Low Income <sup>37</sup>	7,636	10,781	10,781	8,250	8,250	8,250	53,948
	Moderate Income	1,884	2,429	2,430	1,505	1,505	1,505	11,258
	Total	9,520	13,210	13,211	9,755	9,755	9,755	65,206

<sup>37</sup>Includes both projects focused on electric reduction only and home performance services.

### 15.3.2 LMI Multifamily

The LMI Multifamily initiative was originally described in the Resource Acquisition Transition Chapter. As LMI efforts will be continuing beyond the near-term timeframe outlined in that chapter, the initiative has been moved here to provide a comprehensive picture of NYSERDA’s LMI activities.

The Multifamily Performance Program (MPP) – LMI did not meet its 2016 projected targets. Programmatic changes reflected herein include the removal of targeted option due to lack of customer interest and a modification of the comprehensive option incentive level and minimum savings threshold to better align with LMI market needs.

The Targeted Option was intended to help owners of market rate buildings implement single measure upgrades that were not incentivized through energy efficiency programs offered by utility companies. However, as evidenced by lack of participation and customer interest in this program component, this program is not aligned with current customer needs. As such, NYSERDA is eliminating the Targeted Option.

The Comprehensive Option will continue with modifications. A significant risk to LMI projects is access to capital. NYSERDA worked with the market to identify a minimum level of support and will initially increase the incentive level to support a larger portion of project cost to support the needs of the LMI community. NYSERDA will adjust the incentive level based on market reaction. NYSERDA will also decrease lower the program’s minimum savings threshold. Market feedback highlighted a risk associated with the previous 25% savings threshold target and impacts to scope changes during the life of a project. NYSERDA has decreased the savings threshold to increase the potential market opportunity for participation and reduce the risk associated with scope change during the life of a project. The High-Performance Offering will remain to support deeper and comprehensive energy retrofits that are not currently supported by utility programs. However, due to a later than anticipated program launch, budgets and benefits have been adjusted out in time. In addition, NYSERDA may offer this component through either through a competitive or an open enrollment solicitation based on additional market intelligence currently being gathered by program staff.

NYSERDA is also adding funding to support the Solutions Provider Network. As noted in the original filing, the Providers work with building owners and NYSERDA to act as program liaisons to design and implement projects. The funding added is necessary to support the Provider Network in its current state to maintain support for the MPP Comprehensive Program.

#### **Overview**

<b>Intervention Strategy</b>	The Multifamily Performance Program (MPP) – Low-to-Moderate Income (LMI) will continue under the CEF. MPP will continue to seek to address first cost barriers experienced by owners of low-to-moderate income properties, reduce the disparity between LMI and market-rate properties in terms of awareness of and access to energy efficient solutions, and provide foundational support for the launch of various CEF market transformation initiatives. This version of MPP will include two (2) components designed to specifically target certain objectives: <ul style="list-style-type: none"><li>• A Comprehensive Option that will support scopes of work designed to achieve a minimum threshold of whole-building source energy savings. NYSERDA-approved</li></ul>
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	<p>energy consultants will work with building owners to identify the most appropriate building improvements to achieve the minimum reduction target. NYSERDA will review the proposed improvements to ensure that the savings and cost projections are reasonable and that the owner can feel confident in the outcome of the project. The Comprehensive Option is expected to:</p> <ul style="list-style-type: none"> <li>○ Continue providing support for comprehensive projects as a means of supporting the previously developed delivery infrastructure and encouraging building owners to consider holistic solutions to their building’s needs.</li> <li>○ Recognize past market achievements by encouraging deeper building savings.</li> <li>○ Increase private investment in energy efficiency projects by increasing minimum performance targets and moderating program incentives.</li> <li>● A High-Performance Offering that will support deep energy retrofit projects by offering significant incentives capped at 50% of the project cost. Owners will work with NYSERDA- approved energy consultants to help assess their building and develop a proposal that meets the requirements of the Program. This Option is expected to: <ul style="list-style-type: none"> <li>○ Create new opportunities for cutting edge building owners and energy professionals to demonstrate deep energy retrofit possibilities in existing multifamily buildings.</li> <li>○ Gain experience with deep energy projects that can be used to encourage greater adoption of successful strategies and efforts.</li> <li>○ Collect data to highlight successful deep energy projects to convince building owners, regulatory agencies, and financial institutions about the benefits and performance of deep energy projects.</li> </ul> </li> </ul> <p>This program is expected to run through the end of 2021 or until all funds are committed. This program is a continuation of the current MPP with modifications to the incentive schedule previously offered by the Program.</p> <p>The Comprehensive Option will be delivered through a network of Multifamily Building Solution Providers. This network builds upon the previous Multifamily Performance Partner Network and will include energy firms, consultants, engineering firms, and others vetted and pre-approved by NYSERDA. These firms will be selected through an open, on- going application process and building owners will be required to use a network Provider to participate in the Comprehensive Option. The High-Performance Offering will also be delivered through network Providers who will be responsible for identifying and assessing potential applicants to this offering.</p> <p>The Comprehensive Option will be open-enrollment. Funding will be provided on a first-come first-served basis. The High-Performance Offering may l be offered through either a competitive solicitation requesting proposals or as an open-enrollment solicitation for deep energy retrofit projects. These proposals will be reviewed and selected by a Technical Evaluation Panel for compliance with the solicitation and audit of the merits of the project.</p>
<b>Goals</b>	<ul style="list-style-type: none"> <li>● The overall goal of this initiative is to create a self-sustaining market for energy retrofits in New York State to ensure the mass implementation of energy retrofit solutions across building types and different housing market segments. Sub-goals are: <ul style="list-style-type: none"> <li>○ To ensure that affordable housing is prioritized when it comes to developing solutions for enabling the adoption of clean energy solutions.</li> <li>○ To assist with the development of financing mechanisms and new business models enabling building owners to purchase these solutions with little to no upfront costs.</li> <li>○ To identify and address any regulatory issues that could hinder the implementation of the solutions.</li> </ul> </li> </ul>

## Target Market Characterization

<p><b>Target Market Segment(s)</b></p>	<ul style="list-style-type: none"> <li>• The target market includes multifamily building owners and management companies of low-to- moderate income properties, as defined on NYSERDA’s Comprehensive website.<sup>38</sup> The various components are designed to support multiple sub- segments of the multifamily market, i.e. building owners interested in comprehensive building improvements and those building owners who want to push the envelope of possible existing building energy retrofits.</li> <li>• Eligible participants include low-to-moderate income, existing multifamily buildings consisting of five (5) or more units, who are New York State electricity distribution customers of a participating utility company who pay into the SBC. Projects will be deemed income eligible if they meet the definition described above or meet the requirements of a number of low-to-moderate income proxies found in the program guidelines on the NYSERDA website,<sup>39</sup></li> <li>• Specific to the Comprehensive Option, a project that agrees to install any set of building improvements that collectively achieve a minimum threshold whole-building source energy savings will be eligible to receive the MPP incentive. If any of the measures included in that set of improvements receive incentives under another program (either NYSERDA or utility), the value of that incentive will be deducted from the MPP Comprehensive Option incentive. Applications may only be initiated by a Multifamily Building Solutions Provider chosen by the building owner.</li> <li>• Solutions Providers are approved by NYSERDA through an objective, open application process based on a firm’s multifamily experience, energy efficiency and building science expertise, and demonstration of general sound business practices.</li> <li>• For the High-Performance Offering, projects will be selected based on a variety of criteria including, but not limited to, the cost-effectiveness of the project, the depth of the projected energy savings, and its potential impact on the knowledge gained regarding deep energy, existing building retrofits. If any of the measures included in a project proposal receive incentives under another program (either NYSERDA or utility), the value of that incentive will be deducted from the MPP High Performance Offering incentive.</li> </ul>
<p><b>Market Participants</b></p>	<ul style="list-style-type: none"> <li>• New York State multifamily building owners</li> <li>• Multifamily Building Solutions Providers (previously MPP Partners): Customer recruitment, building audit and project development, Program paperwork and documentation submittals, and installation oversight.</li> <li>• Implementation contractor(s): Project management and oversight, document review/desk audit, Solutions Provider support, and program document development and maintenance and analysis of the effectiveness of Program rules and processes.</li> <li>• Quality Assurance/Technical Assistance contractor(s): Support industry standards development, conduct field verification for designated percentage of projects, savings analysis, prepare technical guidance on new systems and equipment for Solutions Providers, building baselining services (development of weather-normalized building energy consumption based on utility data to be used by Solutions Providers in project development).</li> </ul>

<sup>38</sup> <https://www.nyserda.ny.gov/All-Programs/Programs/MPP-Existing-Buildings/Comprehensive-Option>

<sup>39</sup> <https://www.nyserda.ny.gov/-/media/Files/Programs/MPP-Existing-Buildings/MPP-Comprehensive-Option-Program-Guidelines.pdf>



	<ul style="list-style-type: none"> <li>Marketing contractor: Development of branded promotional materials, outreach events, communications strategies, and technical transfer efforts, e.g. case studies, press releases, etc.</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>NYSERDA has engaged this market for 10 years and has an established network of Providers to deliver these types of services. They continue to be willing and eager to participate in this offering.</li> </ul>
<b>Customer Value</b>	<p><u>Value to LMI Tenants:</u></p> <ul style="list-style-type: none"> <li>The tenants will benefit from an improved quality of life. Their apartments will be more comfortable thermally and acoustically.</li> <li>The indoor air quality will also be improved, providing health benefits like a reduction in the frequency and severity of respiratory afflictions.</li> </ul> <p><u>Value to Affordable Building Owners:</u></p> <ul style="list-style-type: none"> <li>Participating building owners will see the quality and value of their buildings increase while bearing only a fraction of the cost of the improvements implemented on their buildings.</li> <li>Maintenance and operation costs (e.g., utility costs) will be reduced.</li> <li>The comfort of the tenants will be improved, which will likely reduce tenant complaints and tenant turn over.</li> </ul>

**Stakeholder/Market Engagement**

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>NYSERDA has engaged with market participants to understand the existing market needs through voice of customer calls. Through these calls, NYSERDA learned there is an increase in perceived risk to building owners as the minimum performance threshold increases. LMI building owners have expressed the need for access to capital throughout the lifetime of the project. NYSERDA has adjusted the Comprehensive Program by decreasing the minimum performance threshold and increasing the incentive levels to better support LMI building owners.</li> <li>NYSERDA has worked with sister agencies (HCR, HPD) to offer complementary strategies to the market.</li> </ul>
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**Theory of Change**

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>As mentioned in the opening of this chapter, many of the more than 3 million LMI households in the State spend a disproportionate share of their annual income on energy bills relative to higher income New Yorkers, and lack the financial resources, including credit profiles, to invest in energy efficiency upgrades. This program provides financial support to overcome those first cost and incremental cost barriers.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>If financial support is provided to LMI customers, then it will enable them greater access to energy efficiency and the co-benefits it can provide and help to reduce their energy use to preserve affordability.</li> </ul>
<b>Activities</b>	<p>Should a project receive an incentive from another program (NYSERDA or utility), the value of that incentive will be subtracted from the available MPP incentive. NYSERDA will assess market response to this incentive schedule on a rolling basis to ensure that incentive funds will be available to projects through 2021. NYSERDA will track market response statewide and regionally to monitor program activity. If market response statewide or for a specific region(s) is greater than projected, NYSERDA will to decrease the incentive schedule for the respective region(s). Advanced notice will be</p>

	<p>given to Providers and posted to NYSERDA’s website; program materials will be updated.</p> <p>For the Comprehensive Option, incentives will be provided to support comprehensive projects that improve a building’s energy performance by a minimum threshold based on whole-building source energy. The Comprehensive Option incentive schedule consists of a base incentive and a performance payment. The performance payment is paid to projects that achieve their projected savings one year after installation of the improvements. The incentive schedule can be found on NYSERDA’s website.<sup>40</sup></p> <p>For the High-Performance Offering, incentives will be provided to cost-share improvements needed to achieve deep energy savings in existing multifamily buildings. Projects will be eligible to receive a payment of \$3,500/unit, capped at 50% of the project cost. If a project receives an incentive from another program (NYSERDA or utility), the value of that incentive will be subtracted from the available MPP incentive. Each subsequent solicitation will assess the response to the previous solicitation to determine if a modification to this incentive level is warranted.</p>
<b>Key Milestones</b>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Increase incentive levels, and decrease minimum threshold</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Host annual Provider Summit understand market impacts and future needs</li> </ul> <p><u>Milestone 3 (2018-2021)</u></p> <ul style="list-style-type: none"> <li>• Continue to evaluate market response to incentive levels and threshold and adjust as needed.</li> </ul>
<b>Goals Prior to Exit</b>	Due to the nature of this work and the societal benefits it provides, NYSERDA envisions continuing to pursue this effort for the duration of the CEF or until such time as the need is met by other market participants.

**Relationship to Utility/REV**

<b>Utility Role/Coordination Points</b>	NYSERDA and the utilities will collaborate to cross-promote their programs with the purpose of directing customers towards the appropriate resource for the work they intend to do. NYSERDA will also work with the utilities to encourage support of additional measures in their programs if demand for such measures is demonstrated through MPP. To further avoid customer confusion, NYSERDA proposes working with each utility to fully coordinate MPP and their respective programs exploring solutions such as co-branded promotional or marketing materials.
<b>Utility Interventions in Target Market</b>	The New York utilities offer multiple programs to improve the energy efficiency of multifamily affordable housing buildings. However, no utility program currently exists to enable deep energy retrofits as defined for this initiative.

**Fuel Neutrality**

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• Energy use and carbon emissions associated with heating and hot water represent the majority of potential savings in the multifamily sector. Approximately 75% of the sector relies on gas or oil for heat and hot water.</li> <li>• Except for the 25% of the multifamily buildings across New York State that use electricity for heat, an electric only initiative would not entice the industry to create</li> </ul>
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<sup>40</sup> <https://www.nyserdera.ny.gov/All-Programs/Programs/MPP-Existing-Buildings/Comprehensive-Option>

	<p>solutions that will significantly reduce heating and domestic hot water consumption. GHG emissions reduction would therefore be limited.</p> <ul style="list-style-type: none"> <li>• Offering MPP LMI on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$796 per ton of carbon, compared to a cost of \$1,455 per ton of carbon in an electric only scenario.</li> </ul>
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**Performance Monitoring and Evaluation Plans**

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>Overall, NYSERDA will regularly review program participation and project performance to determine whether changes in incentives or eligible projects are needed to improve efficacy of program implementation.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <p>NYSERDA and its implementation contractor will review the audits submitted through the Comprehensive Option for accuracy and compliance with the Program’s requirements. This review may be conducted on a sample basis depending upon the status of the designated firm and the familiarity of the building owner with energy efficiency projects. Projects accessing the Comprehensive Option may be inspected upon completion. NYSERDA and its implementation contractor may review proposals submitted to the High-Performance pathway in an initial effort to normalize the proposals in preparation for review and selection by a Technical Evaluation Panel. During the installation phase, projects will be inspected periodically to ensure that work is progressing appropriately.</p> <p>Projects in the Comprehensive Option will be sample inspected and reviewed to ensure that the technical review protocols are adequate. A designated percentage of projects accessing the Comprehensive Option will also be inspected upon completion. Additionally, Data Release Authorization Forms, which authorize NYSERDA to collect utility consumption data on the project, will be submitted as part of program deliverables including forms for all owner accounts as well as forms from a 10% sample of apartments. These forms will be used to assess building performance post-installation on an annual basis to gauge building performance before and after participation in the Program.</p> <p><b><u>Program M&amp;V</u></b></p> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation will include baseline and longitudinal measurement of key indicators of programmatic and broader market success.</li> <li>• Baseline measurements of key market indicators will occur within one year following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These include but are not limited to: number of households served and number of building owners using the solutions available in the market.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: reduction in barriers to retrofitting multifamily buildings, increased comfort for tenants, and development of new financing solutions for building owners.</li> <li>• Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p>
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	<ul style="list-style-type: none"> <li>• Evaluation M&amp;V will be conducted for a sample of participating buildings, according to the International Performance Measurement &amp; Verification Protocol (IPMVP) method(s) most appropriate given the retrofits made. Evaluation M&amp;V will rely heavily on the program M&amp;V strategy, data, and findings to validate program estimated savings.</li> <li>• To draw a sample and conduct an analysis that is representative and robust, evaluation M&amp;V has traditionally been conducted after enough project completions and post-installation operating time have occurred. NYSERDA will employ strategies to balance the need for data with the priority to have evaluation M&amp;V work done on a timely basis to produce the greatest benefit. Pre-retrofit M&amp;V review work and rolling M&amp;V samples are two such strategies that may be applied, as appropriate to the program, in developing M&amp;V plans.</li> <li>• Depending on the extent of replication identified in Market Evaluation, impacts will be examined for a sample of replication projects to ascertain the level of savings.</li> <li>• Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</li> </ul>
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### 15.3.2.1 Budgets & Expenditures

An annual commitment budget for all activities is shown in Table 18. The annual expenditure projection is included in Table 19. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only. See Appendix B for a compilation of LMI budgetary allocations for the first three years of the CEF.

**Table 18: Annual Market Development Budget Allocation – Commitment Basis**

	2016	2017	2018	2019	2020	2021	Total
Direct Incentives and Services	\$725,583	\$5,200,500	\$8,056,000	\$7,544,417	\$8,250,000	\$8,250,000	\$38,026,500
Implementation Support	\$123,041	\$8,239,877	\$-	\$-	\$3,400,000	\$-	\$11,762,918
Tools, Training, and Replication	\$-	\$80,000	\$80,000	\$80,000	\$80,000	\$80,000	\$400,000
<b>Total</b>	<b>\$848,624</b>	<b>\$13,520,377</b>	<b>\$8,136,000</b>	<b>\$7,624,417</b>	<b>\$11,730,000</b>	<b>\$8,330,000</b>	<b>\$50,189,418</b>

**Table 19: Annual Expenditures Projection**

Expenditures	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total

<b>LMI Multifamily</b>	0%	10%	11%	16%	16%	15%	14%	10%	8%	100%
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### 15.3.2.2 Progress and Performance Metrics

Benefits shown in Table 20 are direct, near term benefits associated with the LMI initiatives. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. See Appendix C for a compilation of LMI direct impacts for the first three years of the CEF.

**Table 20. Direct Impacts - LMI Multifamily**

<b>Primary Metrics<sup>41</sup></b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	1,000	4,140	9,380	10,400	11,400	11,400	47,720
	MWh Lifetime	15,000	62,100	141,000	156,000	171,000	171,000	716,100
	MMBtu Annual	13,600	56,500	128,000	142,000	155,000	155,000	650,100
	MMBtu Lifetime	205,000	847,000	1,920,000	2,130,000	2,330,000	2,330,000	9,762,000
	MW	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		1,320	5,470	12,400	13,800	15,000	15,000	62,990
CO2e Emission Reduction (metric tons) Lifetime		19,800	82,100	186,000	206,000	226,000	226,000	945,900
Customer Bill Savings Annual (\$ million)		\$0.28	\$1.14	\$2.58	\$2.87	\$3.14	\$3.14	\$13.15
Customer Bill Savings Lifetime (\$ million)		\$4.14	\$17.10	\$38.80	\$43.00	\$47.00	\$47.00	\$197.00
Private Investment (\$ million)		\$3.53	\$19.40	\$35.90	\$36.70	\$40.20	\$40.20	\$175.50

<sup>41</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

**Table 21. Annual Projected Initiative Participation**

<b>Description</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
Number of units served	835	3,251	7,708	8,682	9,494	9,494	39,464

## 15.4 NY-Sun

### 15.4.1 Low-Income Community Solar

#### Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• The NY-Sun Initiative has included program measures supporting rooftop solar installations for low-to-moderate income homeowners since 2015. However, barriers have limited uptake of rooftop PV for LMI customers compared to middle and upper income customers, including:             <ul style="list-style-type: none"> <li>○ Lower homeownership rates among LMI households</li> <li>○ Higher proportion of LMI households living in multifamily buildings</li> <li>○ Higher proportion of houses owned by LMI homeowners requiring roof repairs or other maintenance work that adds cost and difficulty to rooftop PV installations</li> <li>○ High upfront cost of rooftop PV purchases</li> <li>○ Limited access to financing</li> <li>○ Inability to take full value of federal and state tax credits for PV due to lower taxable income</li> </ul> </li> <li>• In July 2015, the Public Service Commission initiated a community distributed generation program in New York,<sup>42</sup> which allows groups of customers to participate in solar PV projects that are sited anywhere in their utility service territory and load zone (commonly referred to as community solar).</li> <li>• Community solar has drawn considerable interest from solar developers. As of July 31, 2017, 295 community solar projects totaling 735.5 MW have been approved for NY-Sun incentives. However, only 9 projects totaling 3.18 MW have been completed for reasons including lengthy utility interconnection queues and local permitting challenges. NYSERDA anticipates that a significant portion of the projects currently in the NY-Sun pipeline will be completed in 2018-2019.<sup>43</sup></li> <li>• Community solar is a more flexible model than rooftop solar for solar project developers and customers alike, addressing many of the barriers noted above that have limited low income participation in NY-Sun. Community solar customers (commonly referred to as subscribers) can be switched out monthly, reducing risk to the project owner in the case of a subscriber moving out of the utility zone, nonpayment or other breach of the subscription terms. Project developers<sup>44</sup> can also include both individual residential subscribers and larger non-residential subscribers, commonly referred to as anchor subscribers.</li> <li>• Community solar presents the best option for LMI customers to access solar, as both renters and homeowners can participate and it offers flexible solutions for a variety of customers. Subscription terms can be customized to individual customers or market segments, including the amount of energy purchased, the length of the subscription, and any moving or cancellation fees.</li> <li>• However, community solar is still new and relatively untested in New York. Based on NYSERDA’s market engagement to date the market has indicated that</li> </ul>
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<sup>42</sup> <http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=15-E-0082&submit=Search+by+Case+Number>

<sup>43</sup> Public information on the NY-Sun pipeline is available in Open NY: <https://data.ny.gov/Energy-Environment/Solar-Electric-Programs-Reported-by-NYSERDA-Beginn/3x8r-34rs/data>

<sup>44</sup> The terms “project developer” is here used interchangeably with “project sponsor”, with “developer” generally referring to the entity responsible for project finance and construction, and “sponsor” referring to the entity responsible for ongoing operation of the project and management of subscribers. Frequently, the developer and sponsor are the same entity.

	<p>it may have difficulty adequately serving LMI customers, particularly low-income customers (households with incomes below 60% of state median income) for reasons including:</p> <ul style="list-style-type: none"> <li>○ Community solar subscriptions and underwriting terms that are overly restrictive for many low-income customers.</li> <li>○ Community solar subscriptions that offer limited energy cost savings compared to many low-income customers' overall energy cost burden.</li> <li>○ High expected customer acquisition and management costs for all customer segments by project owners, which can discourage marketing to low income customers.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>● To ensure that low income customers specifically, with their heightened market barriers, are sufficiently served by the community solar market, NYSERDA will: <ul style="list-style-type: none"> <li>○ Develop a community solar subscription model specifically for low income (HEAP eligible) customers. Under this model, subscriptions will be offered to income-eligible customers at no cost.<sup>45</sup></li> <li>○ Issue a solicitation for community solar projects to commit project capacity to subscriptions for low income customers. NYSERDA will allocate the committed capacity to low income customers using the program's subscription model, and manage customer enrollment and subscription allocation on an ongoing basis.</li> <li>○ Work with low income energy efficiency programs, utilities, community agencies, solar project developers, investors and other market actors to market the program to low income customers and develop a strategy for a post-initiative transition.</li> </ul> </li> <li>● For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Low-Income Community Solar," which can be found in Appendix A.</li> </ul>
<p><b>Goals</b></p>	<ul style="list-style-type: none"> <li>● Enable up to 10,000 low income New Yorkers to participate in community solar subscriptions that reduce their total electricity bill.</li> <li>● Reduce community solar project implementation and financing costs to maximize savings to low income participants.</li> <li>● Transition program to post-initiative state that sustains low income participation in community solar at comparable levels.</li> <li>● Support the development of a successful and inclusive community solar market, directly contributing to the fulfillment of the NY-Sun goal to add 3 GW of solar capacity by 2023 while achieving a robust, self-sustaining solar market.</li> </ul>
<p><b>State Energy Plan/Clean Energy Standard Link</b></p>	<ul style="list-style-type: none"> <li>● Broadly, this initiative will play an important role in achieving the 2015 State Energy Plan (SEP) and Clean Energy Standard (CES) goal that renewable energy sources generate 50% of New York State's electricity by 2030 by increasing participation of LMI customers in community solar projects.</li> <li>● It will also support the SEP's "desire to ensure the economic, environmental, and health benefits of clean energy are accessible to New Yorkers most in need" by increasing shared renewables such as community solar. As stated in the SEP, shared renewables will "serve as a particularly valuable tool to enhance access to clean energy in LMI communities and will help to ensure all New Yorkers can participate in the State's growing clean energy economy."</li> </ul>

<sup>45</sup> NYSERDA may permit project developers or sponsors to propose models where low-income participants pay a portion of their savings to the sponsor to receive other benefits, such as a longer-term subscription beyond the period of NYSERDA's contract with the project. NYSERDA will define specific requirements and circumstances where this is permissible.



## Target Market Characterization

<b>Target Market Segment(s)</b>	The target market includes low income residents (households with incomes below 60% of the State Median Income).
<b>Market Participants</b>	Market participants include: <ul style="list-style-type: none"> <li>• Community solar developers</li> <li>• Utilities</li> <li>• Agencies and energy efficiency contractors implementing low income energy programs that can be used in conjunction with the proposed program</li> <li>• Housing and social services providers with low income clients and residents</li> <li>• Local governments</li> <li>• Non-profit and community organizations with low income constituents</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• The residential solar market has grown 800% since 2011, demonstrating increased demand and value to residential customers.</li> <li>• The community solar market, while relatively nascent, also shows promising growth. As of July 31, 2017, 295 community solar projects totaling 735.5 MW have been approved for NY-Sun incentives<sup>46</sup>, demonstrating a solid supply of community solar credits during the initiative. Robust stakeholder participation in the Low-Income Community Distributed Generation Collaborative<sup>47</sup>, Value of Distributed Energy Resources Phase 2 LMI Working Group<sup>48</sup>, and related stakeholder processes indicates strong interest from market actors serving the low-income community.</li> <li>• Regulatory and utility changes are also laying the groundwork for community solar. The Phase One Value of Distributed Energy Resources proceeding<sup>49</sup>, now in implementation provides clarity on community solar project compensation. Additionally, the issuance of the revised Standardized Interconnection Requirements<sup>50</sup> will speed the deployment of commercial-scale solar projects, including community solar. REV Demonstration Projects and Pilots proposed or underway by Con Edison and National Grid also demonstrate the readiness of utilities to engage in low income solar.<sup>51</sup></li> <li>• Similar state-level program and policy approaches in California, Massachusetts, and Colorado have led to demand for community solar from low income customers, and have provided valuable lessons learned to consider in program design and implementation.<sup>52</sup></li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Access to community solar subscriptions will allow low income households to participate in the growing clean energy economy while also seeing a reduction in energy costs.</li> </ul>

<sup>46</sup> Public information on the NY-Sun pipeline is available in Open NY: <https://data.ny.gov/Energy-Environment/Solar-Electric-Programs-Reported-by-NYSERDA-Beginn/3x8r-34rs/data>

<sup>47</sup> CDG Low Income Collaborative. <http://www3.dps.ny.gov/W/PSCWeb.nsf/All/8A75B07F45E1672485257EDD00602D7C?OpenDocument>

<sup>48</sup> In the Matter of Value of Distributed Energy Resources. <http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=15-E-0751&submit=Search+by+Case+Number>

<sup>49</sup> Ibid.

<sup>50</sup> Distributed Generation Information. <http://www.dps.ny.gov/distgen.htm>

<sup>51</sup> National Grid, the host of the Fruit Belt Project, aims to offer benefits by offering energy bill savings and for low-to-moderate income customers, and grid efficiency benefits to the local distribution system. The Commission recently approved Con Edison's Shared Solar Pilot Program for Low Income Customers and Con Edison is reviewing proposals it received from its RFI for Energy Solutions for LMI Customers.

<sup>52</sup> For a discussion of low income community solar programs and practices, please see Bringing the Benefits of Solar Energy to Low-Income Consumers: A Guide for States and Municipalities: <http://www.cesa.org/assets/2017-Files/Bringing-the-Benefits-of-Solar-to-Low-Income-Consumers.pdf>

	<ul style="list-style-type: none"> <li>• By acting as a large, creditworthy purchaser of community solar subscriptions on behalf of low income participants for the community solar projects selected via the solicitation, this initiative will increase the ability of those projects to gain financing and help the community solar market scale up in New York.</li> <li>• By acting as a large purchasers of community solar subscriptions, and managing low income customer acquisition and management, this initiative will reduce community solar project costs, in turn increasing the savings that can be provided to low income participants.</li> </ul>
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### **Stakeholder/Market Engagement**

<b>Stakeholder/Market Engagement</b>	<p>Engagement to date:</p> <ul style="list-style-type: none"> <li>• There has been extensive stakeholder engagement around LMI community solar, including the Low-Income Community Distributed Generation Collaborative, which was convened by the New York Public Service Commission to identify barriers to low income customer participation in community distributed generation, including community solar.<sup>53</sup> Additionally, on July 17, 2017, DPS hosted the first meeting of the Value of Distributed Energy Resources Phase 2 LMI Working Group, which included a discussion of the proposed NYSERDA LMI Community Solar Initiative as well as other topics related to providing access to community solar for LMI customers. This initiative seeks to address many of the barriers to low income participation in community solar that were identified through this process.</li> <li>• In the Report on Alternative Approaches to Providing Low and Moderate Income Clean Energy Services, filed on February 3, 2017, the Clean Energy Advisory Council Low-to Moderate Income Working Group recommended that among other things to increase access to CDG for LMI customers, NYSERDA continue seeking ways to use CEF investments to enable LMI access to CDG projects that provide meaningful savings. In addition, the Working Group recommended that NYSERDA, DPS, and the utilities continue to explore options to increase customer participation in CDG projects through regulatory requirements or the provision of incentives. This program design considers the recommendations made by the Working Group to enable access to CDG projects through CEF investments.</li> <li>• On April 13, 2017 DPS hosted a Value of DER Technical Conference that focused on LMI participation in CDG projects. NYSERDA presented preliminary initiative details and gathered feedback from attendees which helped to refine this initiative.</li> <li>• NYSERDA has held ongoing discussions with solar developers regarding high customer management costs and difficulty with financing projects in general, with greater challenges identified for potentially serving LMI customers through their regular business model.</li> </ul> <p>Further engagement:</p> <ul style="list-style-type: none"> <li>• In addition to any formal DPS stakeholder processes, NYSERDA will engage regularly with market participants as the initiative is further developed and implemented. NYSERDA will also work with market</li> </ul>
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<sup>53</sup> CDG Low Income Collaborative.  
<http://www3.dps.ny.gov/W/PSCWeb.nsf/All/8A75B07F45E1672485257EDD00602D7C?OpenDocument>

	<p>participants to develop a post-initiative transition strategy, as described in the activities section.</p> <ul style="list-style-type: none"> <li>• This initiative will be closely coordinated with ongoing LMI activities (e.g. the Low-Income Forum on Energy) as part of the broader CEF LMI strategies and will leverage existing LMI outreach, enrollment, and administrative infrastructure to increase participation and reduce program costs.</li> </ul>
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*Theory of Change*

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Typical community solar subscription terms are too restrictive for many low-income customers.</b> Primarily due to perceived risk by solar financiers, who have limited experience in the new community solar market, community solar subscription terms will often include lengthy terms, penalties, or relatively high customer credit requirements. By directly securing community solar subscriptions for low income customers, NYSERDA can set terms that are appropriate and accessible.</li> <li>• <b>Low income customers are unlikely to be able to access community solar subscriptions that offer adequate savings.</b> Typical community subscription models offer limited energy costs savings, and the expectation of high customer acquisition and management costs is anticipated to limit marketing to low income customers by developers. This initiative will address this barrier by directly securing community solar subscription that will be offered to low income customers at no cost, providing greater cost savings and more reliable access than would otherwise be available.</li> <li>• <b>Community solar developers face high customer acquisition costs, and do not typically focus marketing efforts on low income customers.</b> This initiative will address this barrier by marketing program offerings to the low-income market segment, leveraging other low-income energy programs and outreach channels.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA secures community solar subscriptions for low income customers through a solicitation process and offers them to low income customers at no-cost, then these subscriptions will provide a cost-effective way to provide low income customers access to the benefits of community solar that can be adapted and expanded in the future.</li> <li>• If program marketing is designed to address segment-specific concerns and is delivered in coordination with other low-income outreach channels, then low income customers will enroll in the program.</li> </ul>

<p><b>Activities</b></p>	<p><b>Solicit for community solar project capacity for subscriptions for low-income customers</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will solicit for and contract with community solar project developers to dedicate capacity in community solar projects to low income customers.</li> <li>• NYSERDA anticipates at least two rounds of the solicitation. The solicitation structure, requirements, and targets will be developed based on: <ul style="list-style-type: none"> <li>○ Lessons learned from successful solar procurement examples,</li> <li>○ Analysis of CDG project economics and industry cost data</li> <li>○ Input from solar project developers and financiers</li> <li>○ Policy factors, including geographic diversity and local-level project support</li> <li>○ Insight from the ongoing implementation of the NY-Sun Initiative and the Community Distributed Generation program</li> </ul> </li> </ul> <p><b>Enroll and engage low income participants</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will develop customer education and program marketing materials targeted to low income customers.</li> <li>• In collaboration with low income energy programs, utilities, participating solar developers, community agencies, and other partners, NYSERDA will engage potential customers, provide program information, verify customer income-eligibility, and enroll participants in the program. NYSERDA and its partners will use a range of outreach and marketing activities to engage potential customers, and NYSERDA will develop customer education materials to be used for this purpose.</li> <li>• NYSERDA may prioritize outreach to specific low-income customer sub-segments that are less likely to fully benefit from low income efficiency programs, such as renters and electric heating customers.</li> <li>• Participants will be provided with no-cost community solar subscriptions, with no fees for ending participation. Standard subscriptions will be structured and sized to not interfere with the customer receiving the full value of the Energy Affordability bill discount, HEAP benefit (if electric heating customer), or typical electrical efficiency measures.</li> <li>• NYSERDA will direct participating community solar project sponsors, per the terms of their contracts with NYSERDA, to allocate community solar subscriptions to low income program participants as specified by NYSERDA (e.g. to customers in the appropriate utility zone).</li> </ul> <p><b>Develop a post-initiative transition strategy</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will develop a strategy to transition efforts to ensure low income customer participation to sustainable, long-term, models. <ul style="list-style-type: none"> <li>○ This strategy will seek to leverage the expertise and resources of a range of market participants, including utilities, investors, project developers, and community agencies.</li> <li>○ The strategy will consider models for long-term community management and/or ownership, utility management, community development and philanthropic investment, and other approaches to cost-effectively provide community solar access for low income customers. During the initiative, these models will be tested as appropriate, including through the Affordable Solar Predevelopment and Technical Assistance program, which is funded through the NY-Sun Initiative.<sup>54</sup></li> <li>○ The strategy will also address the transition of the individual low-income participants in the program after the end of NYSERDA’s contracts with project sponsors.</li> </ul> </li> </ul>
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<b>Key Milestones</b>	<p><b><u>Milestone 1 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Issue solicitation for community solar projects to dedicate generation to low-income customers with a standard offer subscription.</li> </ul> <p><b><u>Milestone 2 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Execute agreements with community solar projects for capacity dedicated to low income subscriptions.</li> </ul> <p><b><u>Milestone 3 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Initiate low income customer outreach and enrollment.</li> </ul> <p><b><u>Milestone 4 (2018-2020)</u></b></p> <ul style="list-style-type: none"> <li>• Issue additional solicitation(s) for community solar projects, if needed.</li> </ul> <p><b><u>Milestone 5 (2018-2020)</u></b></p> <ul style="list-style-type: none"> <li>• Execute additional agreements with community solar projects for low income subscriptions, in needed.</li> </ul> <p><b><u>Milestone 6 (2020)</u></b></p> <ul style="list-style-type: none"> <li>• Finalize post-initiative transition strategy.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• Demonstrate successful model for low-income customer participation in community solar.</li> <li>• Develop strategy to transition program to post-initiative state that sustains low income participation in community solar at 10% or more of overall participation by residential customers in community solar.</li> </ul>

***Relationship to Utility/REV***

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• This initiative anticipates a growing role for the utilities as the initiative progresses, in particular as the policies adopted by the New York Public Service Commission in the May 2016 Order Adopting Low Income Program Modifications<sup>54</sup> regarding low income customer bill discounts are implemented by the utilities, greater coordination on customer outreach, referral, and management will become possible.</li> <li>• Utility collaboration will initially be sought for LMI customer outreach and engagement. Opportunities will also be sought to reduce administrative costs through coordination with the utilities (for example, by program staff providing low income CDG customer allocation forms directly to the utility rather than indirectly through the CDG project sponsor).</li> <li>• In addition, community solar cost reduction efforts initiated by the March 2017 Value of DER order will encourage utility coordination on this initiative, particularly on customer billing and management.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• Two utilities have developed demonstration projects and pilots under REV that address low income customer access to community solar, described below. NYSEDA will work utilities both to learn from their interventions in this market, and to more effectively implement and transition the intervention described in this investment plan.</li> </ul>

<sup>54</sup> <https://www.nyserda.ny.gov/aspta>

<sup>55</sup> <http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=14-M-0565&submit=Search+by+Case+Number>

	<ul style="list-style-type: none"> <li>The National Grid Fruitbelt Neighborhood Solar Demonstration aims to help low-to moderate-income customers access clean energy while reducing arrears through a neighborhood solar project in an economically distressed area, and test how solar can be paired with communications technologies to deliver benefits to the overall electricity system<sup>56</sup>.</li> <li>On August 2, 2017, the Public Service Commission approved a Shared Solar Pilot Program by Con Edison with significant similarities to the program described in this investment plan. In the pilot phase, Con Edison will offer up to 1,600 of their low-income customers participation in 3 MW of community solar projects sited on property owned by the utility. Participants will pay no costs and will receive approximately \$5 per month in savings.</li> <li>In approving the Con Edison program, the Public Service Commission noted that “The Department of Public Service and the New York State Energy Research and Development Authority (NYSERDA) will continue their work with solar energy developers, low-income advocates, utilities and others to develop similar shared solar systems across the state.”<sup>57</sup></li> </ul>
<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>This program will not be offered on a fuel-neutral basis.</li> </ul>

#### 15.4.1.1 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 22. The annual expenditure projection is included in Table 23. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

This initiative will also commit and expend approximately \$750,000 in RGGI funds for community-level outreach and customer engagement. This \$750,000 is in addition to the CEF funding requested in Table 22.

**Table 22: Annual Market Development Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Direct Incentives and Services	\$0	\$9,900,000	\$5,940,000	\$3,960,000	\$19,800,000
Implementation Support	\$1,445,000	\$0	\$0	\$0	\$1,445,000
<b>Total</b>	<b>\$1,445,000</b>	<b>\$9,900,000</b>	<b>\$5,940,000</b>	<b>\$3,960,000</b>	<b>\$21,245,000</b>

**Table 23: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>	<b>Total</b>
<b>Total</b>	1%	20%	15%	13%	6%	6%	6%	6%	6%	6%	6%	6%	3%	1%	100%

<sup>56</sup> <http://www3.dps.ny.gov/W/PSCWeb.nsf/All/B2D9D834B0D307C685257F3F006FF1D9?OpenDocument>

<sup>57</sup> <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={6822F974-4B4E-4300-9BD6-FEA0F573DC58}>

### 15.4.1.2 Progress and Performance Metrics

Table 24 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 24. Initiative Specific Metrics**

Indicators <sup>58</sup>		Baseline (Before/Current)	2020 (Cumulative)
Activity/Outputs	Capacity of community solar projects contracted by NYSERDA for low income customer subscriptions (MW DC).	0	16 <sup>59</sup>
	Number of program participants enrolled through outreach and marketing <sup>60</sup> activities.	0	24,000
Near-Term Outcomes	Number of community solar subscriptions provided to low income customers through the initiative	0	10,000
	Low income customer acquisition costs <sup>61</sup>	\$1000 <sup>62</sup>	\$175
	Low income customer management costs <sup>63</sup>	\$75 <sup>64</sup>	\$15
	Cost savings to low income program participants	0	\$5 million
Mid- and Long-term Outcomes	Participation of low income customers in community solar projects post-initiative	0%	10%

The LMI Community Solar initiative will support NY-Sun and its efforts to achieve 3 GW of solar by 2023. This investment plan does not claim direct benefits in addition to those already accounted for by NY-Sun. Accordingly, benefits are not included herein.

<sup>58</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>59</sup> 16 MW DC will generate approximately 18.78 MWh per year.

<sup>60</sup> The program targets 10,000 subscriptions for low income customers. However, it is anticipated that as participants move or otherwise leave the program, replacement customers will be enrolled. For planning purposes, NYSERDA is assuming that 20% of participants will leave the program each year, and that up to 24,000 individual households will participate over the course of the program.

<sup>61</sup> Per participant.

<sup>62</sup> This number reflects a best estimate of average residential customer acquisition costs based on interviews with community solar projects developers conducted by NYSERDA.

<sup>63</sup> Per participant, per year.

<sup>64</sup> This number reflects a best estimate of average residential customer management costs based on interviews with community solar projects developers conducted by NYSERDA.

**Table 25. Annual Projected Initiative Participation<sup>65</sup>**

<b>Participants</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Low Income Residential Customers	3,000	4,000	3,000	10,000

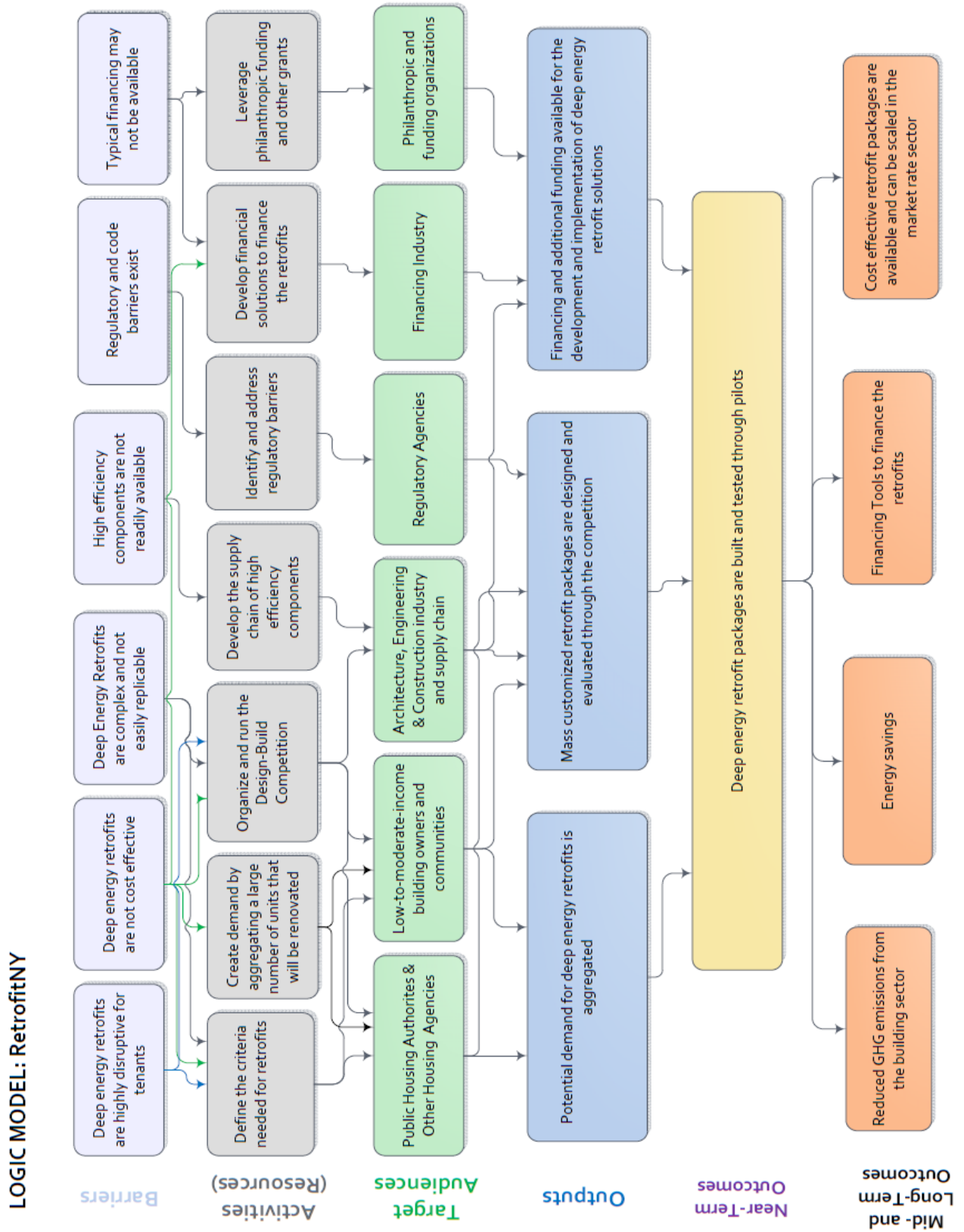
***Performance Monitoring and Evaluation Plans***

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• NYSERDA will monitor the output metrics of all activities described above, segmented by targeted customer type. Marketing messages, incentive levels/structure, administrative process, and other program activities will be adjusted based on periodic review of these metrics.</li> <li>• Based on the solicitation response and outcome of the contracting and implementation processes, NYSERDA may revise and reissue the solicitation as needed over the course of the initiative. Factors to be considered include:             <ul style="list-style-type: none"> <li>○ Number of responding solar project owners/developers, and quantity of projects/capacity proposed</li> <li>○ Pricing presented in the solicitation responses</li> <li>○ Range of project geography, size, and business models presented in the solicitation responses</li> <li>○ Rate of completion, delay, and/or attrition of projects selected</li> </ul> </li> <li>• Insights as to how the initiative can be optimized will be gathered and applied to future initiative design to ensure greatest market impacts within the identified market sectors.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation draws on the theory of change of the related logic model and will include baseline and longitudinal measurement of key indicators of success.</li> <li>• Baseline measurements of key market indicators will occur within one year following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These include but are not limited to: the number of community solar projects contracted by NYSERDA for low income customer subscriptions and number of outreach and marketing campaigns by NYSERDA focused on low income community solar customers.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: number of community solar subscriptions, and customer acquisition/management and financing costs for LMI solar projects.</li> <li>• Sources of data will include public and commercially available data, Salesforce, and primary data collection through surveys of key market actors.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>• Impact Evaluation will be completed for the NY-Sun portfolio, and will include projects developed under this program.</li> </ul>
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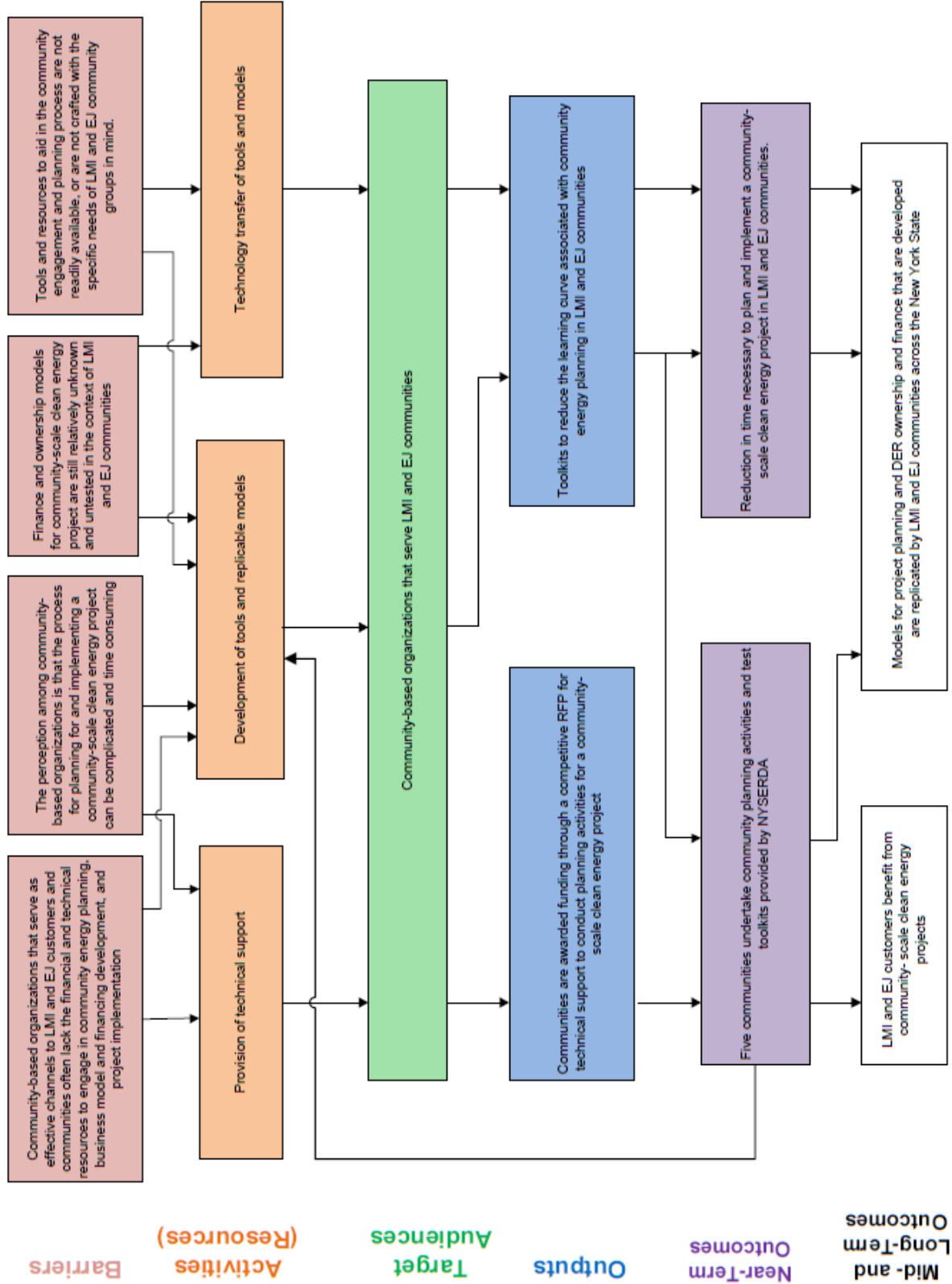
<sup>65</sup> Table 25, counts newly filled subscriptions (up to the program goal of 10,000). However, it is anticipated that as participants move or otherwise leave the program, replacement customers will be enrolled. For planning purposes, NYSERDA is assuming that 20% of participants will leave the program each year, and that up to 24,000 individual households will participate over the course of the program.



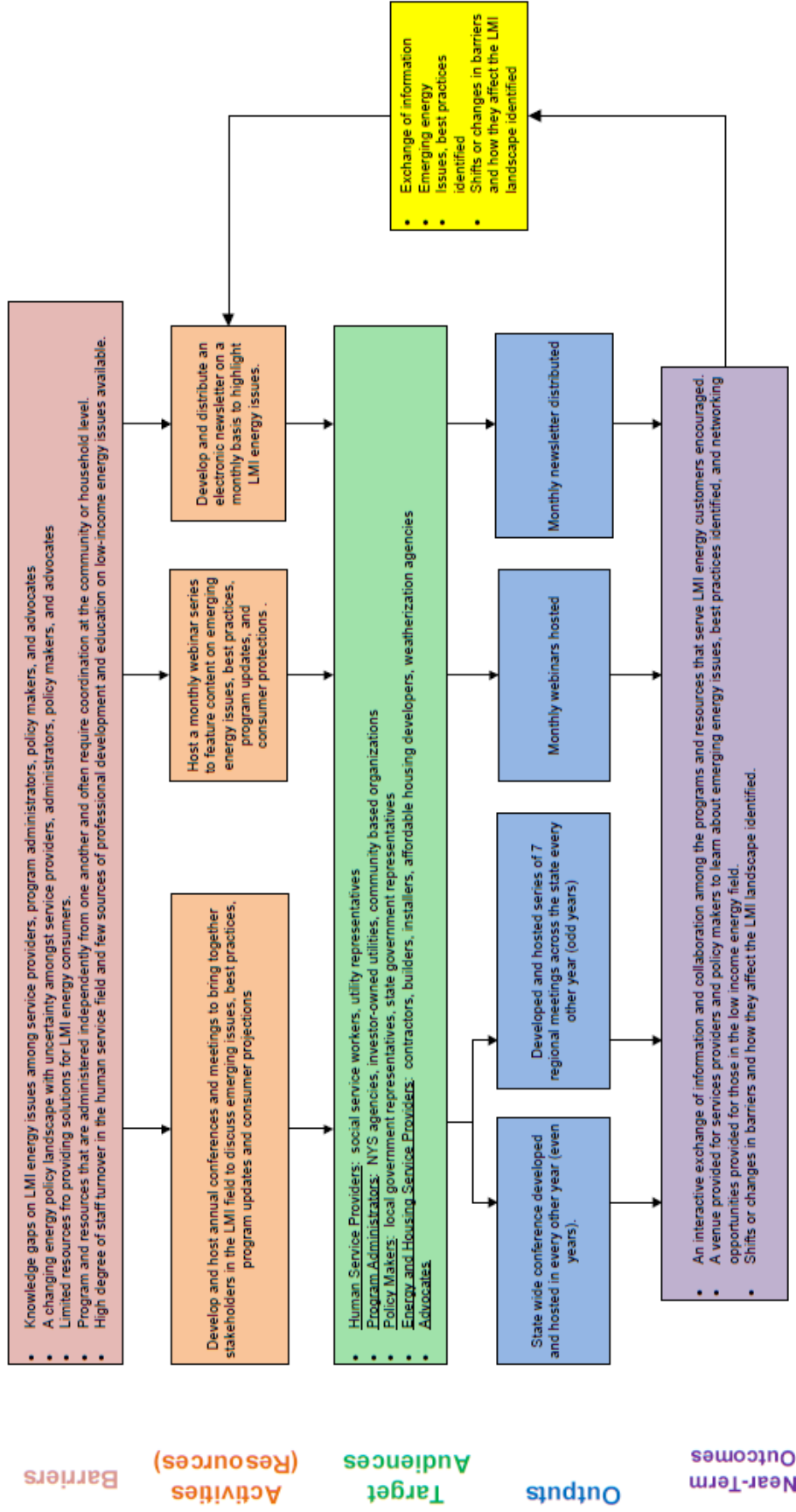
# Appendix A – Logic Models



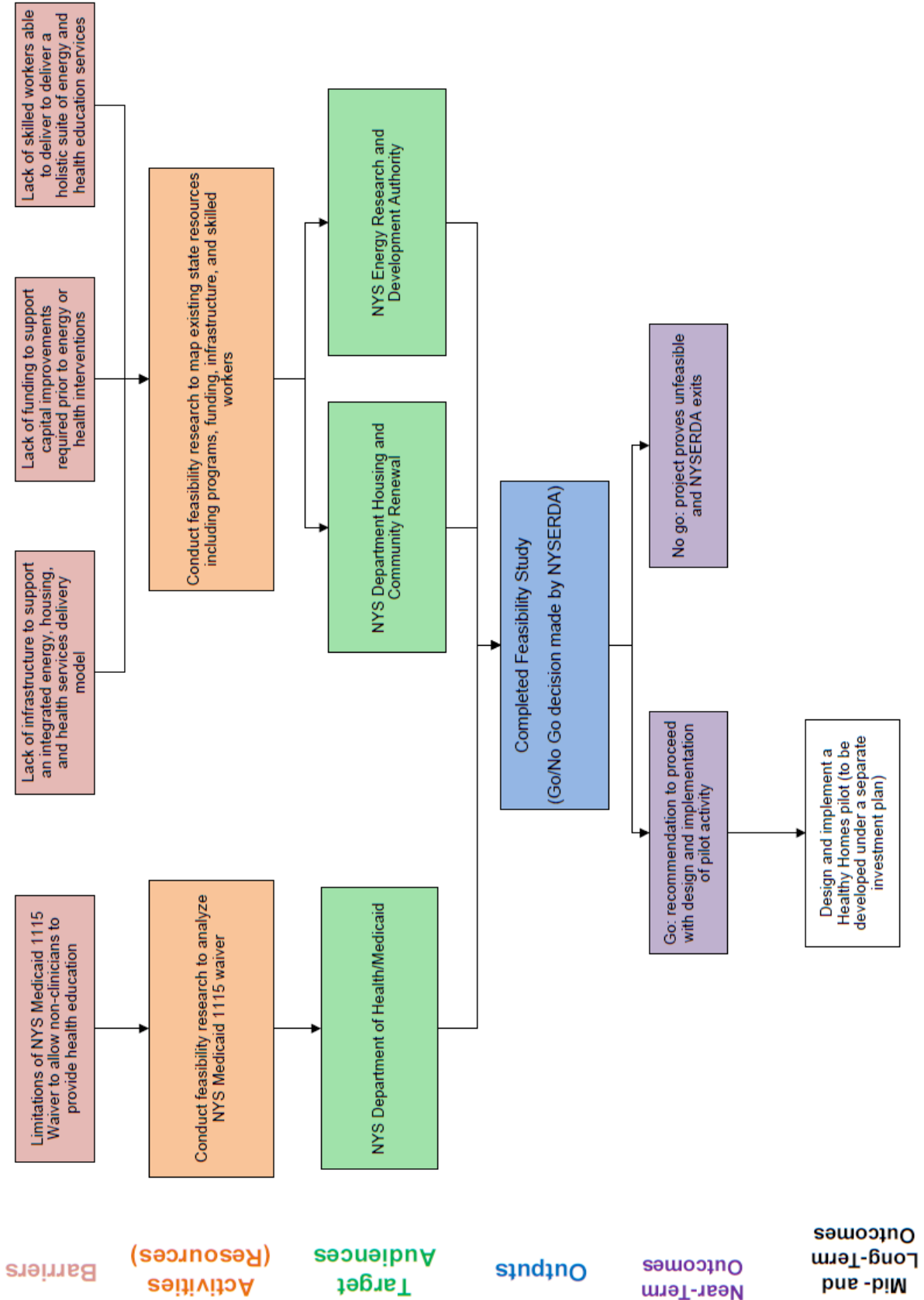
# LOGIC MODEL: REVitalize



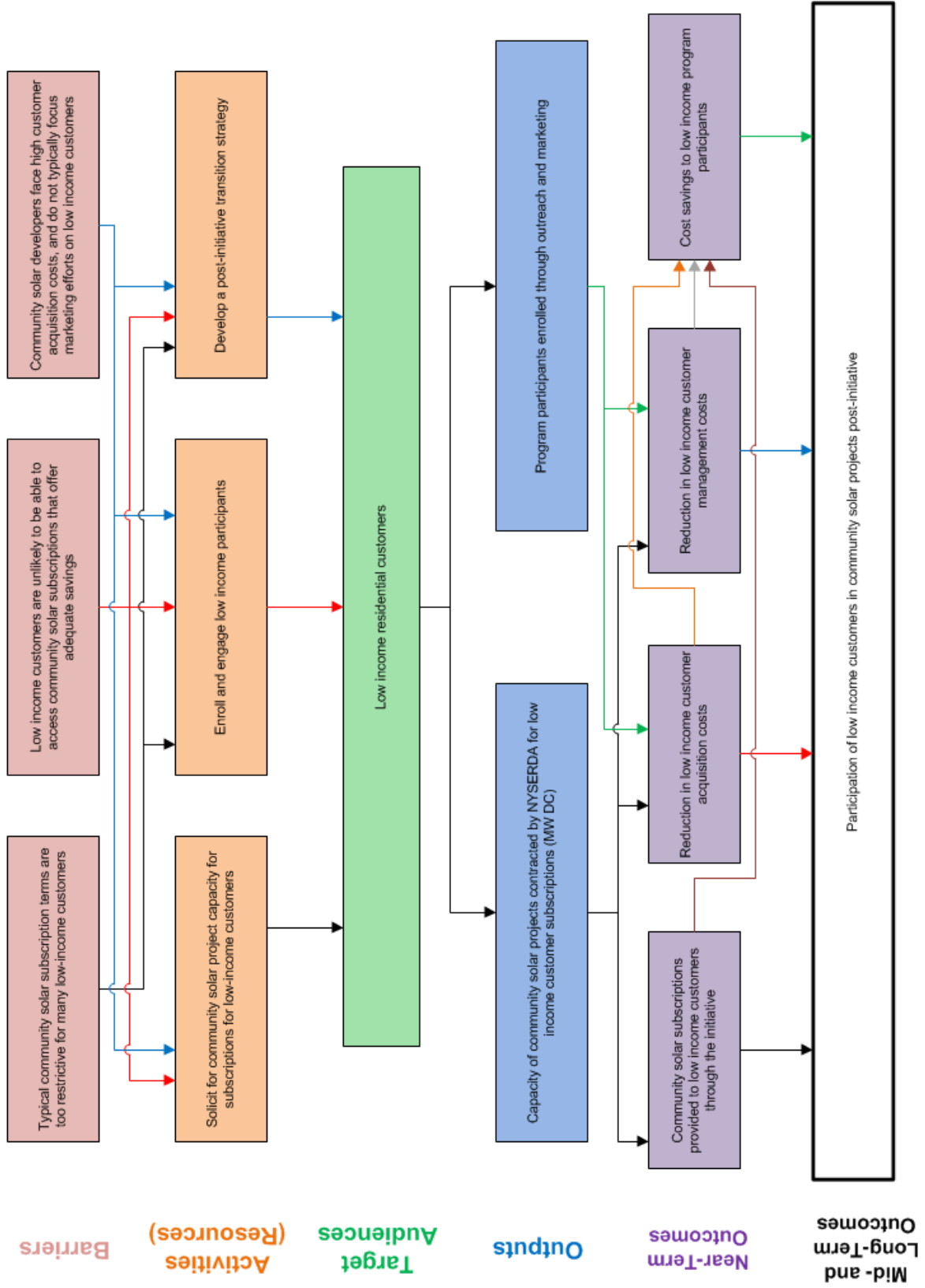
# LOGIC MODEL: LIFE: Low-Income Forum on Energy (Education and Awareness Initiative)



# LOGIC MODEL: Healthy Homes Feasibility Study



# LOGIC MODEL: Low Income Community Solar



## Appendix B – CEF LMI Portfolio 3 Year Budgets

The following table represents all programmatic LMI CEF budgetary allocations for the first three years of the CEF, as of the date of this filing.<sup>66</sup> The budgets do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The CEF Order directs NYSERDA to allocate a minimum of \$234.5 million to LMI initiatives over the first three years of the CEF.<sup>67</sup> The allocation of the balance of funds, net Administration and Cost Recovery Fee, will be informed through stakeholder engagements and recommendations from the CEAC LMI Working Group.

<b>CEF Investment</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>3 Year Total</b>
Resource Acquisition Transition Programs <sup>68</sup>	\$36,707,184	\$77,785,377	\$61,826,000	\$176,318,567
<i>Single Family LMI</i>	\$31,202,557	\$57,910,000	\$45,335,000	\$134,447,557
<i>Multifamily LMI</i>	\$848,624	\$13,520,377	\$8,136,000	\$22,505,001
<i>New Construction LMI</i>	\$4,656,000	\$ 6,355,000	\$8,355,000	\$ 19,366,000
Market Development Initiatives	\$0	\$7,373,000	\$12,633,000	\$20,136,000
<i>Retrofit NY</i>	\$0	\$6,413,000	\$6,177,000	\$12,590,000
<i>REVitalize</i>	\$0	\$600,000	\$125,000	\$725,000
<i>Low-Income Forum on Energy</i>	\$0	\$245,000	\$75,000	\$320,000
<i>Healthy Homes Feasibility Study</i> <sup>69</sup>	\$0	\$215,000	\$-	\$215,000
<i>New Construction LMI</i>	\$0	\$0	\$6,286,000	\$6,286,000
NY-Sun Initiatives	\$0	\$1,445,000	\$9,900,000	\$11,345,000
<i>Low-Income Community Solar</i>	\$0	\$1,445,000	\$9,900,000	\$11,345,000
<b>Total</b>	<b>\$36,707,181</b>	<b>\$86,703,377</b>	<b>\$78,103,000</b>	<b>\$207,799,356</b>

<sup>66</sup> As outlined in Section 15.2.5, funds beyond the initial three years of the CEF have been committed, however this table is intended to present a summary of budget commitments over the first three years of the CEF to compare with the CEF order requirements to commit \$234.5 million over the first three years of the CEF.

<sup>67</sup> The \$234.5 million is inclusive of Administration and Cost Recovery Fee funding; the total net Administration and Cost Recovery Fee is \$210.6 million.

<sup>68</sup> Filed as part of the Resource Acquisition Transition Chapter on February 22, 2016.

<sup>69</sup> The Healthy Homes Feasibility study will take place in Q4 2016. Based on the outcome of the Healthy Homes Feasibility study, NYSERDA will determine whether to proceed with the implementation of a pilot. The 2017 budget includes funds for pilot design. If NYSERDA determines that the pilot should be implemented, a supplemental investment plan will be filed to account for the pilot implementation.

## Appendix C – CEF LMI Portfolio 3 Year Direct Impacts

The following table presents the direct impacts associated with the LMI portfolio for the first three years of the CEF, including the standard offer and market development initiatives, as of the date of this filing.

<b>Primary Metrics</b>		<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	12,670	18,464	27,884	59,018
	MWh Lifetime	223,100	314,090	487,490	1,024,680
	MMBTU Annual	224,600	305,325	408,285	938,210
	MMBTU Lifetime	5,284,000	6,832,592	8,579,492	20,696,084
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		19,230	26,843	37,682	83,755
CO2e Emission Reduction (metric tons) Lifetime		413,000	547,755	737,735	1,698,490
Customer Bill Savings Annual (\$ million)		\$4.3	\$6.1	\$8.4	\$18.8
Customer Bill Savings Lifetime (\$ million)		\$91.7	\$122.9	\$163.8	\$378.3
Private Investment (\$ million)		\$40.9	\$59.3	\$85.0	\$185.2
LMI Units Served		17,334	26,709	29,568	73,611

# Appendix D – Investment Plan Review Supplement<sup>1</sup>

## RetrofitNY

### Results to Date – Metrics

Currently the program engagement strategy is still being finalized and no progress has yet been recorded against the program targets. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2025)	% of Total Target through Initiative Completion (2025)
Energy Efficiency	MWh Annual	-	-	-	-	-	-	-	187,100	-
	MWh Lifetime	-	-	-	-	-	-	-	3,742,000	-
	MMBtu Annual	-	-	-	-	-	-	-	3,356,000	-
	MMBtu Lifetime	-	-	-	-	-	-	-	67,130,000	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	-	-	290,200	-
	Lifetime Tons	-	-	-	-	-	-	-	5,804,000	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	-	-	\$56.16	-
	Lifetime Dollars	-	-	-	-	-	-	-	\$1,122	-
Private Investment (millions)	Dollars	-	-	-	-	-	-	-	\$1,411	-
Participants	Participants	-	-	-	-	-	85	-	100,000	-

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Activity/Outputs	Indicators	Baseline	2019 Target	2025 Target	June 2017 Actual
			(Cumulative)	(Cumulative)	(Cumulative)
Activity/Outputs	Number of units committed by affordable housing organizations and private owners	0	50,000	100,000	0
	Number of valid solutions evaluated by the competition jury	0	5	15	0
	Funding and financing committed by the private sector	\$0	\$605,000	\$1,410,680,000	0
	Number of retrofit packages tested through pilots	0	1	4	0
	Number of units retrofitted or in the pipeline	0	430	100,000	0

<sup>1</sup> As this report includes performance through Q2 2017 and the Low-Income Community Solar Initiative was filed in Q4 2017, that initiative is not included herein.



### Performance Against Key Milestones

Currently the program is finalizing the strategy to engage design teams and building owners through this solicitation, which is anticipated to be released in Q3 2017. Criteria to be met by technical solutions have been drafted and demand aggregation and the identification of potential pilot sites and portfolios are proceeding on schedule. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
	2016	Criteria to be met by technical solutions are defined.
	2017	Sufficient potential demand for deep energy retrofits is aggregated.
	2017	Competitive solicitation for the first round of the design-build competition is released.

### Plan for Continuation/Modification/Termination

The Retrofit NY initiative was revised in June 2017 to reflect a shift in timing of budget and benefits commitments, as well as program activities to further out in time. Following these modifications, the initiative will continue as planned. NYSERDA will continue to monitor progress once the solicitation is launched to determine if any additional modifications are needed to the investment plan.

## REVitalize

### Results to Date – Metrics

The REVitalize Initiative is ramping up, with the June 27, 2017 launch of a solicitation to fund five Community-Based Organizations to plan and develop a community scale clean energy project. The initiative will begin accounting for benefit metrics once project commitments are made. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2025)	% of Total Target through Initiative Completion (2025)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	881	-	2,994	-
	MWh Lifetime	-	-	-	-	-	17,600	-	59,880	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	1	-	2	-
	Annual Tons	-	-	-	-	-	463	-	1,575	-
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	-	-	9,260	-	31,500	-
	Annual Dollars	-	-	-	-	-	\$0.14	-	\$0.48	-
Private Investment (millions)	Lifetime Dollars	-	-	-	-	-	\$2.78	-	\$9.46	-
	Dollars	-	-	-	-	-	\$1.88	-	\$5.88	-
Participants	Participants	-	-	-	-	-	3	-	5	-

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2019 Target	2025 Target	June 2017 Actual <sup>2</sup>
		(Cumulative)	(Cumulative)	(Cumulative)
Number of LMI and EJ communities undertaking clean energy planning efforts	0	5	80	n/a
Number of toolkits developed to reduce the learning curve associated with community energy planning in LMI and EJ communities	0	1-3	1-3	n/a

<sup>2</sup> Outputs have “n/a” in the June 2017 Actual column because the initiative only launched as of June 27, 2017.

### Performance Against Key Milestones

The REVitalize initiative is currently working toward completion on several 2017 milestones due to a delayed launch. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
✓	2017	Issue a competitive solicitation seeking proposals for a community energy planning effort that benefits low-to-moderate income (LMI) communities and residents.
	2017	Selection of five communities to receive financial and technical support, contract development, and contract execution by Q2 2017.
	2017	Commencement of community planning activities, development of community plan, testing of the toolkit.
	2017	Community-scale clean energy project development and implementation started.

### Plan for Continuation/Modification/Termination

The REVitalize initiative has been modified in June 2017 to shift the budget and benefit commitments forward in time, and to update Milestones 1, 5, and 6 in the investment plan to reflect an updated timeframe for completion. Following these modifications, the initiative will continue as planned.

## Low Income Forum on Energy

### Results to Date – Metrics

Participant enrollment is the only benefit metric ordered for Low-Income Forum on Energy. This metric is exceeding its annual target. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2025)	% of Total Target through Initiative Completion (2025)
Participants	Participants	422	519	941	-	941	569	165%	7,629	12%

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	2025 Target	June 2017 Actual
			(Cumulative)	(Cumulative)	(Cumulative)
<b>Activity/Outputs</b>	Number of meetings and conferences	1 conference every other year and 7 annual meetings occurring in the alternate years	1 conference and 14 regional meetings	4 biennial conferences and 35 regional meetings	7 regional meetings were held in April-May 2017
	Number of monthly webinars completed	10 per year	33	93	9
	Number of monthly newsletters circulated	10 per year	33	93	9

### Performance Against Key Milestones

The Low Income Forum on Energy initiative has completed all of its current milestones. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete ✓	Time Frame	Milestone
✓	2017	Issue a competitive solicitation for program support.
✓	2017	Implement a series of regional meetings across the State in Q2 of 2017.

Plan for Continuation/Modification/Termination

The Low Income Forum on Energy initiative was updated in June 2017 to reflect 2016 actual participants, and to add a participant value for 2025, which was left blank in error in the original filing, increasing the total number of participants. Following these modifications, the initiative will continue as planned.

## Healthy Homes Feasibility

### Results to Date – Metrics

Not applicable. There were no energy related metrics in this investment plan.

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA's current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	2025 Target	June 2017 Actual
			(Cumulative)	(Cumulative)	(Cumulative)
<b>Activity/Outputs</b>	Feasibility Study	0	1	1	0

### Performance Against Key Milestones

The Healthy Homes initiative has not completed any of its milestones as of Q2 2017, but is making progress. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓		
	2017	Complete feasibility study and decide on whether to continue with the pilot design and implementation phase.
	2017	Begin the pilot design phase, if NYSERDA and NYS agency partners decide to go forward.
	2017	Pilot design is complete.
	2017	Commencement of pilot activities.

### Plan for Continuation/Modification/Termination

The Healthy Homes Feasibility initiative has been progressing following the activities and timeline laid out in the investment plan. There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

## Low-to-Moderate Income Single Family, Moderate Income

### Results to Date – Metrics

The Low-to-Moderate Income Single Family, Moderate Income Initiative is on track to achieve all benefit metrics, with achievements ranging from 89% to 104% of cumulative current targets through Q2 2017. MWh savings and private investment are currently the only benefit metrics exceeding their targets. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2021)	% of Total Target through Initiative Completion (2021)
Energy Efficiency	MWh Annual	1,272	302	1,574	67	1,641	1,585	104%	4,236	39%
	MWh Lifetime	19,079	4,534	23,613	1,009	24,622	23,700	104%	63,520	39%
	MMBtu Annual	65,170	11,699	76,869	4,968	81,837	86,550	95%	282,300	29%
	MMBtu Lifetime	1,629,249	292,479	1,921,728	124,200	2,045,929	2,170,000	94%	5,986,000	34%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	4,490	838	5,328	327	5,655	5,740	99%	18,160	31%
	Lifetime Tons	105,562	19,362	124,924	7,813	132,737	134,750	99%	368,400	36%
Customer Bill Savings (millions)	Annual Dollars	\$0.92	\$0.16	\$1.08	\$0.08	\$1.16	\$1.30	89%	\$4.08	28%
	Lifetime Dollars	\$21.48	\$3.72	\$25.20	\$1.80	\$27.00	\$30.15	90%	\$82.50	33%
Private Investment (millions)	Dollars	\$10.81	\$2.41	\$13.22	\$0.99	\$14.21	\$13.85	103%	\$43.06	33%
Participants	Participants	2,194	503	2,697	207	2,904	3,099	94%	11,258	26%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Current milestones that are not yet complete are currently in progress. Four regional contractor meetings are scheduled in July, where contractor feedback will be gathered. The Technical Services Implementation RFP was issued in Q2 2017 and NYSERDA anticipates awarding the contract in Q3. In addition, testing and training activities on the referral database are underway and the policies and procedures manual is being updated with a next release expected in Q4. Future milestones are not included in this table, but are detailed in NYSERDA’s investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA’s Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓	2017	Host regional contractor meetings to gather stakeholder input.
	2017	Competitive solicitation for technical implementation services.
	2017	Deploy new low-income referral tracking database.
	2017	Update policies and procedures manual.

### Plan for Continuation/Modification/Termination

The Low-to-Moderate Income Single Family initiative budget and benefit values were updated in June 2017 to reflect 2016 actuals, as well as to update the timing for the overall budget and benefit

commitments metrics to reflect actual program uptake rates. Additional funding was also added for increased projects for both low income and moderate income based on increasing demand, and to meet Governor Cuomo's goal of serving 20,000 low income households in 2017, as well as to support improved data management, program evaluations, and consumer education and awareness activities. Overall MWh and MMBTU savings are expected to increase in accordance with this increase in funding, and the revised benefit values were reflected herein. The initiative has been extended through 2021, with increased funding for the additional years. Following these modifications, the initiative will continue as planned.



## Low-To-Moderate Income Multifamily

### Results to Date – Metrics

Most benefit metrics for the Low-To-Moderate Income Multifamily Initiative are lagging slightly behind expectations, ranging from 69% to 94% of cumulative current targets through Q2 2017. MMBtu savings are the only benefit metric currently exceeding the cumulative current target through Q2 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2021)	% of Total Target through Initiative Completion (2021)
Energy Efficiency	MWh Annual	-	-	-	2,391	2,391	3,070	78%	47,720	5%
	MWh Lifetime	-	-	-	35,864	35,864	46,050	78%	716,100	5%
	MMBtu Annual	-	-	-	43,813	43,813	41,850	105%	650,100	7%
	MMBtu Lifetime	-	-	-	657,197	657,197	628,500	105%	9,762,000	7%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	3,587	3,587	4,055	88%	62,990	6%
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	53,808	53,808	60,850	88%	945,900	6%
	Annual Dollars	-	-	-	\$0.58	\$0.58	\$0.85	69%	\$13.15	4%
Private Investment (millions)	Lifetime Dollars	-	-	-	\$8.75	\$8.75	\$12.69	69%	\$197.00	4%
	Dollars	-	-	-	-	-	\$13.23	-	\$175.54	-
Number of Units Served	Participants	-	-	-	2,322	2,322	2,461	94%	39,464	6%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

The Low-To-Moderate Income Multifamily Initiative is making progress toward its current milestones. Current milestones that are not yet complete are or will soon be in progress. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓		
	2017	Increase incentive levels, and decrease minimum threshold.
	2017	Host annual Provider Summit understand market impacts and future needs.

### Plan for Continuation/Modification/Termination

The Low-to-Moderate Income Multifamily initiative did not meet its 2016 projected targets. The initiative was revised in July 2017 to remove the targeted option due to lack of customer interest and modify the comprehensive option incentive level and minimum savings threshold to better align with LMI market needs.

The Targeted Option was intended to help owners of market rate buildings implement single measure upgrades that were not incentivized through energy efficiency programs offered by utility companies. However, as evidenced by lack of participation and customer interest in this program component, this program was not aligned with current customer needs. As such, NYSERDA

eliminated the Targeted Option, and corresponding budget and benefit estimates have been removed.

The Comprehensive Option will continue with modifications, and the budget and benefits have been revised accordingly. A significant risk to LMI projects is access to capital. NYSERDA worked with the market to identify a minimum level of support and increased the incentive level to support a larger portion of project cost to support the needs of the LMI community. NYSERDA also lowered the program's minimum savings threshold. Market feedback highlighted a risk associated with the previous 25% savings threshold target and impacts to scope changes during the life of a project. NYSERDA decreased the savings threshold to increase the potential market opportunity for participation and reduce the risk associated with scope change during the life of a project.

The High-Performance Offering will continue to support deeper and comprehensive energy retrofits that are not currently supported by utility programs. However, due to a later than anticipated program launch, budgets and benefits have been adjusted out in time. In addition, NYSERDA may offer this component through either through a competitive or an open enrollment solicitation based on additional market intelligence currently being gathered by program staff. NYSERDA also added funding to support the Solutions Provider Network. As noted in the original filing, the Providers work with building owners and NYSERDA to act as program liaisons to design and implement projects. The funding added is necessary to support the Provider Network in its current state to maintain support for the Comprehensive Option.

## Low-to-Moderate Income Single Family, Low Income

### Results to Date – Metrics

The Low-to-Moderate Income Single Family, Low Income Initiative is on track for all benefit metrics, with progress ranging from 91% to 96% of cumulative current target through Q2 2017. Additional information can be found in NYSERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2021)	% of Total Target through Initiative Completion (2021)
Energy Efficiency	MWh Annual	3,754	1,110	4,863	1,648	6,512	6,775	96%	29,620	22%
	MWh Lifetime	56,307	16,646	72,952	24,721	97,674	101,600	96%	444,500	22%
	MMBtu Annual	96,889	28,549	125,438	44,436	169,873	183,000	93%	729,000	23%
	MMBtu Lifetime	2,422,227	713,720	3,135,946	1,110,889	4,246,836	4,575,000	93%	14,970,000	28%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	7,283	2,135	9,418	3,293	12,711	13,850	92%	56,750	22%
	Lifetime Tons	162,317	47,533	209,850	73,655	283,504	311,500	91%	1,078,000	26%
Customer Bill Savings (millions)	Annual Dollars	\$1.67	\$0.51	\$2.18	\$0.85	\$3.03	\$3.29	92%	\$13.55	22%
	Lifetime Dollars	\$37.06	\$11.19	\$48.25	\$18.53	\$66.78	\$71.50	93%	\$251.50	27%
Private Investment (millions)	Dollars	-	-	-	-	-	\$0.38	-	\$5.70	-
Participants	Participants	6,947	1,968	8,915	3,020	11,935	13,027	92%	53,948	22%

### Results to Date – Outputs/Outcomes

Not applicable. Transition programs do not have outputs/outcome reporting.

### Performance Against Key Milestones

Current milestones that are not yet complete are currently in progress. Four regional contractor meetings are scheduled in July, where contractor feedback will be gathered. The Technical Services Implementation RFP was issued in Q2 2017 and NYSERDA anticipates awarding the contract in Q3. In addition, testing and training activities on the referral database are underway and the policies and procedures manual is being updated with a next release expected in Q4. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

Complete	Time Frame	Milestone
✓	2017	Host regional contractor meetings to gather stakeholder input.
	2017	Competitive solicitation for technical implementation services.
	2017	Deploy new low-income referral tracking database.
	2017	Update policies and procedures manual.

### Plan for Continuation/Modification/Termination

The Low-to-Moderate Income Single Family initiative budget and benefit values were updated in June 2017 to reflect 2016 actuals, as well as to update the timing for the overall budget and benefit commitments metrics to reflect actual program uptake rates. Additional funding has been added for

increased projects for both low income and moderate income based on increasing demand, and to meet Governor Cuomo's goal of serving 20,000 low income households in 2017. Additional funding has also been added to support improved data management and program evaluations as well as consumer education and awareness activities. Overall MWh and MMBTU savings are expected to increase in accordance with this increase in funding, and the revised benefit values are reflected herein. The initiative has been extended through 2021, with increased funding for the additional years. Following these modifications, the initiative will continue as planned.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

**Clean Energy Fund Investment Plan:  
Workforce Development and Training  
Chapter**

**Portfolio: Market Development**

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan: Workforce Development and Training Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
August 18, 2016	Original Issue	Original Issue
September 9, 2016	Revised Table 3	10
September 15, 2017	Expanded eligibility, and increased funding to allow for additional solicitations. Tables 1-6 have been revised, and Milestones have been updated accordingly.	Multiple
November 1, 2017	Corrected chapter number.	Multiple

# 16 Workforce Development and Training

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The New York State Energy Research and Development Authority (NYSERDA) seeks to build on its long history of working in partnership with education and training systems to deliver the workforce skills employers need. With many of the state’s most skilled employees approaching retirement age, an insufficient pipeline of skilled workers to fill the gap and technologies that are evolving rapidly, New York needs a readily available workforce that is skilled and adaptable. Many initiatives will target incumbent workers, but whenever possible, efforts will seek to identify future workforce needs and increase economic opportunity for unemployed and underemployed workers by developing and promoting middle-skill jobs.

In the first initiative described in this Chapter, NYSERDA is utilizing an Industry Partnership approach to workforce training (i.e., an ongoing dialogue among industry leaders on common workforce issues and opportunities). This approach is intended to: help identify worker skill needs; inform investments in skills and talent development; support career pathways; and develop the training infrastructure needed to better link supply and demand in the labor market. NYSERDA will initially focused this approach on building operations and maintenance. However, the initiative will also explore an industry partnership approach for other sectors or technologies. The initiative has been modified to expand the eligibility of who can lead an industry partnership project, as well as adding funding for additional solicitations. The benefits have been increased and milestones have been updated accordingly to account for the additional funding.

Potential additional initiatives under consideration would address discrete training and workforce development gaps and necessary interventions to support other Clean Energy Fund (CEF) priorities including, but not limited to, training on large scale renewables and distributed generation technologies for municipalities and code officials, practitioner training for renewable thermal technologies (e.g., geothermal and solar thermal), smart grid technologies, new storage technologies and zero energy homes, high efficiency heating, ventilation and air conditioning (HVAC) technology and system training, training to help support transitioning veterans and low- and moderate-income populations, training on advanced residential clean energy technologies, technical sales training for renewable energy technologies, etc.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 16.1 Industry Partnerships

<b>Present Situation</b>	<ul style="list-style-type: none"> <li>Commercial net energy use, including most large multifamily buildings, accounts for 25 percent of the total energy demand in New York State. According to the U.S.</li> </ul>
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	<p>Department of Energy, building owners can save five to 20 percent on their energy bills annually by implementing operations and maintenance best practices<sup>1</sup>.</p> <ul style="list-style-type: none"> <li>• Proper building operations and maintenance, quality training for operations and maintenance staff, and the creation of an energy efficiency culture for building owners and occupants are important components of operation and maintenance programs<sup>2</sup> but are often overlooked or undervalued. Facility equipment performance is directly linked to the capabilities of the individuals responsible for building operations. Proper training for operators increases the likelihood that equipment will function effectively and efficiently over its expected lifespan.</li> <li>• There are more than 120,000 people employed in building operations and maintenance-related occupations across New York State. Approximately 20 percent of the building operations and maintenance workforce is slated to retire over the next five years. This would result in more than 24,000 vacancies, which could lead to a significant skills shortage<sup>3</sup>. With starting wages for entry level maintenance and operations workers averaging \$17 per hour and boiler operators averaging \$32 per hour, there is a great potential to prepare low- and middle-income workers for clean energy jobs.</li> <li>• In addition to losses through retirement attrition, the industry is also faced with ongoing technological advancements that can have significant impacts on the workforce. As new and emerging clean energy technologies, continue to gain prominence, there is a need to upgrade the skills of new and existing workers. Both employers and workers will benefit from the development of new clean energy skills.</li> <li>• NYSERDA has past experience developing training and career pathways initiatives, including its on-the-job training program, which resulted in more than 600 job placements and job advancements.</li> <li>• Results from the building operations and maintenance solicitation indicate significant interest from building owners and managers in developing integrated and sustainable training mechanisms that can be replicated across large portfolios. Proposals target training activities in hospitals, universities, K-12 schools, commercial office buildings, and multifamily buildings with great interest building. Activities include the development and deployment of in-house talent development strategies that will institutionalize best practices across organizations.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA will leverage existing training infrastructure and focus on job skills and training that lead to job placement and career advancement through an “Industry partnership” approach. This approach involves obtaining stakeholder input to help identify, implement, and replicate workforce development and training initiatives designed to match industry workforce needs with a supply of skilled workers.</li> <li>• The industry partnership approach will identify workforce development and training needs for building operations and maintenance occupations across multiple sectors. NYSERDA will also assess the potential for follow-on industry partnerships in additional areas where labor market needs and workforce training gaps have been identified, such as but not limited to renewable thermal technologies (e.g., geothermal and solar thermal), smart grid and smart networks, and large-scale renewables.</li> </ul>

<sup>1</sup> Patterns and Trends New York State Energy Profiles: 1999-2013 Final Report October 2015:

<http://www.nyserdera.ny.gov/About/Publications/EA-Reports-and-Studies/Patterns-and-Trends>

<sup>2</sup> Energy Efficient Operations and Maintenance Practices in NYS Buildings, Columbia University School of International and Public Affairs, 2014

<sup>3</sup> Building Operations and Maintenance: Maintenance and Repair Workers (108,832 workers in 2015, SOC 49-9071), Property, Real Estate, and Community Association Managers (10,477 workers in 2015, SOC 11-9141), and Boiler Operators (1,768 workers in 2015, SOC 51-8021). Total of 121,077 workers.



	<ul style="list-style-type: none"> <li>• NYSEERDA will issue competitive solicitations targeting large entities with multiple buildings and sites to support development of on-the-job building operation and maintenance training initiatives. Employers will commit to replicating the results throughout their buildings.</li> <li>• Proposals could be submitted by an organization or by teams that include existing training entities, unions, etc. Examples of typical projects include: partnerships with training providers to update classroom training and the development of internal trainers to provide continuous, on-the-job training and sustainable, replicable models; development of internships, mentoring, or on-the-job training programs that can build skills, help new hires, and provide career advancement opportunities for supervisors/mentors; development of new curriculum or curriculum modules to support continuing education and pursuit of certifications; support for new certifications; or creation or updating of apprenticeships.</li> <li>• The strategy is designed to address common skills gaps and workforce training needs in an industry or sector, across industries or sectors, and related to a specific technology or occupation. While interventions are designed to be responsive to industry needs, existing workers will develop new skills that can result in new responsibilities and higher wages.</li> <li>• With guidance from industry, NYSEERDA will also implement a minimum of six demonstrations (three in building operations and maintenance and three in areas such as renewable thermal, storage, zero energy homes, renewables, high efficiency HVAC technologies and systems, advanced residential clean energy technologies, or smart grid technology applications). These demonstrations will help make the business case for investing in training and for developing internal training mechanisms and career advancement for workers. Such demonstrations will also help identify opportunities for new industry partnerships that address common skills gaps and workforce needs in targeted areas.</li> <li>• Demonstrations will be used to show the isolated energy impacts associated with a skilled and/or credentialed workforce, information on which is not readily available.</li> <li>• The results from the business case demonstrations will be disseminated through market channels to help support the development of more effective talent strategies for relevant occupations and to facilitate the adoption of an energy culture within facilities and across organizations.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Workforce Development and Training: Industry Partnerships,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Demonstrate the value of training to employers of building workers.</li> <li>• Demonstrate the value of training to new and existing employees in terms of job placements, opportunities for low- and moderate-income workers, starting wages and wage increases, career paths and advancements, and attainment of certifications.</li> <li>• Train workers to meet the emerging technology demands of jobs in the clean energy sector.</li> <li>• Form industry partnerships to inform employer-driven workforce solutions, including: <ul style="list-style-type: none"> <li>○ improved skills enhancement for existing workers;</li> <li>○ increased access to entry level jobs for disadvantaged (including workers from low- and moderate-income communities) New Yorkers; and</li> <li>○ increased energy savings and net operating income for building owners.</li> </ul> </li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<p>This strategy contributes to the State Energy Plan goals for energy efficiency and emission reductions because well-trained workers will allow buildings to fully realize the energy savings potential of systems and equipment through proper maintenance and operation. The Energy Plan also directs the State to look for opportunities to leverage the Regional Economic Development Councils, to identify workforce needs and engage</p>

	industry to help shape curriculum--particularly at the State University of New York (SUNY), City University of New York (CUNY), community colleges, and technical institutes--including short courses and incumbent worker retraining. This strategy encompasses jobs in energy efficiency, building retrofit, weatherization, site-based clean and renewable energy resources, power supply and demand, smart grid, codes and standards, manufacturing and operations, and professional services.
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### 16.1.1 Target Market Characterization

<b>Target Market Segment(s)</b>	The initial target market is employers, managers, new hires and staff involved in building operations and maintenance across the commercial and multifamily building sectors. NYSERDA will seek to partner with large organizations and institutions with high potential for large scale energy savings as a result of training building operations and maintenance staff.
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Colleges and universities</li> <li>• Healthcare institutions</li> <li>• Large commercial real estate firms</li> <li>• Public agencies with significant building space</li> <li>• NYC Department of Citywide Administrative Services (DCAS)</li> <li>• SUNY, Office of Facilities Management</li> <li>• CUNY, Building Performance Lab</li> <li>• New York City Housing Authority</li> <li>• NYC Mayor’s Office of Sustainability</li> <li>• NYC Small Business Services</li> <li>• NYS Department of Labor (DOL)</li> <li>• New York Power Authority (NYPA)</li> <li>• Training organizations, including, among others: <ul style="list-style-type: none"> <li>○ International Union of Operating Engineers (IUOE) Local 94</li> <li>○ International Brotherhood of Electrical Workers (IBEW) Local 3</li> <li>○ Service Employees International Union (SEIU) 32 BJ</li> <li>○ Urban Green Council (NYC Chapter of the United States Green Building Council)</li> <li>○ Solar One</li> <li>○ Association for Energy Affordability</li> <li>○ Association for Energy Engineers</li> </ul> </li> <li>• Regional Economic Development Councils (REDCs)</li> <li>• Workforce Investment Boards (WIBs)</li> <li>• Job seekers including disadvantaged workers<sup>4</sup></li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• NYSERDA has worked with over 70 training partners over the past 10 years to develop state-of-the-art training facilities and programs to ensure there is an adequate training infrastructure and a skilled labor supply to support the clean energy economy. The industry partnership approach will allow NYSERDA to leverage past work and identify a comprehensive portfolio of NYSERDA initiatives to enhance the skills of clean energy workers in order to enable growth in identified markets.</li> </ul>

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<sup>4</sup> Disadvantaged workers include, but are not limited to: those residing in low and moderate-income communities, underrepresented populations including women and people of color, and disconnected youth.

	<ul style="list-style-type: none"> <li>• Industry is looking for more customized, site-specific and hands-on training to supplement classroom training. Such training can better prepare new workers and provide opportunities to advance the skills of existing workers. After extensive stakeholder interviews and surveys, building operations and maintenance was identified as an area for more concerted worker training beyond classroom training.</li> <li>• The level of retirements expected throughout the industry necessitates an influx of new entrants and increased skill levels for existing workers.</li> <li>• When combined with advanced technologies for energy and cost savings, these factors create an ideal opportunity to work with industry to address critical skills gaps and needs for building operators and maintenance staff. Initial feedback from industry partners, detailed in the Market Participants section, indicates that there is receptivity to the employer-driven approach to program planning. Feedback has been positive from employers as well as training providers.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Properly managing and closely monitoring facilities can reduce energy use and associated utility costs, protect investments in equipment, improve building safety, and avert unnecessary service interruptions and the costs associated with equipment failures.</li> <li>• Investments in continuous workforce development and skill enhancement can lead to opportunities for professional development and advancement for entry and mid-level workers seeking careers in operations and maintenance occupations. These skills are transferrable throughout the industry and can also lead to increased wages over time.</li> </ul>

16.1.2 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA has conducted extensive outreach, including interviews, stakeholder meetings, and focus groups with more than 50 customers, as well as a survey that garnered an additional 48 responses.</li> <li>• Through its outreach, NYSERDA was able to engage with employers across a variety of market segments: solar electric; renewable thermal; existing trades (e.g., heating, ventilation and air conditioning, plumbing, carpentry, and weatherization) serving residential customers; equipment and component manufacturers; architects and engineers; investor-owned and private utilities; and building operations and maintenance staff serving multifamily and commercial buildings.</li> <li>• As a result of stakeholder input, building operations and maintenance quickly emerged as an initial focus area with the potential for a large impact in the near term: advancing skills for existing workers, better preparing new entrants to the workforce, and achieving energy efficiency and greenhouse gas reduction goals.</li> <li>• After several informal brainstorming sessions with stakeholders, an initial meeting of key industry partners took place in early June 2016. Dialogue with industry partners and stakeholders continued through 2017.</li> <li>• In response to the 2017 building operations and maintenance solicitation, NYSERDA spoke with more than 70 potential proposers about project concepts and ideas. Inquiries from potential applicants continue.</li> <li>• NYSERDA will also coordinate with the workforce activities of other State agencies, such as NYPA, DOL, and Empire State Development (ESD).</li> </ul>
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### 16.1.3 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>● <b>Shortage of skilled workers due to attrition from retirements:</b> There is an opportunity for NYSERDA to assist industry partners to leverage existing training infrastructures, develop internal training systems to impact more buildings and workers, support entry-level workers, and advance the skills of existing workers. Career pathway development and career advancement for building operations and maintenance will be a priority.</li> <li>● <b>Changing technology demands requiring upgraded skills for new and existing workers:</b> The industry is faced with the integration of clean energy resources such as solar, geothermal, wind, storage technologies, micro-grids, smart meters and devices, network-connected systems, applications for managing equipment and building systems, and the availability of real-time data. These new technologies, devices, and systems will have significant impacts on building operations and maintenance and the workforce. There is a critical need to upgrade the skills of new and existing workers on a systematic and on-going basis.</li> <li>● <b>Lack of information and tools needed to address skills gaps from the demand side:</b> Most workforce interventions in New York State focus on the labor supply and are measured by the number of workers being trained or certified. New interventions demonstrated through this initiative will balance labor demand with supply. Recent industry-based efforts in the advanced manufacturing sector, have shown some of the most successful workforce interventions are those driven by regional employer demand<sup>5</sup>.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>● If industry partners implement operations and maintenance best practices, then energy savings could exceed five percent within the first two years of implementation.</li> <li>● If industry partners institutionalize a culture of continuing professional development among operations and maintenance staff, then they can expect to see improved worker retention and knowledge transfer as aging workers approach retirement.</li> <li>● If NYSERDA isolates the impacts of a trained and workforce to prove the business case for training through the demonstrations, then other decision makers (property owners, employers, institutional administrators, etc.) will adopt similar strategies.</li> </ul>
<p><b>Activities</b></p>	<ol style="list-style-type: none"> <li>1) Industry Partnerships to Identify Barriers and Skills - develop two to four regional industry partnerships of five to 10 employers to identify labor-related barriers and skills gaps based on labor market analysis             <ol style="list-style-type: none"> <li>a) Building operations and maintenance is the first industry partnership to be fully implemented. Convene industry partnership meetings and conduct voice of customer outreach to solicit input and find common skills and training gaps.</li> <li>b) With input from the industry partnership, identify the specific worker skills and talents needed by employers, which may be at any stage: hiring, technological modernization, or incumbent worker advancement.</li> <li>c) Explore opportunities to develop industry partnerships, where appropriate and through a modification to this plan or through an additional plan, in new areas: renewable thermal, storage, zero energy homes, renewables, high</li> </ol> </li> </ol>

<sup>5</sup> Groves Garrett and Woolsey, Lindsey. (2013) *Sector Strategies Coming of Age: Implications for State Workforce Policy Makers*. Ann Arbor, Michigan and Washington DC: Corporation for a Skilled Workforce, National Governors Association, and National Skills Coalition.

	<p>efficiency HVAC technologies and systems , advanced residential clean energy technologies or smart grid technology applications.</p> <p>d) Facilitate the replication of successful training models and initiatives where applicable.</p> <p>2) Business Case Demonstrations - conduct six business case demonstrations to prove the impact and value of technical training.</p> <p>a) Evaluate technical training available in the market, utilizing an industry recognized evaluation model that goes beyond immediate reactions to training to measure the impacts of training.</p> <p>b) Present business case and evaluation findings in case studies and other tools for dissemination to others in the industry who may be considering an investment in workforce training and development.</p> <p>3) Identify Training Intervention to Address Skills and Barriers - work with industry partners to identify specific building operations and maintenance training needs and best practices to address barriers identified by the Industry Partnership. Interventions will be targeted at developing sustainable in-house training infrastructure and practices and will include but will not be limited to, the following:</p> <p>a) Train-the-trainer initiatives to develop internal capacity for knowledge transfer</p> <p>b) Partnerships with manufacturers to ensure that training providers have equipment that meets or exceeds industry standards</p> <p>c) Curriculum development</p> <p>d) On-the-job training, internships, and apprenticeship enhancement in support of career pathways</p> <p>4) Competitive Solicitations - Issue up to five competitive solicitations by the end of 2019 (open to all eligible New York entities) in support of innovative approaches and interventions, as identified above, with entities with multiple buildings and sites). One open enrollment solicitation was issued with two due dates for submission by July 2017. Projects will be solicited to develop workforce training initiatives that leverage existing resources while moving organizations toward a culture that promotes more routine training, including the advancement of skills for existing workers and the development of career pathways for new workers.</p> <p>a) Make contract awards – Award a total of approximately 36 contracts. Performance metrics may include, but are not limited to: number of workers training, incumbent workers advanced or promoted, new hires from LMI communities, and number of trainers trained.</p> <p>5) Curriculum Development - Where gaps are identified, invest in curriculum development and assess the need for new industry standards to address technological changes.</p> <p>6) Case Studies - Develop case studies to identify best practices and to illustrate career pathways in energy efficient building operations and maintenance. Templates- Work with industry partners to develop templates that identify interventions and combinations of interventions that can serve as a road map to advance skills and provide easy paths to entry-level jobs.</p> <p>7) Marketing Plan - Develop plan to market business demonstration and building operation and maintenance training project results and case studies. Plan will need to be tailored to the various sectors that can benefit from the results and lessons learned.</p>
<b>Key Milestones</b>	<p><u>Milestone 1 (2016)</u></p> <ul style="list-style-type: none"> <li>• Convene industry partners for building operation and maintenance.</li> </ul>

	<p><u>Milestone 2 (2016)</u></p> <ul style="list-style-type: none"> <li>Identify employer champions, those who will help NYSERDA to lead the initiative, for building operations and maintenance.</li> </ul> <p><u>Milestone 3 (2016)</u></p> <ul style="list-style-type: none"> <li>Identify common labor-related barriers and potential training interventions.</li> </ul> <p><u>Milestone 4 (2017-2018)</u></p> <ul style="list-style-type: none"> <li>Identify and implement up to six business demonstrations. Collect performance data from demonstration sites for case studies and sharing results.</li> </ul> <p><u>Milestone 5 (2017-2019)</u></p> <ul style="list-style-type: none"> <li>Issue a solicitation (s) to support the development of building operations and maintenance training initiatives that address skills gaps and facilitate career paths. with multiple due dates as appropriate.</li> </ul> <p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>Identify one additional area (by sectors, industry or technology) to initiate industry partnership strategy to address workforce development and training needs to advance goals of CEF</li> </ul> <p><u>Milestone 7 (2017)</u></p> <ul style="list-style-type: none"> <li>Data collected from demonstration sites to help demonstrate the business case for training.</li> </ul> <p><u>Milestone 8 (2018-2019)</u></p> <ul style="list-style-type: none"> <li>Develop and implement marketing plan to share results of business case demonstrations and building operations and maintenance project results. Share intervention templates with industry.</li> </ul>
<p><b>Goals Prior to Exit</b></p>	<ul style="list-style-type: none"> <li>Achievement of site-specific performance targets at business case demonstration sites. These may include the following: <ul style="list-style-type: none"> <li>Energy savings/CO2 emissions reduced in buildings where on-site training is implemented</li> <li>Employee retention and/or reduced time to fill vacancies improved</li> <li>Training and skill enhancement institutionalized</li> <li>Trained worker wage increased, commensurate with skill enhancement</li> <li>New hires placed</li> <li>Employee turnover for trained workers reduced</li> <li>Career pathways better defined</li> <li>Tenant satisfaction/health/comfort improved</li> <li>Skills specific to technological barriers enhanced: <ul style="list-style-type: none"> <li>Automated controls</li> <li>Network-connected systems</li> </ul> </li> </ul> </li> <li>Dissemination of best practices proving the return on investment for training and skill enhancement for workers.</li> <li>Improved coordination with Regional Economic Development Councils and Workforce Investment Board activities, including leveraging of funds where appropriate.</li> <li>Deploy an industry partnership model across other areas of the clean energy economy where justified by market readiness and strategic fit. Other areas may include: renewable thermal, storage, zero energy homes, renewables, high efficiency HVAC technologies and systems, advanced residential clean energy technologies or smart grid technology applications.</li> </ul>

#### 16.1.4 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• NYSERDA is coordinating sector strategy work with NYPA's training activities to share best practices and lessons learned and intends to engage other utilities through the stakeholder engagement process.</li> <li>• Many training partners already work closely with the utilities. Commercial building partners often have close relationships with their utilities and participate in energy efficiency incentive programs administered by their utilities. NYSERDA will seek to engage utility key account managers to help identify potential end users.</li> <li>• NYSERDA will also take advantage of the Clean Energy Advisory Council (CEAC) Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• The industry partnership model leverages investments such as Build Smart NY, under which NYPA and SUNY implemented large scale energy efficiency upgrades at several SUNY campuses. The industry partnership model seeks to bolster these investments by improving worker skills so that systems are operated optimally in eligible buildings.</li> </ul>

#### 16.1.5 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

Commitment Budget	2016	2017	2018	2019	Total
Direct Incentives and Services	\$35,000	\$4,055,000	\$3,850,000	\$2,510,000	\$10,450,000
Tools, Training, and Replication	\$-	\$220,000	\$200,000	\$150,000	\$570,000
Implementation Support	\$175,000	\$50,000	\$50,000	\$50,000	\$325,000
Total	\$210,000	\$4,325,000	\$4,100,000	\$2,710,000	\$11,345,000

**Table 2: Annual Expenditures Projection**

Expenditures	2017	2018	2019	2020	2021	2022	Total
Total	3%	13%	15%	27%	27%	14%	100%

#### 16.1.6 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are

measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

<b>Indicators<sup>6</sup></b>		<b>Baseline (Before/Current)</b>	<b>2019 (Cumulative)</b>	<b>2022 (Cumulative)</b>
Activity/Outputs	Increase in number of workers trained	0	435	1,170
	Increase in the percent of trainees obtaining national certifications	0%	20%	30%
Outcomes	Increase number of staff qualified to train others	0	90	120
	Increase in number of industry partnerships	1	3	3
	Increase number of new curricula available	0	3	8
	Improve performance and efficiency of building systems	0%	5%	10%
	Number of incumbent workers advanced/promoted	0	108	123
	Number of individuals placed into paid internships/OJT/apprenticeships	0	136	170
	Number of disadvantaged (LMI) workers placed in building operations and maintenance jobs	0	35	45

In addition to the above outcomes, NYSERDA will also assess:

- Increased wages for trainees
- Improved employee retention
- Decreased time for employer to find and hire new talent with the appropriate skills.

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

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<sup>6</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.



**Table 4. Direct Impacts<sup>7</sup>**

Primary Metrics		2017	2018	2019	TOTAL
Energy Efficiency	MWh Annual	53,200	65,500	28,700	147,400
	MWh Lifetime	426,000	524,000	229,000	1,179,000
	MMBtu Annual	352,000	434,000	190,000	975,800
	MMBtu Lifetime	2,820,000	3,470,000	1,520,000	7,806,000
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		46,700	57,500	25,100	129,300
CO2e Emission Reduction (metric tons) Lifetime		374,000	460,000	201,000	1,034,000
Customer Bill Savings Annual (\$ million)		\$9.0	\$11.1	\$4.9	\$24.99
Customer Bill Savings Lifetime (\$ million)		\$72.2	\$88.8	\$38.9	\$199.90
Private Investment (\$ million)		\$3.6	\$4.4	\$1.9	\$9.95

**Table 5. Annual Projected Initiative Participation**

	2017	2018	2019	Total
Participants (Contracts with employers)	15	18	9	42

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 6. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	316,000	1,120,000	1,680,000
	MMBtu Cumulative Annual	2,090,000	7,450,000	11,100,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		277,000	987,000	1,470,000

<sup>7</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes an 8-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

### 16.1.7 Fuel Neutrality

<p><b>Fuel Neutrality</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA intends to offer this initiative in a fuel neutral manner to encourage more efficient use of all fuel types. Offering the initiative on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$76 per ton of carbon, compared to a cost of \$126 per ton of carbon in an electric only scenario.</li> </ul>
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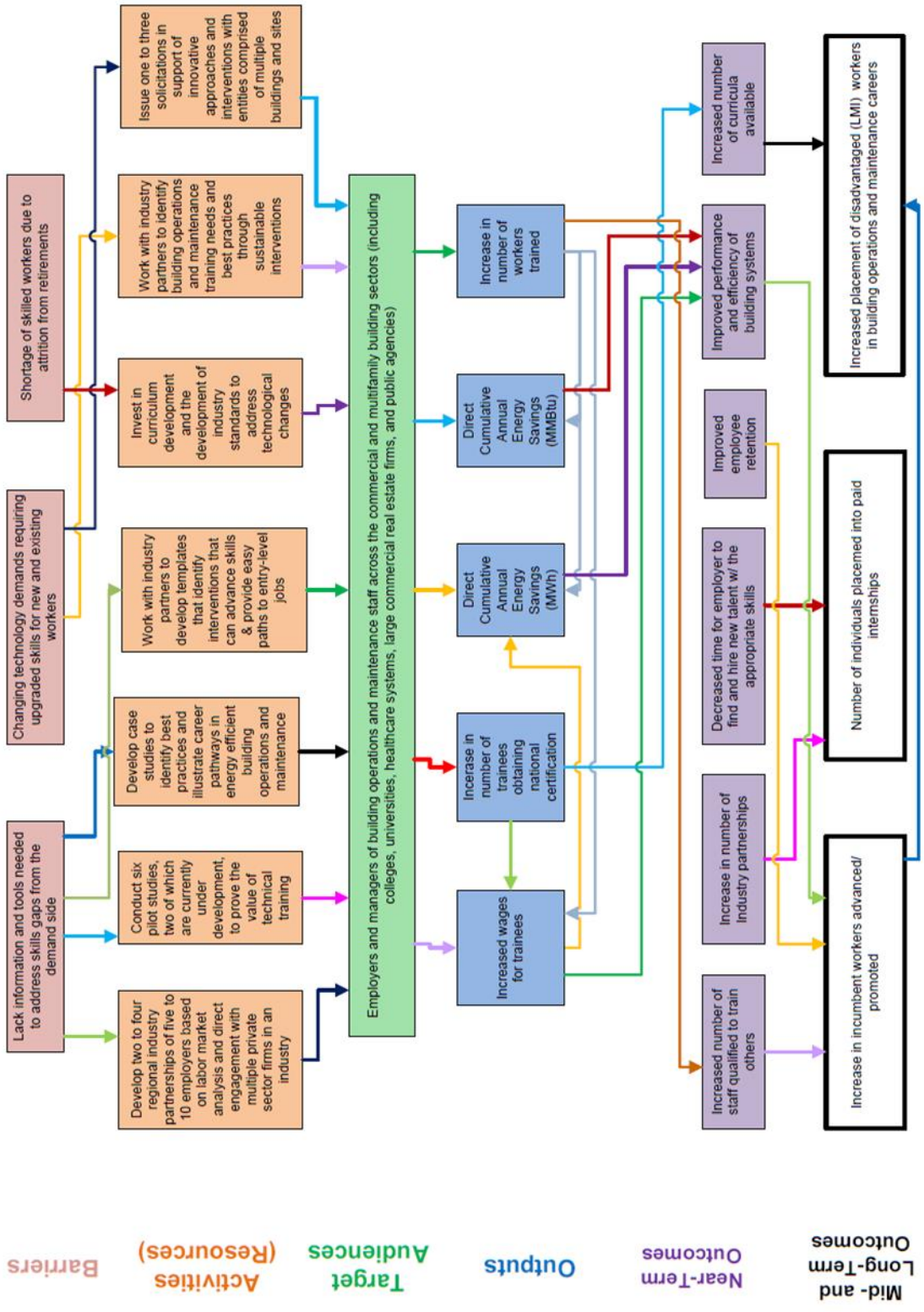
### 16.1.8 Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• Annual starting 2017: reporting on building and maintenance industry partnership approach to test if optimizing operation and maintenance strategies to keep building equipment and systems operating efficiently reduces the risk of early equipment failure, unscheduled down time, high utility costs, and tenant complaints and turnover. Assess and validate the sector partnership approach and adjust the program design or activity as needed.</li> <li>• Annual starting 2018: Impacts of efficient building operation on a facility’s net operating income and overall value will be captured via annual reporting. Additionally, impacts on energy efficiency and emission reductions due to well-trained workers better maintaining and operating energy efficient systems will be assessed.</li> <li>• Annually starting 2017: Test to see if business case demonstrations have proven the business case for investing in training and for developing internal training mechanisms and career advancement for workers in occupations in this sector in a wide range of markets. Adjust the program design or specific activity as needed.</li> <li>• 2019: Assess if business case demonstrations have supported the development of more effective talent strategies and facilitates the adoption of an energy culture within facilities and across organizations.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of programmatic and broader market success.</li> <li>• Baseline measurements of key market indicators will occur within one year following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These include but are not limited to: increased wages for trainees, increase in number of workers trained, and employee retention.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: number of incumbent workers advanced/promoted, of industry partnerships established, number of workers who participate in an internship or apprenticeship, and disadvantaged workers (LMI) entering building operations and maintenance careers.</li> <li>• Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul>
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	<p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"><li>• Evaluation M&amp;V will be conducted for a sample of participating spaces/buildings, according to the International Performance Measurement &amp; Verification Protocol (IPMVP) method(s) most appropriate given the improvements made. Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</li></ul>
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# Appendix A – Logic Models

**LOGIC MODEL: Workforce Development and Training: Industry Partnerships**



## Appendix B – Investment Plan Review Supplement

### Industry Partnerships

#### Results to Date – Metrics

Nearly all benefit metrics for Industry Partnerships are far exceeding their cumulative current targets through Q2 2017. Participant enrollment is the only metric lagging behind at 62% of target. Cumulative Current Targets are not in alignment with committed benefits and will be revised in Q3 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2019)	% of Total Target through Initiative Completion (2019)
Energy Efficiency	MWh Annual	-	-	-	38,565	38,565	4,610	837%	90,270	43%
	MWh Lifetime	-	-	-	308,517	308,517	36,800	838%	722,200	43%
	MMBtu Annual	-	-	-	262,078	262,078	30,500	859%	597,700	44%
	MMBtu Lifetime	-	-	-	2,096,622	2,096,622	244,000	859%	4,781,000	44%
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	34,224	34,224	4,040	847%	79,200	43%
	Lifetime Tons	-	-	-	273,790	273,790	32,300	848%	633,600	43%
Customer Bill Savings (millions)	Annual Dollars	-	-	-	\$6.58	\$6.58	\$0.78	843%	\$15.31	43%
	Lifetime Dollars	-	-	-	\$52.61	\$52.61	\$6.25	842%	\$122.40	43%
Private Investment (millions)	Dollars	-	-	-	\$3.12	\$3.12	\$1.13	276%	\$6.85	46%
Participants	Participants	-	-	-	8	8	13	62%	24	33%

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	2022 Target	June 2017 Actual
			(Cumulative)	(Cumulative)	(Cumulative)
Activity/ Outputs	Increase in number of workers trained	0	435	555	0
	Increase in the percent of trainees obtaining national certifications	0%	20%	30%	0%

#### Performance Against Key Milestones

The Industry Partnerships Initiative has made good progress toward its current milestones. Current milestones that are not yet complete are in progress. NYSERDA is considering several

potential industries or sectors that are suitable for partnership strategies, including large-scale renewables, industrial technologies (specifically compressed air) and geothermal. Several opportunities for additional business case demonstrations have also been identified. In addition, as a result of the Building Operations and Maintenance Workforce Development Training Program, PON 3442, seven contracts are currently under negotiation. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
✓	2016	Convene industry partners for building operation and maintenance.
✓	2016	Identify employer champions, those who will help NYSERDA to lead the initiative, for building operations and maintenance.
✓	2016	Identify common labor-related barriers and potential training interventions.
	2016	Identify additional areas (by sectors, industry, or technology) to initiate industry partnership strategy to address workforce development and training needs to advance goals of CEF.
✓	2017	Implement one to two business case demonstrations to show value of operations and maintenance training.
	2017	Begin to collect data from demonstration sites.
	2017	Identify additional demonstrations (for a total of six business case demonstrations identified and implemented) for implementation in 2017.
✓	2017	Issue a solicitation to support the development of building operations and maintenance training initiatives that address skill gaps and facilitate career paths.
	2017	Issue contracts resulting from the solicitation(s).
	2017	Revise and reissue solicitation, one to two additional times, if necessary based on results and findings from the solicitation issued in January 2017.
	2017	Data collected from demonstration sites to help demonstrate the business case for training.
	2017	Case studies shared with industry.
	2017	Templates available to illustrate models and training options.

#### Plan for Continuation/Modification/Termination

The Industry Partnerships initiative was modified in September 2017 to expand the eligibility of who can lead an industry partnership project, as well as adding funding for additional solicitations. The benefits have been increased and milestones have been updated accordingly to account for the additional funding. Following these modifications, the initiative will continue as planned.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

Clean Energy Fund Investment Plan:  
Energy-Related Environmental Research  
Chapter

Portfolio: Innovation & Research

**Submitted by:**

**The New York State Energy Research and Development Authority**

January 26, 2017

# 17 Energy-Related Environmental Research

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The Energy-Related Environmental Research program is designed to increase the understanding and awareness of the environmental impacts of energy choices and emerging energy options by providing a strong scientific, technical foundation for formulating effective, equitable energy-related policies and practices. It will:

- Inform state and federal energy and environmental policies;
- Guide cost-effective greenhouse gas mitigation and climate adaptation strategies;
- Ensure that the chemical, biological and public health impacts of air pollution from power generators are documented in a scientifically-rigorous and legally-defensible manner;
- Defend state energy initiatives against legal challenges;
- Examine the health and ecological co-benefits of alternative energy solutions, and identify and mitigate environmental barriers;
- Guide emerging energy technologies and systems; and
- Assess progress over time toward policy goals and provide environmental accountability.

The investment approach includes ongoing support for long-term monitoring efforts, recurring competitive solicitations targeting research priorities identified in the Program’s Research Plans, and opportunistic research projects and partnerships, such as with organizations with similar goals who can leverage program funds and enhance scientific and/or policy value. Based on a robust stakeholder-driven framework, the program’s research agenda will continue to develop over time and integrate an evolving energy–environmental landscape that identifies information gaps and research needs.

New York State will need to continuously assess progress toward policy goals related to environmental, energy and economic benefits. As progress is made and challenges are addressed it will be critical that policies and initiatives have the scientific foundation to measure success and guide new strategies.

## 17.1 Energy-Related Environmental Research

### 17.1.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"><li>• Energy production and use can cause adverse environmental, public health and economic impacts including: degradation of lakes, streams, forests, and buildings from acid deposition; elevated levels of mercury in fish and other wildlife; human morbidity and mortality from poor air quality related to ozone, particulate matter and air toxins; habitat alterations and societal impacts from alternative energy development; and costly impacts from the changing climate.</li><li>• While emission reduction efforts have resulted in measured improvements, energy-related impacts continue to affect New York’s sensitive ecosystems and vulnerable populations.</li><li>• Historically, NYSERDA’s energy-related environmental research activities have helped provide the knowledge necessary to reduce the adverse energy-related impacts that damage New York’s ecosystems and the health of its citizens, support</li></ul>
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	<p>environmental accountability for the State’s existing energy and environmental policies, and guide cleaner, more environmentally thoughtful alternatives in ways that advance New York’s energy policies. Well established relationships have been developed to facilitate the dissemination of program information to key end users. NYSERDA’s energy-related environmental research program has been cited by regulations and actions ranging from the federal Clean Air Interstate Rule to the Update of the National Emissions Inventory to the NYS Climate Risk and Resiliency Act, to name a few.</p> <ul style="list-style-type: none"> <li>• Scientific information will continue to be needed to provide guidance for sound decision-making related to the State’s energy-related environmental goals.</li> <li>• While State regulators and local resource managers and planners desire such scientific information, they often do not have the capacity to conduct the necessary research to help inform their policies and decision-making.</li> </ul>
<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• This program is a continuation of NYSERDA’s successful energy-related environmental research efforts (previously known as Environmental Monitoring, Evaluation and Protection Program) that will continue to be based on scientific objectivity, and use a stakeholder-driven framework to develop an agenda that addresses information gaps and research needs. It will also consider the broader, evolving energy and environmental policy context. For instance, traditional emission reduction strategies that focused on central generating power plants may no longer be adequate to improve air quality and reduce deposition and its associated effects. Therefore, this program is intentionally designed to address issues related to new distributed generation (DG) initiatives and fuel mixes envisioned under Reforming the Energy Vision (REV).</li> <li>• This program will focus on monitoring and associated research and analysis to provide critical components of information used to guide regulations addressing transport of ozone, fine particles, air toxics and other pollutants and rules affecting mobile and DG/Combined-Heat-and-Power (CHP) sources. The information also guides the development of state implementation plans (SIPs) to achieve ozone reduction and the US National Ambient Air Quality Standards (NAAQS) for ozone, PM2.5, and GHG reduction options, and strategies to accelerate the recovery of impacted ecosystems, improving resiliency, water quality and public benefits.</li> <li>• NYSERDA’s strategy will include: <ul style="list-style-type: none"> <li>○ Development and regular updates of a Research Plan to guide program activities, based on input from a diverse set of stakeholders from the scientific and policy communities.</li> <li>○ Contracting with institutions and consultants to conduct the prioritized monitoring and research activities identified in the Research Plan. Most of these activities will employ competitive solicitations to select contractors to conduct the activities; ongoing monitoring needs will continually be assessed and may leverage existing networks of organizations conducting complementary activities.</li> </ul> </li> <li>• Diverse and targeted technology transfer and outreach activities to guide those responsible for energy-related policies and actions designed to better protect environmental and public health in New York State.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Provide the knowledge necessary to better understand and reduce the adverse energy-related impacts that damage New York’s ecosystems and the health of its citizens.</li> <li>• Support environmental accountability for existing and future energy and environmental policies.</li> <li>• Guide cleaner, more environmentally thoughtful alternatives in ways that advance New York’s energy policies.</li> </ul>
<b>State Energy Plan/Clean Energy</b>	<ul style="list-style-type: none"> <li>• The 2015 New York State Energy Plan states that <i>“Clean air and clean water are essential to New Yorkers’ health and quality of life as well as the State’s growing tourism business and other economic development opportunities... While New York has made</i></li> </ul>

<b>Standard Link</b>	<p><i>substantial progress in improving its environment over recent years, the State's environmental imperatives dictate that much more must be done. The Plan sets forth aggressive greenhouse gas (GHG) reduction, renewable energy, and energy efficiency targets. Done properly, this transition will result in the needed emissions reductions, clean air, clean water, and better land-use policy that will foster a cleaner environment while improving the health, economy, and quality of life for all New Yorkers."</i></p> <ul style="list-style-type: none"> <li>• Through these aggressive goals New York is leading by example, and demonstrating to upwind states with emissions impacting New York, and others, how they can advance an environmentally responsible clean energy economy in their states.</li> <li>• Environmental monitoring and associated research and analysis are critical for assessing and quantifying the environmental soundness and effectiveness of energy programs, and provide the foundation for researchers and policymakers to design and implement the most effective policies and programs.</li> </ul>
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17.1.2 Target Audience Characterization

<b>Target Audience</b>	The target audience includes research institutions and energy and environmental consultants.
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• High-level policymakers and elected officials at the federal, state and local levels</li> <li>• Technically-oriented academic, not-for-profit, government and private sector researchers</li> <li>• Environmental and renewable energy advocacy groups</li> <li>• State and federal departments/agencies, including: <ul style="list-style-type: none"> <li>○ NYS Department of Environmental Conservation (DEC)</li> <li>○ NYS Department of Health (DOH)</li> <li>○ NYS Department of Public Service (DPS)</li> <li>○ NYS Department of Transportation (DOT)</li> <li>○ NYS Office of the Attorney General (OAG)</li> <li>○ U.S. Environmental Protection Agency (EPA)</li> <li>○ U.S. Geological Survey (USGS)</li> <li>○ Bureau of Ocean Energy Management (BOEM)</li> <li>○ U.S. Fish and Wildlife Service (USFWS)</li> <li>○ National Oceanic and Atmospheric Administration (NOAA)</li> </ul> </li> <li>• Utilities</li> <li>• Renewable energy developers</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• NYSERDA has established very close and productive working relationships with New York, other state, and federal regulatory agencies. In addition to the roles these partners play in developing the Research Plan, they also participate in solicitation planning efforts, Technical Evaluation Panels to select research projects, and Project Advisory Committees to guide contractors throughout the research projects. Through these interactions and audience engagement, the outcomes of NYSERDA projects and products are improved and the key entities are directly involved in and informed by the work.</li> <li>• NYSERDA also conducts topical workshops, conferences, and briefings to expand the dissemination of new findings and information.</li> <li>• Key partners in the Clean Energy Fund program will continue to include DPS staff, DEC, DOH, OAG, USEPA, USGS, BOEM, USFWS, NOAA, private and public sector researchers, and environmental and clean energy advocates.</li> </ul>

<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• The program provides policy-makers and decision-makers with defensible, science-based information to guide and evaluate their efforts related to improving public health and environmental quality.<sup>1</sup></li> <li>• Examples of regulations and actions that have cited work from NYSERDA’s energy-related environmental research program include: <ul style="list-style-type: none"> <li>○ Federal Clean Air Interstate Rule</li> <li>○ New York’s Acid Deposition Reduction Program, and Mercury Reduction Program</li> <li>○ Update of the National Emissions Inventory</li> <li>○ Transportation Conformity Rule Amendments for the PM2.5 National Ambient Air Quality Standard: PM2.5 Precursors</li> <li>○ 2015 federal New Source Performance Standard for Wood Heat</li> <li>○ NYS Climate Risk and Resiliency Act</li> <li>○ EPA’s Mercury and Air Toxics Standards</li> </ul> </li> <li>• Additionally, earlier work by the energy-related environmental research program has helped lay the groundwork for a broader spatial mapping approach to evaluate renewable energy siting in New York, and collaboration with other State and federal partners has resulted in an improved and more cost-effective program to monitor atmospheric deposition.</li> </ul>
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### 17.1.3 Stakeholder/Market Engagement

<b>Stakeholder Engagement and Customer Discovery</b>	<ul style="list-style-type: none"> <li>• The Energy-Related Environmental Research program relies upon a network of professional contacts and working groups of science and policy experts to identify critical gaps and research needs in New York State. Multiple groups, which include the Energy-Related Environmental Research Program’s Program Advisory Group and Science Advisory Committee, provide guidance on the areas representing the major issues and cutting edge scientific understanding related to energy-related environmental impacts.</li> <li>• The results of this guidance are compiled into a comprehensive Research Plan designed to guide the focus of energy-related environmental research in New York State. (see: <a href="http://www.nyserda.ny.gov/All-Programs/Programs/Environmental-Research/Research-Planning">www.nyserda.ny.gov/All-Programs/Programs/Environmental-Research/Research-Planning</a>)</li> <li>• Components of the plan will be updated on a regular basis. The most recent update focused on Marine Wind and Wildlife issues; the next update will focus on energy-related air quality and public health issues, especially those related to REV.</li> <li>• The plan’s potential users, in addition to those who were engaged in the plan’s development, include NYSERDA programs, other New York State, regional, and national research funding organizations, the scientific and environmental communities, and policymakers.</li> <li>• Implementation of the plan’s research recommendations help prioritize, coordinate and maximize the efficient use of limited resources to serve the needs of New York State and others. This stakeholder discovery process will be relied upon to ensure that investments are focused on providing sound scientific research in support of high priority environmental policy issues.</li> </ul>
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### 17.1.4 Theory of Change

<b>Barriers/</b>	<ul style="list-style-type: none"> <li>• Although NYSERDA’s energy-related environmental research program has in the past provided sound, current, scientific research to inform decision-making relevant to</li> </ul>
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<sup>1</sup> A 2013 citation analysis indicated that 245 articles published from NYSERDA-supported studies of this nature were cited 5,833 times between 1999 and 2013.

<b>Challenges Addressed</b>	<p>energy-related environmental policies and goals, research will continue to be needed to meet current and emerging energy and environmental goals.</p> <ul style="list-style-type: none"> <li>• Lack of coordinated activities between and within State agencies and organizations, each with distinct responsibilities but with intersecting missions of public interest. For example, ozone research is important from public health, environmental, and agricultural perspectives, but the agencies responsible for these areas do not have the capacity or mission to address ozone issues in a comprehensive manner.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If the Energy-Related Environmental Research Program supports sound, scientific research, the results will inform and improve decision-making relevant to energy-related environmental policies and goals, and continue to assist New York State in reducing environmental impacts and improving environmental quality.</li> <li>• If the long-term monitoring components of the program focus on needs identified in the Research Plan, accountability will be provided for the State's policies and regulations to help assess their effectiveness in attaining goals.</li> </ul>
<b>Activities</b>	<p>The investment approach will include ongoing support for long-term monitoring efforts, recurring competitive solicitations targeting research priorities identified in the Program's Research Plans, and opportunistic research projects and partnerships, such as with organizations with similar goals who can leverage program funds and enhance scientific and/or policy value. More information on anticipated near-term projects is provided in Appendix A and will be updated as Research Plans are revised.</p> <p><u>Program Planning and Stakeholder Discovery:</u></p> <ul style="list-style-type: none"> <li>• Develop and provide regular updates to a Research Plan to guide program activities, based on input from a diverse set of stakeholders from the scientific and policy communities.</li> </ul> <p><u>Monitoring:</u></p> <ul style="list-style-type: none"> <li>• Promote environmental accountability through support and analysis of long term-monitoring records and modeling of energy-related environmental pollutants.</li> <li>• Encourage the adaptation of traditional monitoring programs and approaches to reflect the changing information needs and policy questions.</li> <li>• Where strategic opportunities exist, support efforts to augment compliance monitoring to provide scientifically robust information to advance understanding of the fate and transport<sup>2</sup> of energy-related pollution in New York and the region.</li> </ul> <p><u>Focused Research:</u></p> <ul style="list-style-type: none"> <li>• Support efforts that will help evaluate the effectiveness of energy-related air quality management strategies for acid deposition, mercury, ozone and co-pollutants, particulate matter, climate-forcing agents and their interactions with each other.</li> <li>• Provide the necessary research to assess changes in the environment, specifically in relation to changes in emissions and adoption of renewable and emerging energy technologies.</li> <li>• Support research that will enhance understanding of the source types, source regions, and specific pollution components contributing to environmental issues in New York State.</li> <li>• Provide insight on the relative contribution of the combustion of fossil fuel in the various sectors (e.g., electricity production, heating, transportation) to major environmental problems in New York State.</li> <li>• Help identify, understand and prioritize opportunities for mitigation, and pave the way for cross-sector, and potentially market-based, pollution control strategies.</li> </ul>

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<sup>2</sup> "Fate and transport" analysis is defined as the study of how chemicals degrade and where chemicals travel in the environment when they are released intentionally or unintentionally.

	<ul style="list-style-type: none"> <li>• Evaluate and to the extent possible quantify greenhouse gas impacts as well as health and ecological issues related to pollution sources in New York State.</li> <li>• Provide a scientific foundation for formulating effective and equitable policies and practices to guide strategies to prepare for a changing climate.</li> <li>• Support efforts to examine the health and ecological co-benefits of alternative energy and technology solutions.</li> <li>• Enhance the understanding of the environmental impacts of emerging technologies, energy systems, and related energy-related pollution control technologies. Seek options to reduce or mitigate the environmental impacts of these technologies.</li> </ul> <p><u>Technology Transfer/Outreach/Policy Guidance:</u></p> <ul style="list-style-type: none"> <li>• Provide insight on how energy-related environmental-protection policies may better protect environmental and public health in New York State.</li> <li>• Collect data and facilitate discussions to reduce costs associated with environmental regulations and permitting, thereby accelerating environmentally responsible development of renewable energy.</li> <li>• Help foster collaborative, inter-disciplinary research to make better use of limited resources available for research and enhance the dissemination of research findings.</li> <li>• Provide seed funding to help attract other resources that will further develop research capability in New York State so it can be sustained and grow beyond resources available to NYSERDA.</li> </ul>
<b>Key Milestones</b>	<p>During the term of environmental monitoring and research supported through the Clean Energy Fund, strategically-timed research planning events will be conducted and program solicitations will be issued. The initial round of research planning events and products for all program areas are expected to be completed by the first quarter of 2018. The exact timing of program offerings and activities will be based on input from Program and Science Advisors, and other stakeholders, as well as current and future needs of the energy-related environmental regulatory and policy communities. Building upon the previous research plans will aid in a smooth transition to Clean Energy Fund supported efforts. For each of the program years (2017 through 2021), key milestones will include:</p> <p><u>Milestone 1 (each calendar year)</u></p> <ul style="list-style-type: none"> <li>• Solicitations issued for research projects consistent with the Research Plan.</li> </ul> <p><u>Milestone 2 (each calendar year)</u></p> <ul style="list-style-type: none"> <li>• Projects contracted from solicitations.</li> </ul> <p><u>Milestone 3 (each calendar year)</u></p> <ul style="list-style-type: none"> <li>• Outreach, technology transfer, and briefings to share research findings.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• The overarching goal is to provide the scientific foundation for decisions that will support State goals related to a cleaner environment.</li> <li>• Due to the nature of this work, research priorities will shift as energy and environmental needs, strategies, and policies evolve. These will be articulated and updated in the Research Plan.</li> <li>• Program area activities and completion milestones for near-term activities are included as an appendix.</li> </ul>

17.1.5 Relationship to REV

<b>Utility Role/Coordination Points</b>	While the New York State utilities do not have any similar energy-related environmental research capacity, they do support the Environmental Energy Alliance of New York, a representative of which is an Energy-Related Environmental Research Program Advisor. The Energy-Related Environmental
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	Research Program will use this contact and other mechanisms to continue to look for opportunities to engage with utilities by working collaboratively on projects such as those focused on climate resiliency in the electricity sector, and habitat and renewable energy siting issues relating to right-of-ways.
<b>Utility Interventions in Target Market</b>	New York State utilities don't have interventions in this market.

### 17.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Innovation & Research Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
Research and Technology Studies/Development/Demos	\$10,100,000	\$8,400,000	\$4,850,000	\$4,150,000	\$1,500,000	\$29,000,000
Implementation Support	\$500,000	\$0	\$0	\$0	\$500,000	\$1,000,000
<b>Total</b>	<b>\$10,600,000</b>	<b>\$8,400,000</b>	<b>\$4,850,000</b>	<b>\$4,150,000</b>	<b>\$2,000,000</b>	<b>\$30,000,000</b>

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>Total</b>
<b>Total</b>	6%	12%	14%	16%	16%	14%	12%	10%	100%

### 17.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the program.

**Table 3. Program Specific Metrics**

<b>Indicators</b>		<b>2019 (Cumulative)</b>	<b>2021 (Cumulative)</b>
<b>Activity/ Outputs</b>	Update multi-year Research Plan components with input from policymakers, scientists, and other stakeholders	3	6
	Sponsored workshops, conferences, seminars or facilitated meetings to inform decision making	15	25
<b>Outcomes</b>	\$7.5M in leveraged funds (co-funding and outside investment) to support projects and sponsored research	\$5,962,500	\$7,500,000

In addition to the above, NYSERDA will also internally track and assess the following activities and outcomes:

- Signed contracts
- Completed research studies
- Briefings with policy makers and other stakeholders
- Formal outreach to both Program and Science Advisors
- Published peer-reviewed scientific journal articles
- Citations of research by others
- Presentations by researchers
- Documented support for energy-related environmental policy and management decisions at the local, state and federal levels

**Table 4. Direct Impacts**

Primary Metrics <sup>3</sup>		2017	2018	2019	2020	2021	TOTAL
Energy Efficiency	MWh Annual						
	MWh Lifetime						
	MMBtu Annual						
	MMBtu Lifetime						
	MW						
Renewable Energy	MWh Annual						
	MWh Lifetime						
	MW						
CO <sub>2</sub> e Emission Reduction (metric tons) Annual							
CO <sub>2</sub> e Emission Reduction (metric tons) Lifetime							
Customer Bill Savings Annual (\$ million)							
Customer Bill Savings Lifetime (\$ million)							
Private Investment (\$ million)		\$2.65	\$2.10	\$1.21	\$1.04	\$0.50	\$7.50

**Table 5. Annual Projected Program Participation**

	2017	2018	2019	2020	2021	Total
Participants <sup>4</sup>	35	28	16	14	7	100

<sup>3</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Benefits are rounded to three significant figures. Totals may not sum due to rounding.

<sup>4</sup> Participants are awardees of NYSERDA contracts.

### 17.1.8 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the program and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"><li>• The program will rely upon regular, ongoing input from the Science and Program Advisors, as well as from external stakeholders, to monitor and prioritize energy-related environmental issues, and to effectively target program resources. The regular updating of the research plans, as well as output from funded research projects, will help staff measure success of efforts and identify opportunities for program adjustments.</li></ul> <p><b><u>Stakeholder Discovery Evaluation</u></b></p> <ul style="list-style-type: none"><li>• In addition to the metrics detailed above, regular citation analyses will be conducted on articles published through the program. This analysis will provide the number of citations of NYSERDA program research outputs by other researchers and studies. Obtaining citation information helps document if and how the research findings supported by this program are being used by other researchers.</li><li>• Program staff will regularly track policies, regulations and decisions at the State and federal levels that cite research sponsored through this program.</li></ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"><li>• Not applicable.</li></ul>
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## Appendix A – Anticipated Near Term Projects

### **Climate Change: (Approximately \$4M)**

- *Inland Flooding Projections* – Inland riverine areas of the State currently have little to no scientific information on their vulnerability. Consistent with the Community Risk and Resiliency Act, this project would develop inland flooding projections to assist communities, owners of critical infrastructure, and agencies in making policy decisions that could reduce their vulnerability to flooding under future climate change. Estimated completion in 2020.
- *CO2 Air Capture Technology Assessment* – Capture of CO2 from the air is seen as a necessary strategy for keeping atmospheric CO2 below catastrophic levels. This project would assess CO2 air capture technology and activity in NYS, with the aim of building business and technological capability. Technology demonstrations would follow. Estimated completion in 2019 for the assessment and 2022 for the demonstrations.
- A competitive solicitation will be issued targeting priority research topics identified in the updated research plan. Resulting projects are anticipated to be of varying length, with all completed by 2021. Based on current priorities it is likely that projects from this solicitation will include:
  - *Climate Vulnerability and Resiliency Guidance* – Develop climate vulnerability and resilience guidance for distributed generation and combined heat and power (DG/CHP) and microgrid systems, which are anticipated to be installed in support of REV. Guidance will identify vulnerabilities of microgrid and DG/CHP systems to future climate changes and identify potential ways of reducing those vulnerabilities and increasing resiliency.
  - *Assessing the climate vulnerability of the liquid-fuel infrastructure in NYS* – An assessment of the State’s climate vulnerability of natural gas and liquid-fuel infrastructure in NYS, specifically regarding NYS’s existing and potential future infrastructure, and including potential ways to increase the resiliency to climate change.

### **Air Quality/Public Health: (Approximately \$5.5M)**

- *Whitepapers* – A series of scoping sessions and workshops and white papers will be conducted and produced in 2017 and 2018 to:
  - better define REV-related environmental research needs, such as pollution issues close to emission sources (e.g. DG/CHP), especially in densely populated areas;
  - define research needs and potential state strategies for meeting air standards related to regional ozone; and
  - identify remote sensing tools to better inform REV-related energy and air planning in New York State.
- *Air Quality and Health Monitoring* – Long-term monitoring projects for air quality and health effects related to energy sources to improve the scientific and technological foundation necessary to address key policy-relevant questions related to air quality and health effects. Estimated completion in 2022.

- A competitive solicitation will be issued based on the priorities identified in the updated research plan. Resulting projects are anticipated to be of varying length, with all completed by 2021. It is likely that projects from this solicitation will include:
  - *Third-party Scientific Validations* – Third-party scientific validation of improved emissions, air quality, and health impacts in locations where new generation in a micro grid displaces older, less efficient, and more polluting generation.
  - *Scientific Validations* – Scientific validation of reduced emissions, air quality, and health impacts for facilities installing CHP or renewables.
  - *Scientific Evaluations* – Scientific evaluation of improved air quality and health impacts in locations with higher vehicle electrification.

**Renewable/Alternative Energy: (Approximately \$2.5M)**

- *Offshore Wind Wildlife Monitoring* – A competitive solicitation will be issued focusing on projects addressing specific near term needs related to offshore wind wildlife monitoring technologies/methods and wildlife distribution/abundance modeling. Estimated completion in 2018.
- A competitive solicitation will be issued based on the priorities identified in the updated research plan. Resulting projects are anticipated to be of varying length, with all completed by 2021. Based on current priorities it is likely that projects from this solicitation will include:
  - *Benthic Habitat Surveys* – Benthic (i.e., plants and animals living at the bottom of a body of water) habitat surveys to map marine ecosystems and manage development of offshore wind resources.
  - *Relationship Examination* – Examination of the relationships between environmental processes, primary productivity, and distributions of species at upper trophic (i.e., feeding position in a food chain) levels to help identify important habitat areas and guide siting and permitting of future wind energy areas.
  - *Avian Vulnerability Assessment* – Development of an avian vulnerability assessment for New York, to identify priority species for targeted research that will lead to more informed decision making and improved outcomes for avian wildlife in wind energy areas.

**Ecosystem Response to Energy-related Deposition: (Approximately \$5.5M)**

- *Long-term Acidic/Mercury Deposition Monitoring* – Long-term monitoring projects related to acidic/mercury deposition to measure the effectiveness of emission reduction policies and guide future actions. Estimated completion in 2022.
- A competitive solicitation will be issued relating to ecosystem response to energy-related deposition, including climate indicators. Resulting projects are anticipated to be of varying length, with all completed by 2021. Projects will be based on the outcome of the revised 2017 Research Plan, but based on current priorities it is likely that projects from this solicitation will include:
  - *Climate Change Impacts* – Projects to better understand how climate change will affect acidification, recovery, and mercury effects by determining how native tree/plant species

will respond to changing environmental conditions, and the resultant effects on ecosystem structure and function.

- *Biogeochemistry Research* – Research on how the biogeochemistry of mercury, acidification, and soil recovery may be affected by changing hydrological factors, such as projected increases in precipitation coupled with periods with more severe droughts and decreased snowpack duration and depth.

## Appendix B – Investment Plan Review Supplement

### Energy Related Environmental Research

#### Results to Date – Metrics

The Energy Related Environmental Research Initiative is currently lagging on private investment and participant enrollment benefits, which are at 5% and 22% of their respective cumulative current targets through Q2 2017; however, the majority of the budgeted funds are designated for long-term monitoring projects which expire at the end of 2017. The intent within the CEF is to renew and contract these monitoring activities in the coming months, which will achieve current targets by the end of 2017. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2021)	% of Total Target through Initiative Completion (2021)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	-	-	*	-	*	-
	Annual Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Lifetime Dollars	-	-	-	-	-	*	-	*	-
	Dollars	-	-	-	\$0.06	\$0.06	\$1.33	5%	\$7.50	1%
Participants	Participants	-	1	1	3	4	18	22%	100	4%

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		2019 Target	2021 Target	June 2017 Actual
		(Cumulative)	(Cumulative)	(Cumulative)
Activity/Outputs	Update multi-year Research Plan components with input from policymakers, scientists, and other stakeholders	3	6	0
	Sponsored workshops, conferences, seminars or facilitated meetings to inform decision making	15	25	0

### Performance Against Key Milestones

The Energy Related Environmental Research Initiative is working toward completion of its current milestones. A solicitation is currently in development and planned to be issued in Q3 2017. Outreach and briefings to share research findings are ongoing. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
	2017	Solicitations issued for research projects consistent with the research plan.
	2017	Projects contracted from solicitations.
	2017	Outreach, technology transfer, and briefings to share research findings.

### Plan for Continuation/Modification/Termination

There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative, particularly if metrics continue to lag, to determine if any changes are needed. If warranted, the metrics values will be updated in the next annual review.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Renewables Optimization Chapter

Portfolio: Innovation & Research

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017

Clean Energy Fund Investment Plan: Renewables Optimization Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
March 3, 2017	Original Issue	Original Issue
November 1, 2017	Updated the baseline values in Table 3 to reflect latest data available.	10

## 18 Renewables Optimization

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Increased utilization of renewable energy assets and energy storage has many grid and consumer benefits. Optimizing the energy output and uptime of renewable resources will provide both near term economic benefits and decrease the total cost of deploying renewable technologies in future. Energy storage can reduce the intermittency of solar and wind energy, helping these resources to be flexible assets deployed when needed. Energy storage can also avoid the need for new electric system infrastructure, increase system efficiency and resiliency, and reduce the need for fossil fuel plants to meet periods of peak electric demand. NYSERDA's energy storage strategy will target barriers limiting energy storage adoption in three sectors: customer-sited (behind-the-meter systems), the transmission and distribution system, and transportation.

NYSERDA aims to achieve accelerated market adoption and realization of these benefits through strategies that improve performance, reduce cost and improve integration with a grid that is distributed energy resources (DER) friendly. The initiatives in this chapter will improve the economics for renewable and distributed energy resources by addressing technical barriers, as well as advancing renewable technologies that have potential to drive large scale greenhouse gas reductions, improve grid resiliency, and contribute to New York State's renewable generation objectives.

The first initiative described in this chapter focuses on the development of innovative energy storage systems. Specific focus will be on reducing hardware (including balance-of-system hardware) costs of energy storage devices, as well as improving their performance in terms of efficiency, energy & power density and thermal stability. This initiative complements NYSERDA's market development initiative focused on reducing soft costs of energy storage, which together will work to develop and deploy energy storage products and remove market barriers for their adoption.

Additional initiatives under consideration will focus on increasing the economic value of renewable resources, mainly solar PV and large-scale wind, and providing accurate real-time forecasting of their power production. A future initiative will pursue net energy zero operations at water resources recovery facilities through on-site energy generation using biogas produced during the wastewater treatment process.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.



## 18.1 Energy Storage Technology and Product Development

### 18.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Total energy storage capacity in USA is currently approximately 24,180 MW.<sup>1</sup> 22,560 MW (93.3%) of that storage capacity is in the form of pumped hydro storage (PHS) and, with the remainder spread across battery storage, compressed air energy storage (CAES), flywheel energy storage and thermal energy storage technologies. California is leading the nation with 298 MW of installed energy storage, followed by Texas with 171 MW of installations; in comparison, New York State has 31 MW.<sup>2</sup> California has set the goal of having 1,330 MW of total behind-the-meter and transmission and distribution system energy storage applications implemented by 2024.<sup>3</sup></li> <li>• New York’s energy storage sector has grown 30% since 2012 to approximately 3,900 employees, and global annual revenues from New York companies has increased 50% to \$900 million. The New York energy storage roadmap developed by NY-BEST has set the goal of deploying 2,000 MW of energy storage capacity by 2025 and 4,000 MW by 2030.<sup>4</sup> A recent study projects that by 2030 this sector could employ 25,000 in New York and comprise \$8 billion in annual revenues.</li> <li>• Despite advances in storage technology, several technological challenges still exist including high upfront costs (both hardware and soft costs), safety, and system performance uncertainty. These barriers affect the growth of energy storage deployment.</li> <li>• New York has deep industrial, testing, and academic research and development (R&amp;D) capability in energy storage, with many institutions/companies poised to play a key role in developing better performing and lower cost energy storage technologies.</li> <li>• Investment opportunities to improve performance in energy storage technologies include advanced analytics and controls, system integration, and better materials/components in a range of energy storage devices including batteries, ultracapacitors, and flywheels.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• This strategy will make investments primarily through competitive solicitations that focus on supply chain innovations and determining the best technology fit for specific applications. The advancements identified will reduce costs, improve performance (efficiency, safety, energy density), and stimulate growth of the cleantech industry in New York.</li> <li>• This will complement NYSERDA’s current energy storage Market Development strategy, which is addressing barriers to deployment of behind-the-meter energy storage. From a cost perspective, the energy storage Market Development work is trying to reduce energy storage soft costs which account for about 25% of total system costs. This Innovation initiative is focusing on the other 75% of the cost components of energy storage – specifically the hardware costs, including balance-of-system hardware.</li> </ul>

<sup>1</sup> U.S DOE (February 2017) “Global Energy Storage Database Projects.”

<sup>2</sup> This includes both transmission and distribution system and behind-the-meter and applications. This does not include pumped hydro.

<sup>3</sup> California Independent System Operator (ISO), California Public Utilities Commission (CPUC), and the California Energy Commission (CEC) (2014) Advancing and Maximizing the Value of Energy Storage Technology: A California Roadmap.

<sup>4</sup> NYSERDA Energy Storage and NY-BEST Program: Market Characterization and Assessment. EMI Consulting and Industrial Economics, Inc. (IEc), February 2017. Does not include pumped hydro.

	<ul style="list-style-type: none"> <li>• This initiative will target three sectors/applications: customer sited (behind-the-meter), transmission and distribution system applications, and transportation system applications.</li> <li>• Investments will leverage NY’s unique innovation/testing assets; adapt innovation from other regions, including testing and optimization under typical NY duty cycles/use cases, relevant environmental/weather conditions and in NY’s regulatory environment; facilitate commercialization-oriented partnership; and work with stakeholders to define technical performance specifications that can serve as market relevant stretch goals to drive innovation.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Energy Storage Technology and Product Development,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Help achieve New York’s long-term renewable and greenhouse gas reduction goals by integrating intermittent renewables, increasing utilization of electric system assets, and reducing the need for fossil fuel peaker plants.</li> <li>• Increase the value proposition of energy storage for New York applications by reducing cost and improving performance, specifically seeking to: <ul style="list-style-type: none"> <li>○ Demonstrate innovative solutions that can decrease energy storage hardware costs (including balance of system and hardware installation costs), by 20% by 2022, compared to industry average in that year, for a portfolio of projects.</li> <li>○ Demonstrate innovative solutions that can yield a 20% improvement in critical system performance parameters by 2022 compared to industry average in that year, for a portfolio of projects.</li> </ul> </li> <li>• Grow a vibrant energy storage cluster in New York.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The New York State Energy Plan discusses energy storage as a particular focus for State R&amp;D support to “facilitate and reduce cost of New York State’s transition to a REV-based energy system.” It also recognizes the important multifaceted role that energy storage technologies can play to improve reliability, reduce peak load, enable greater integration of intermittent renewables, and enhance resiliency when deployed with microgrids.</li> <li>• Energy storage is important to the Clean Energy Standard where it is recognized for its ability, along with wind and solar, to help “develop and operate the electric grid to be more responsive, efficient, secure, and clean.”</li> </ul>

18.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market is energy storage technology and product developers.
<b>Market Participants</b>	Market participants include: <ul style="list-style-type: none"> <li>• Startup/emerging companies</li> <li>• Technology developers</li> <li>• Component manufacturers, system integrators, supply chain partners</li> <li>• Commercial and residential consumers (load side)</li> <li>• Utilities and Energy Service Companies (ESCOs)</li> <li>• Metropolitan Transportation Authority (MTA), State University of New York (SUNY), Public Service Commission (PSC) and New York Independent System Operator (NYISO)</li> <li>• Brookhaven National Lab (BNL), New York Battery and Energy Storage Technology (NY-BEST) Consortium, Rochester Institute of Technology (RIT) Prototyping Center, Eastman Business Park</li> <li>• Universities, research organizations, government agencies</li> </ul>

<p><b>Market Readiness</b></p>	<ul style="list-style-type: none"> <li>• Behind-the-meter and transmission and distribution system energy storage applications are projected to grow globally from 538 MW installed in 2014 (valued at \$675 million) to 21,000 MW (valued at \$15.6 billion) in 2024, and up to \$400 billion by 2030.<sup>5</sup> New York firms engaged in the energy storage sector include Fortune 500 companies, original equipment manufacturers, system integrators, and a strong startup and research community.</li> <li>• Battery prices are declining by 10% or more annually. For example, since 2008-2010, lithium-ion battery module cost has decreased by 75% while lifetime and capacity has doubled.<sup>6</sup> In 2016, quoted cost of an installed behind-the-meter four-hour lithium-ion system in a metropolitan location was on the order of \$850/kWh or greater. Multiple market research firms point to behind-the-meter systems declining to approximately \$500/kWh or lower by the early to mid-2020's. Other advanced storage technologies also offer the potential for lower lifetime costs and attractive performance attributes. At these projected price points, the number of systems with positive return on investment increases substantially and large-scale deployment is possible.</li> <li>• Growth in renewable generation, interest in demand response, and desire for utility non-wires alternatives is positioning energy storage to be a significant component in meeting the needs of the electric system.</li> <li>• The number of vendors developing and selling energy storage solutions continues to increase. Many firms are watching the New York market evolve and ready to be engaged more meaningfully.</li> <li>• NYSERDA has been developing an ecosystem for energy storage innovations and their path to commercialization in NY State. Thru these efforts NYSERDA already is deeply engaged with local energy storage companies, large original equipment manufacturers (OEMs), Utilities, NYPA, NYISO, PSC, SUNY, MTA, BNL, Eastman Business Park, Battery prototyping and commercialization center at RIT, Empire State Development's Division of Science, Technology and Innovation (NYSTAR), and NY-BEST.</li> </ul>
<p><b>Customer Value</b></p>	<ul style="list-style-type: none"> <li>• Technology innovations are expected to reduce costs to customer and address important performance attributes limiting customer acceptance (e.g., safety, footprint).</li> <li>• If NYSERDA is successful in achieving the cost reduction noted above, this could reduce payback to customer from 7 or more years to a projected 5 years for a behind-the-meter application.</li> <li>• Successful development of higher performing/lower cost energy storage for grid-support could reduce capital costs for system upgrades and reduce the revenue requirements that would need to be spread across the rate-base (i.e., providing value to all customers).</li> </ul>

<sup>5</sup> Navigant Research, Energy Storage for the Grid and Ancillary Services, 2Q 2016 (providing 2014 and 2024 market data). <http://www.navigantresearch.com/newsroom/energy-storage-for-the-grid-is-expected-to-reach-15-6-billion-in-annual-revenue-by-2024>

<sup>6</sup> Battery price percentage decline prices:  
 Battery Power Magazine, October 2013, <http://www.batterypoweronline.com/main/articles/the-lithium-ion-inflection-point/>  
 PV Magazine, November 2015, [http://www.pv-magazine.com/news/details/beitrag/li-ion-battery-costs-to-fall-50-in-next-5-years--driven-by-renewables\\_100022051/#axzz4G5vZqQof](http://www.pv-magazine.com/news/details/beitrag/li-ion-battery-costs-to-fall-50-in-next-5-years--driven-by-renewables_100022051/#axzz4G5vZqQof)  
 Bloomberg New Energy Finance Summit historical price chart: <http://c1cleantechnicacom.wpengine.netdna-cdn.com/files/2015/09/battery-learning-rate.png>  
 Pike Research and Deutsche Bank price trends: <https://grist.files.wordpress.com/2011/09/li-ion-projected-costs.png>  
 Lithium ion density trends: [http://static.cdn-seekingalpha.com/uploads/2012/5/14/saupload\\_Battery\\_20Energy\\_20Density.jpg](http://static.cdn-seekingalpha.com/uploads/2012/5/14/saupload_Battery_20Energy_20Density.jpg)  
 and <http://www.nissan-global.com/JP/TECHNOLOGY/FILES/2010/07/f4c4d5d2e20391.jpg>

### 18.1.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement and Customer Discovery</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA has conducted ongoing stakeholder engagement in the NYS renewables market that has included technology providers, project developers, OEMs, the NYISO, and NYS utilities. This interaction was used to better understand the challenges facing the market, to determine whether and where NYSERDA intervention could be most helpful, and ultimately to refine the approach outlined in this initiative.</li> <li>• A key aspect of this initiative is regular engagement with market stakeholders across the value chain (from technology providers to project developers and operators). Objectives of this engagement will be to define technology performance specifications/technology challenges and ensure that NYSERDA remains in tune with and responsive to market needs.</li> <li>• NYSERDA is also actively engaged with NY-BEST, Battery Commercialization Prototyping Center in Rochester, and Smart Energy Facility at SUNY Binghamton to accelerate innovation and understand customer needs.</li> </ul>
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### 18.1.4 Theory of Change

<p><b>Technology Barriers and Opportunities Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Total hardware costs and installation cost of energy storage systems are high.</b> Total hardware costs include the energy storage device cost, along with the hardware balance-of-system cost. This combined with the difficulty in monetizing all of the value streams associated with energy storage limits the return on the investment and, in turn, market adoption of the systems. Potential innovations to be investigated to decrease these costs include: applications of advanced analytics and controls, improved processes for system integration/packaging, better power electronics, higher performing/longer-lived materials (including solid state materials), advanced computational approaches for materials testing, use of simulations and digital testing to reduce innovation cycle times for new energy storage technologies, and advanced manufacturing processes.</li> <li>• <b>Performance (efficiency, life, and safety) of energy storage systems is suboptimal.</b> The number of allowable charge cycles and round trip charge/discharge efficiencies of most current energy storage systems are not attractive enough to propel quick market acceptance. Furthermore, these systems often do not readily meet the safety standards that are set in dense urban environments. These factors hinder wide-scale market adoption and therefore technology innovations are needed in these performance measures to make energy storage systems attractive to the market.</li> <li>• <b>Technology risks in integrating energy storage devices with the grid at transmission and distribution level, are neither well understood nor fully optimized.</b> Energy storage performance is very application/site specific, requiring significant “real world” testing before the technology can become adopted by the market. The applications could include energy storage for peak demand reduction, energy storage to make the large-scale wind and Solar PV predictable, energy storage for rail braking energy recovery, and storage solutions at distribution as well as transmission level to avoid costly grid upgrades. While advanced simulations can reduce some of this need for field demonstrations, the current state-of-the art still requires in-field applications testing and optimization. Successful field demonstration projects integrating energy storage system with the grid at congested grid junctions are necessary to open path to large scale applications.</li> </ul>
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	<ul style="list-style-type: none"> <li>• <b>Small and medium-size companies do not know who to work with at large OEMs, limiting the ability for strategic partnerships that could accelerate innovations.</b> From a business innovation perspective, New York has vibrant energy storage cluster with many small start-ups and medium-sized firms. These start-ups can take more risk than established companies and can accelerate the pace of innovation. However, a successful path to market may include a partnership with a larger company (either through licensing, intellectual property acquisition, or supply chain relationships).</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If energy storage devices capital costs are reduced and their performance is improved, energy storage market penetration by new customers and investors will increase.</li> <li>• If energy storage devices are integrated at the distribution and transmission level, they will reduce peak demand and increase the value of power generated by intermittent renewable resources (i.e. solar PV and large-scale wind).</li> <li>• If energy storage devices are integrated at the distribution and transmission level, they will increase customer and grid resiliency, enhance grid asset utilization, and defer costly grid upgrades.</li> <li>• If NYSERDA facilitates partnerships among small/medium companies and large OEMs, more rapid commercialization will occur.</li> </ul>
<b>Activities</b>	<ul style="list-style-type: none"> <li>• Provide competitive funding opportunities in support of technology companies to leverage existing capabilities, validate technologies, create innovative products and applications, and otherwise facilitate the development of energy storage in New York. NYSERDA will issue broad competitive solicitations for project proposals to identify teams and approaches to address innovations focusing on: <ul style="list-style-type: none"> <li>○ Hardware BOS including power electronics cost reduction for energy storage systems.</li> <li>○ Hardware cost reduction for energy storage components and devices.</li> <li>○ Performance improvements (efficiency, safety, energy density) of storage devices, especially for NY-specific applications and duty cycles (e.g., building demand response, electric vehicle charging, solar photovoltaics, and large-scale wind firming).</li> <li>○ Load-side and generation-side applications of energy storage to reduce peak load, store and reuse solar PV and wind energy to aid firming up these resources, and provide ancillary services.</li> </ul> </li> <li>• Facilitate strategic corporate partnerships among small/medium sized companies and large OEMs to speed up the path to commercialization.</li> <li>• Explore viability of establishing technical performance specifications that can serve as market-relevant stretch goal to drive innovation. If appropriate, use the stretch goal as a technology challenge in one or more competitive solicitations.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue 1<sup>st</sup> Competitive Solicitation.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Contract projects from 1<sup>st</sup> Competitive Solicitation.</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>• Review portfolio of activities, solicit market input and reassess technology challenges areas and targets.</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue 2<sup>nd</sup> Competitive Solicitation.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract projects from 2<sup>nd</sup> Competitive Solicitation.</li> </ul>

	<p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>• Review portfolio of activities, solicit market input and reassess technology challenges areas and targets.</li> </ul> <p><u>Milestone 7 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue 3<sup>rd</sup> Competitive Solicitation.</li> </ul> <p><u>Milestone 8 (2019)</u></p> <ul style="list-style-type: none"> <li>• Contract projects from 3<sup>rd</sup> Competitive Solicitation.</li> </ul> <p><u>Milestone 9 (2019)</u></p> <ul style="list-style-type: none"> <li>• Review portfolio of activities, solicit market input and reassess technology challenges areas and targets.</li> </ul> <p><u>Milestone 10 (2019)</u></p> <ul style="list-style-type: none"> <li>• Issue 4<sup>th</sup> Competitive Solicitation.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• Due to the nature of this work, NYSERDA envisions continuing to pursue innovation this space for many years. Research priorities will shift as various Energy Storage Innovation functionalities are realized and new or improved energy storage functionalities are identified.</li> <li>• By accomplishing the following, NYSERDA seeks to improve the economics and performance of energy storage in several important applications in New York: <ul style="list-style-type: none"> <li>○ Integration of energy storage solutions at the behind-the-meter and transmission and distribution system level to make intermittent renewables (solar PV and wind power) assets always deployable.</li> <li>○ Energy storage serves as generators and ancillary services providers, especially during peak demand hours, through behind-the-meter or large-scale storage systems;</li> <li>○ Demonstration of solutions for rail-braking energy recovery through storage.</li> </ul> </li> <li>• NYSERDA will exit or cease funding specific areas of technology development and shift focus once market scalability is confirmed and a value proposition to customers, regulators and policy makers is validated/demonstrated.</li> </ul>

18.1.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>• Under REV, utilities may own storage when integrated into their distribution network. This could enable them to maintain reliable system operation without new capital investments unless absolutely necessary.</li> <li>• New York utilities are routinely solicited by vendors looking to test and/or deploy new energy storage technology. However, much of this new technology is not sufficiently field tested or de-risked to allow for widespread application on the utility grid, and utilities currently have modest internally funded research and development activities related to energy storage.</li> <li>• Furthermore, New York utilities participate to varying degrees in broader energy storage research programs that often are designed to serve a multitude of utility interests across differing jurisdictions and markets; so unique interests of concern to New York may not be entirely addressed.</li> <li>• NYSERDA has and will continue to work with the utilities to better understand the role of energy storage in the evolving development of DSIPs under REV. This will include continued engagement with utilities through the Joint Utilities (JU) Distributed System Implementation Plan (DSIP) Advisory group and NYSERDA's</li> </ul>
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	<p>Grid Modernization advisory group. NYSERDA will also try to seed REV demonstrations where appropriate, potentially developed and identified through REV Connect and other avenues.</p> <ul style="list-style-type: none"> <li>• NYSERDA will consult with the utilities in designing technical challenges under this program to ensure that it is investing in applications/use cases that will address utility system needs, including addressing the challenges identified above, such as field testing and de-risking technologies.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• New York utilities do not have offerings to the market in this area. However, utilities are a key direct customer of this initiative and therefore are considered part of the target market.</li> </ul>

18.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Innovation & Research Budget Allocation – Commitment Basis**

Commitment Budget	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Research and Technology Studies/ Development/ Demos	\$1,825,000	\$4,475,000	\$3,600,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$5,775,000	\$4,125,000	\$33,000,000
Total	\$1,825,000	\$4,475,000	\$3,600,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$5,775,000	\$4,125,000	\$33,000,000

**Table 2: Annual Expenditures Projection**

Expenditures	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total
Total	2%	6%	10%	11%	10%	10%	10%	13%	13%	10%	4%	100%

18.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The metrics here provide a view on the first five years of the initiative. As innovation focus areas shift as the market evolves, NYSERDA will identify and provide additional indicators to track

outcomes associated with these new focus areas. These updates will be provided in advance of the end of the 5-year term projected below.

**Table 3. Initiative Specific Metrics**

Indicators <sup>7</sup>		Baseline (Before/Current) <sup>8</sup>	2019 (Cumulative)	2022 (Cumulative)
Activity/ Outputs	Number of studies, demonstrations, and product development projects initiated	0	30	60
	Number of studies, demonstrations, and product development projects completed	0	10	46
	Number of strategic partnerships between small/medium sized companies and large OEMs formed	0	5	23
	Number of companies supported	0	25	55
Outcomes	Number of products commercialized	0	3	14
	Number of test sites for new technologies	0	9	18
	Revenue to companies commercializing products (\$millions)	0	\$3	\$23
	Number of replications from demonstration projects	0	10	30
	Hardware BOS cost including power electronics for energy storage systems and Hardware Installation cost	Lead acid system: \$1000/kWh for 4 hr. duration <sup>9</sup> Lithium ion system: \$667-\$670/kW <sup>10</sup>	10% cost reduction	20% cost reduction
	Hardware cost for energy storage devices	Lead acid system: \$600-\$650/kWh for 4 hr. duration <sup>11</sup> Lithium ion system <sup>12</sup> Hardware (excluding battery): \$369-\$380/kW Battery only: \$350-\$500/kWh	10% cost reduction	20% cost reduction
	Performance of energy storage systems (efficiency, life, energy/power density, etc.)	2016 data unavailable	10% improvement	20% improvement

<sup>7</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>8</sup> Revised baseline metrics reflect the recently-completed Energy Storage market baseline evaluation which included research on Renewables Optimization. This study will be available publicly on NYSERDA's website and in the DPS Document and Matter Management system in the near future.

<sup>9</sup> Within the recently-completed Energy Storage and Renewables Optimization market baseline evaluation, these values are from New York State installations in 2016.

<sup>10</sup> Within the recently-completed Energy Storage and Renewables Optimization market baseline evaluation, these values are from secondary data and do not reflect New York State specific costs. Baseline data will be updated when New York State installations are available.

<sup>11</sup> Within the recently-completed Energy Storage and Renewables Optimization market baseline evaluation, these values are from New York State installations in 2016.

<sup>12</sup> Within the recently-completed Energy Storage and Renewables Optimization market baseline evaluation, these values are from secondary data and do not reflect New York State specific costs. Baseline data will be updated when New York State installations are available.



These outcomes will be the results of successful field demonstrations of the interventions backed by favorable business value propositions. The energy storage products developed through this intervention will demonstrate stated improvements above the industry would be able to produce in that year.<sup>13</sup>

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Improved value of the intermittent renewables (Solar PV and Wind).
- Improved grid and behind-the-meter resiliency including peak load reduction, reliability, and ancillary services.

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 4. Direct Impacts**

Primary Metrics <sup>14</sup>		2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-	-	-
	MMBtu Annual	-	-	-	-	-	-	-	-	-	-
	MMBtu Lifetime	-	-	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Lifetime		-	-	-	-	-	-	-	-	-	-
Customer Bill Savings Annual (\$ million)		-	-	-	-	-	-	-	-	-	-
Customer Bill Savings Lifetime (\$ million)		-	-	-	-	-	-	-	-	-	-
Private Investment (\$ million)		\$9.1	\$22.4	\$18.0	\$16.5	\$16.5	\$16.5	\$16.5	\$28.9	\$20.6	\$165.0

**Table 5. Annual Projected Initiative Participation**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Participants <sup>15</sup>	8	18	14	13	13	13	13	13	13	118

<sup>13</sup> Battery price percentage decline prices:

Battery Power Magazine, October 2013, <http://www.batterypoweronline.com/main/articles/the-lithium-ion-inflection-point/>  
 PV Magazine, November 2015, [http://www.pv-magazine.com/news/details/beitrag/li-ion-battery-costs-to-fall-50-in-next-5-years--driven-by-renewables\\_100022051/#axzz4G5vZqQof](http://www.pv-magazine.com/news/details/beitrag/li-ion-battery-costs-to-fall-50-in-next-5-years--driven-by-renewables_100022051/#axzz4G5vZqQof)

Bloomberg New Energy Finance Summit historical price chart: <http://c1cleantechicacom.wpengine.netdna-cdn.com/files/2015/09/battery-learning-rate.png>

Pike Research and Deutsche Bank price trends: <https://grist.files.wordpress.com/2011/09/li-ion-projected-costs.png>

Lithium ion density trends: [http://static.cdn-seekingalpha.com/uploads/2012/5/14/saupload\\_Battery\\_20Energy\\_20Density.jpg](http://static.cdn-seekingalpha.com/uploads/2012/5/14/saupload_Battery_20Energy_20Density.jpg)  
 and <http://www.nissan-global.com/JP/TECHNOLOGY/FILES/2010/07/f4c4d5d2e20391.jpg>

<sup>14</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Benefits are rounded to three significant figures. Totals may not sum due to rounding.

<sup>15</sup> Participants are awardees of NYSERDA contracts.

### 18.1.8 Fuel Neutrality

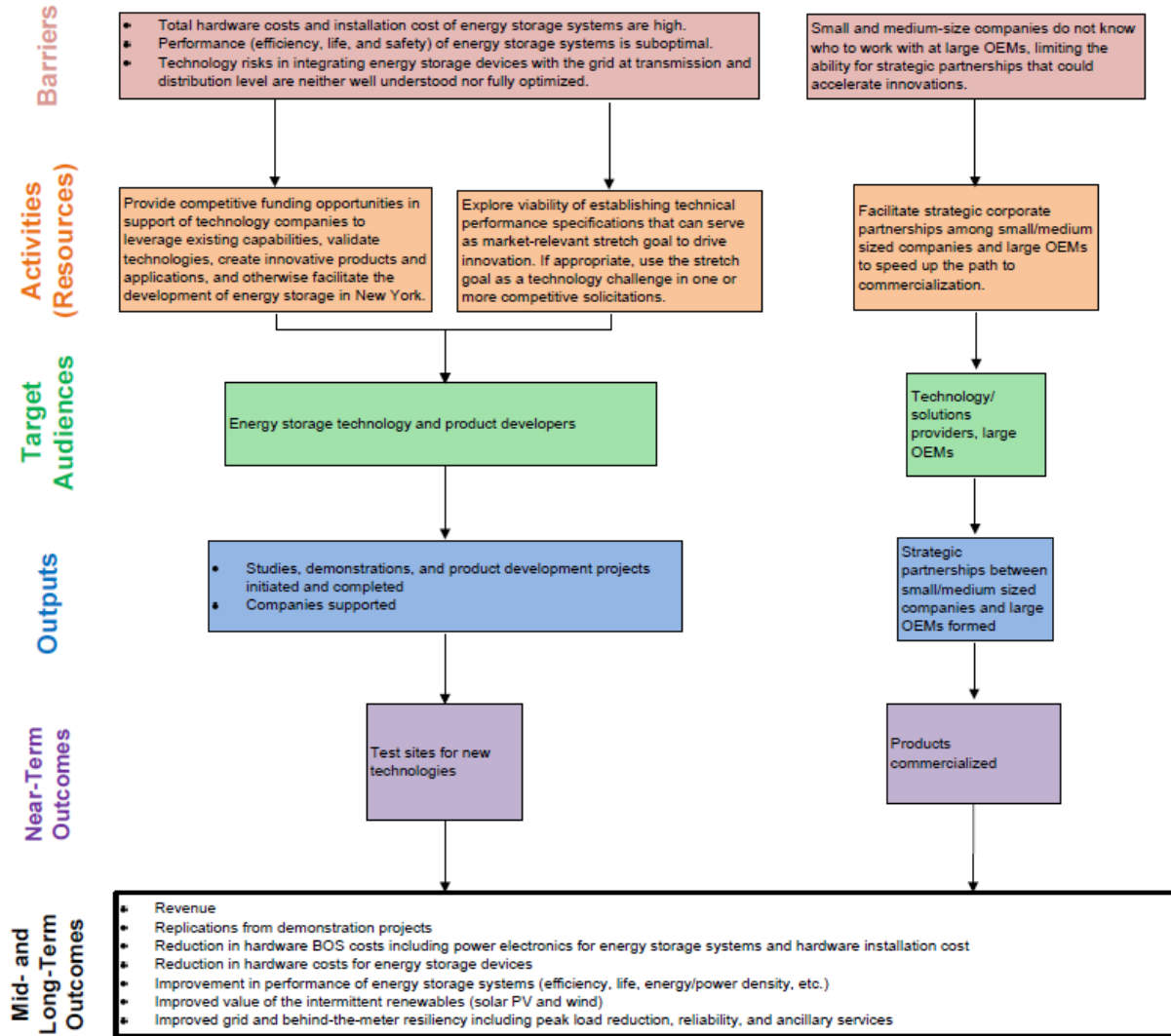
<b>Fuel Neutrality</b>	This initiative is not being delivered on a fuel neutral basis.
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### 18.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>• NYSERDA will monitor standard activity/output metrics including number of projects initiated and completed by type, private investment, etc.</li> <li>• For any new technology developments launched under the program, on a yearly basis, NYSERDA staff and contractor will reassess the Technology and Commercialization Readiness Levels for each project in the portfolio.</li> <li>• NYSERDA will conduct peer reviews of certain projects based on need. Examples – technical impasse, pivot point, critical milestone.</li> <li>• NYSERDA will assess the portfolio of projects annually regarding goals, metrics, outputs, and outcomes.</li> </ul> <p><u>Market Evaluation/Impact Evaluation</u></p> <ul style="list-style-type: none"> <li>• Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of market success.</li> <li>• Baseline measurements of key performance indicators will occur soon following initiative approval and will address indicators including hardware cost. In these areas, NYSERDA will first utilize existing information and will fill gaps in information as needed and feasible for appropriate baselining.</li> <li>• Regular (e.g., annual) updates to key performance indicators and measurement of market change will occur once the initiative is underway. Sources of data include public and commercially available data, and primary data collection through surveys of key market actors.</li> <li>• A broad demonstration project impact evaluation will include projects from this area and will examine benefits of demonstration projects, rate of success factors associated with replication, and benefits of replication projects. Cost savings will be quantified as part of this study.</li> </ul>
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# Appendix A – Logic Models

## LOGIC MODEL: Energy Storage Technology and Product Development



## Appendix B – Investment Plan Review Supplement

### Energy Storage Technology and Product Development

#### Results to Date – Metrics

The Renewables Optimization Initiative will begin recording benefits once project commitments are made. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2025)	% of Total Target through Initiative Completion (2025)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	*	-	*	-
	MMBtu Lifetime	-	-	-	-	-	*	-	*	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO <sub>2</sub> e Emission Reduction (metric tons)	MW	-	-	-	-	-	*	-	*	-
	Annual Tons	-	-	-	-	-	*	-	*	-
Customer Bill Savings (millions)	Lifetime Tons	-	-	-	-	-	*	-	*	-
	Annual Dollars	-	-	-	-	-	*	-	*	-
Private Investment (millions)	Lifetime Dollars	-	-	-	-	-	*	-	*	-
	Dollars	-	-	-	-	-	\$4.55	-	\$165.00	-
Participants	Participants	-	-	-	-	-	4	-	118	-

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	2022 Target	June 2017 Actual
			(Cumulative)	(Cumulative)	(Cumulative)
Activity/Outputs	Number of studies, demonstrations, and product development projects initiated	0	30	60	0
	Number of studies, demonstrations, and product development projects completed	0	10	46	0
	Number of strategic partnerships between small/medium sized companies and large OEMs formed	0	5	23	0
	Number of companies supported	0	25	55	0

### Performance Against Key Milestones

The Renewables Optimization Initiative is early in its development but is making progress toward its current milestones. Current milestones that are not yet complete are or will soon be in progress. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
✓	2017	Issue first competitive solicitation.
	2017	Contract projects from first competitive solicitation.
	2017	Review portfolio of activities, solicit market input, and reassess technology challenge areas and targets.
	2017	Issue second competitive solicitation.

### Plan for Continuation/Modification/Termination

The Renewables Optimization initiative has been progressing following the activities and timeline laid out in the investment plan. There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Renewable Heating & Cooling Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

May 8, 2017

## 19 Renewable Heating and Cooling

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Renewable heating and cooling (RH&C) technologies, have the potential to contribute significantly to decarbonization of the heating and cooling sector. They also offer other benefits to those directly using the technologies, including energy bill savings, increased comfort levels, and health benefits, compared to conventional heating and cooling technologies. Other benefits, including the value RH&C technologies can offer to the electricity grid, are not yet fully accessible to RH&C customers.

Today, RH&C technologies occupy a niche position in the State's heating and cooling market. Barriers exist, including cost-effectiveness challenges, inadequate access to low-cost investment capital, limited customer awareness of and confidence in RH&C technologies, and a range of supply chain barriers, all of which currently stand in the way of widespread market adoption and growth. As a result, RH&C is often not competitive with conventional heating and cooling technologies in today's marketplace.

In February 2017, NYSERDA published a RH&C Policy Framework that considers a set of policies to support the growth of the RH&C market in New York State. The Policy Framework is structured around consideration of three major pillars: (i) reducing technology costs and lowering supply chain, customer awareness and finance barriers; (ii) mandates that could drive demand for RH&C in new construction and major renovations; and (iii) incentives that improve project cost effectiveness. The Framework noted that cost reductions, plus potentially monetization of value (e.g. value of carbon and grid value) will likely be needed to create conditions for a mass RH&C market. This investment plan presents priority interventions that will unlock RH&C potential and build market momentum and infrastructure, drawing on analysis and input received from stakeholders and market participants in the development of the Policy Framework.

The initial initiatives described in this chapter address several of the barriers described above including RH&C project economics, lack of awareness of the advantages and disadvantages of RH&C technologies, uncertainty regarding savings and technical performance, and lack of technical expertise to evaluate feasibility and execute projects. The first initiative includes activities to reduce soft costs for Ground Source Heat Pumps (GSHP), Air Source Heat Pumps (ASHP), Solar Thermal (ST) and biomass by improving access to reliable information, supporting the development of a customer targeting tool, and supporting clustering/aggregation of installations developing standardized contracts, data protocols and requirements and quality assurance processes; provide targeted cost-shared technical assistance for GSHP and ST; and provide incentives to off-set the cost of GSHP systems. The second initiative continues the Renewable Heat NY activities, including incentives, research and development, policy development, workforce development, and education and outreach) for biomass.

The initiatives in this Chapter are closely related to and coordinated with an initiative in the Products chapter that addresses ASHP. The initiative in this chapter focuses on awareness generation and cost reduction through community campaigns. The Products initiative will focus on upstream tools, resources and incentives to support growth in ASHP product sales through manufacturers and distributors.

Further RH&C initiative under development will consider the impact of relevant policy deliberations under the Clean Energy Standard, and the design and reform of rate structures for beneficial electrification, both of which have the potential to improve the customer economics of RH&C solutions.

## 19.1 Heat Pumps and Solar Thermal

### 19.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Thermal energy used in the residential and commercial sectors for space heating, hot water, and cooling accounts for 37% of net energy consumption and 32% of all combustion-based GHG emissions in the state.</li> <li>• Today, RH&amp;C technologies occupy a niche position in New York State’s heating and cooling market, penetrating less than 1% of the market. Only a small fraction (around 4%) of statewide heating, ventilation, and air conditioning (HVAC) load can be met by RH&amp;C technology cost effectively today, despite a large technical potential with significant opportunity to realize customer and societal benefits.</li> <li>• Various RH&amp;C technologies suffer from common barriers, including high upfront costs and low fossil fuel prices, inadequate access to low-cost investment capital, and limited customer awareness of and confidence in RH&amp;C technologies. In addition, a range of supply chain barriers to growth exist, including a lack of capacity to manufacture, distribute, design, install, and service reliable, high-quality, and standardized RH&amp;C systems.</li> <li>• In addition to these common barriers, GSHP and ST face additional impediments. GSHP and ST installation typically require specialist contractors. Additionally, due, in part, to installation complexity, lack of a competitive market for installations, and unfamiliarity of customers with system performance history, GSHP systems are high cost and have low market penetration to date. Large GSHP and ST projects are highly complex, face higher technical risk and, as a result, face higher pre-development costs.</li> <li>• Due to the similarity in installation process and shared equipment components between ASHP and conventional air conditioning, many traditional HVAC contractors install and maintain ASHP systems. Also, ASHP are the most-cost effective RH&amp;C technology due to low installation cost and economies of scale derived from their widespread use in Asia and Europe. However, although much progress has been made, ASHP market progress is still impeded by the barriers described in this investment plan, particularly related to customer awareness and supply chain barriers.</li> </ul>
<p><b>Intervention Strategy</b></p>	<p>This first phase of Renewable Heating and Cooling initiatives under the CEF will advance timely interventions focusing on reducing soft costs. This initiative will:</p> <ul style="list-style-type: none"> <li>• Target general soft cost reduction strategies for all RH&amp;C technologies: <ul style="list-style-type: none"> <li>○ Improve access to reliable information</li> <li>○ Support the development of a customer targeting tool to identify high potential sites</li> <li>○ Support local clustering of installations through community campaigns</li> <li>○ Develop standardized contracts, data protocols and requirements, and quality assurance processes where appropriate based on prioritization</li> </ul> </li> <li>• For GSHP and ST, this initiative will provide targeted cost-shared technical assistance for larger projects to address the higher pre-development costs.</li> <li>• GSHPs are the most efficient RH&amp;C technology and present a near-term opportunity for increased focus to help increase the customer awareness and acceptance of RH&amp;C</li> </ul>



	<p>technologies more generally. Therefore, this initiative will provide incentives to offset the cost of installation of GSHP systems.</p> <ul style="list-style-type: none"> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Heat Pumps and Solar Thermal,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Achieve project cost reductions of 10% to 20% for enrollees in community campaigns and for college and university campuses benefiting from aggregated procurement.</li> <li>• Increase scale of deployment 10% to 20% in communities that run campaigns.</li> <li>• Increase customer awareness of the benefits of RH&amp;C systems and reduce customer acquisition costs and time.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<p>This initiative will contribute to the achievement of New York State’s greenhouse gas (GHG) emissions reduction goals identified in the 2015 New York State Energy Plan — targeting 40% reduction of GHG emissions by 2030, and 80% by 2050.<sup>1</sup> This initiative directly begins to address the 32% of GHG emissions produced by direct thermal use. The Energy Plan calls on NYSERDA to help “make renewable energy solutions more competitive in the energy market” and specific to RH&amp;C technologies, to support development of market infrastructure, which could include project-specific support, training and technical support for service providers, and tools and resources to drive consumer demand.</p>

19.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<p>The target market includes residential, multi-family, commercial, and institutional buildings owners/managers/developers that have a stronger value proposition, such as sites that currently use oil and propane, or have limited access to natural gas as these represent high value use cases across market segments based on project economics. Due to the newness of the market, NYSERDA is not limiting the offering to any particular market segment, and in doing so intends to allow the strongest value proposition use case(s) to emerge.</p>
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Consultants</li> <li>• Designers</li> <li>• Installers</li> <li>• Drillers</li> <li>• Building Owners and Managers</li> <li>• Equipment suppliers</li> <li>• National labs</li> <li>• Academic institutions</li> <li>• Architectural and mechanical, electrical, and plumbing engineering firms</li> <li>• Financiers</li> <li>• Community groups</li> <li>• Municipalities</li> <li>• Regional associations such as Renewable Thermal Alliance (RTA) and the Northeast Energy Efficiency Partnerships (NEEP)</li> <li>• New York Power Authority (NYPA)</li> <li>• Industry Organizations such as New York-Geothermal Energy Organization (NY-GEO), Solar Energy Industries Association (SEIA)</li> <li>• Utilities</li> </ul>

<sup>1</sup> 2015 New York State Energy Plan: *The Energy to Lead*. Albany: New York State Energy Planning Board <https://energyplan.ny.gov/-/media/nysenergyplan/2015-state-energy-plan.pdf>

<p><b>Market Readiness</b></p>	<ul style="list-style-type: none"> <li>• Communities are ready and interested in leveraging infrastructure from Solarize<sup>2</sup> and other clean energy campaigns to encourage RH&amp;C.</li> <li>• Customers that are engaged in Solarize campaigns represent a receptive audience motivated to value the benefits RH&amp;C provide. However, awareness and understanding of RH&amp;C systems and the benefits they offer is low.</li> <li>• There are RH&amp;C installers in NYS with varying degrees of certification but not necessarily enough within all geographic areas and not enough to serve a scaled market. A number of installers are seeking and evaluating new business models, and are interested in training and tools support growth of their workforce.</li> <li>• Many customers, in particular colleges and universities and local governments, have adopted aggressive GHG reduction goals toward which RH&amp;C technologies could make a substantial contribution.</li> <li>• Some of New York’s investor owned utilities have expressed interest in further exploring and supporting RH&amp;C market development though incentive programs, in conjunction with energy efficiency programs and possibly through loop field<sup>3</sup> ownership.</li> </ul>
<p><b>Customer Value</b></p>	<ul style="list-style-type: none"> <li>• End user annual energy bill savings and reduced customer exposure to fossil fuel price volatility.</li> <li>• Improved end user comfort and health, particularly for vulnerable populations, such as the elderly and low-to-moderate income (LMI) residents, via more economical options for building cooling.</li> <li>• Increase site usability through expanded cooling in facilities, such as schools and churches, which will allow for more services to the public.</li> <li>• Improved resiliency with the potential to continue delivering thermal energy generated by distributed electricity resources during disruptions to critical infrastructure.</li> <li>• Increase access to objective and reliable information which will stimulate customer confidence and market growth, while reducing customer acquisition costs for developers.</li> <li>• Broadly, deployment of RH&amp;C technologies will improve fuel diversity across the thermal energy mix, increase the choices available to customers, and reduce dependence on fossil fuel delivery infrastructure and direct consumer exposure to national and global fossil fuel price volatility. Additionally, ground source heat pumps provide higher efficiency cooling than many conventional AC systems, contributing to peak load reductions and associated electricity cost savings passed on to ratepayers. The increased off-peak electricity sales from broader heat pump deployment will also enable fixed utility costs to be spread over a greater volume of sales, contributing to additional electricity cost savings for all ratepayers.</li> </ul>

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<sup>2</sup> Solarize campaigns are locally organized community outreach efforts aimed at getting a group of homes and businesses in one area to go solar. When groups of neighbors—including residents and businesses—learn about solar and the installation together, they can often get better pricing and share the tasks. Group members can contribute their strengths and learn new skills. NYSERDA provides technical assistance, marketing materials, and other support for these efforts.

<sup>3</sup> The “loop field” is the heat exchanger that is buried in the ground or submerged in water that enables the exchange of thermal energy between the building and the ground and/or water.

### 19.1.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement</b></p>	<p>Engagement to date:</p> <ul style="list-style-type: none"> <li>• NYSERDA convened a Cost and Cost Reductions Advisory Committee of over 30 industry stakeholders and experts (including manufacturers, designers/engineers, installers, and drillers) to provide input on RH&amp;C costs and cost reduction strategies.</li> <li>• GSHP stakeholders have been convened to provide input on design of incentive program.</li> <li>• NYSERDA has held discussions with ten communities, from regions including Westchester, Western NY, Central NY, Southern Tier and the Capital District to assess the level of interest and opportunity for community campaigns, seek feedback on the planned approach and ask for input on program design.</li> <li>• HeatSmart Tompkins and NYSERDA conducted focus groups with customer and contractor participants in HeatSmart Tompkins to better understand decision making, explore lessons learned and establish best practices in community campaigns.</li> <li>• NYSERDA and NYPA have engaged with the State University of New York (SUNY), and several other college campuses, to assess interest and co-investment in a GSHP campus initiative.</li> <li>• NYSERDA held a stakeholder meeting on March 2, 2017 to get input on the strategies identified in the RH&amp;C Framework. Input is reflected in the interventions proposed here.</li> </ul> <p>Future engagement:</p> <ul style="list-style-type: none"> <li>• NYSERDA will continue to engage the Cost and Cost Reductions Advisory Committee.</li> <li>• NYSERDA will form a working group of communities with active RH&amp;C campaigns to facilitate peer exchange and ensure best practices are proliferated.</li> <li>• NYSERDA will continue to engage with companies and real estate developers looking to explore innovative business models (e.g., GSHP loop field ownership models, district systems)</li> </ul>
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### 19.1.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Systems have high upfront costs and low returns.</b> In the commercial sector, many building owners require a quick payback, and RH&amp;C technologies must compete for scarce internal investment dollars with other priorities, including priorities that are more central to the business or mission. This first phase of initiatives will reduce soft costs to address this barrier.</li> <li>• <b>Lack of awareness of the advantages and disadvantages of RH&amp;C technologies.</b> Contractors prefer selling conventional technologies because new technologies like RH&amp;C require new training and/or installation practices, and a different sales approach, both of which require investments in time and money for their staff. Customer targeting/engagement tools and installation clustering through community campaigns will help address this barrier.</li> <li>• <b>Uncertainty regarding energy and operational and maintenance savings and technical performance.</b> Customers and contractors may perceive larger risks associated with RH&amp;C than traditional systems, including concerns over quality and durability, warranties from the manufacturer, overall performance, and availability of maintenance services. Contractors also face higher risks of installing a poorly performing project when using new technologies, which can further increase their costs. Improving access to reliable information and de-risking project development costs for target market segments will help address this barrier.</li> </ul>
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	<ul style="list-style-type: none"> <li>• <b>For technologies other than ccASHP, conventional HVAC installers and project developers, lack customer acquisition resources and technical expertise to evaluate feasibility and/or execute projects.</b> A lack of capacity to manufacture, distribute, design, install, and service RH&amp;C systems is a significant barrier to market scale. Conventional HVAC designers and installers often lack experience and training in evaluation and execution of RH&amp;C projects. This difficulty is amplified in sectors where sales staff must both sell their specific product and educate customers about RH&amp;C opportunities more broadly. Customer targeting/engagement tools, installation clustering through community campaigns and de-risking project development in target market segments will help address these barriers.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If NYSERDA improves access to reliable information on RH&amp;C solutions, then awareness and confidence will increase, system costs will decrease, and installations will increase.</li> <li>• If NYSERDA supports the development of a customer targeting tool, customer acquisition time and cost will decrease.</li> <li>• If NYSERDA supports local clustering of installations, customer acquisition, contractor mobilization and installation costs will decrease.</li> <li>• If NYSERDA provides cost-shared technical assistance to large systems, pre-development costs will decrease and system performance and customer confidence will increase.</li> <li>• If NYSERDA develops standardized contracts, data protocols and requirements, and quality assurance processes, soft costs will decrease, confidence in performance will increase and market conditions enabling more private sector investment will be created.</li> </ul>
<b>Activities</b>	<p>NYSERDA will invest to reduce costs through information, standardization and innovation, and will provide direct financial support to community campaigns and installations.</p> <ul style="list-style-type: none"> <li>• <b>Invest to reduce costs</b> <ul style="list-style-type: none"> <li>○ Develop and distribute materials such as performance estimations, building suitability guidelines, and tips for dealing with contractors to potential customers to increase awareness and confidence.</li> <li>○ Support innovative RH&amp;C business models and successful soft-cost reduction strategies through competitive solicitations and disseminate results to spur replication.</li> <li>○ Facilitate the development of standardized contracts, data protocols and requirements, and quality assurance (QA) processes (in collaboration with neighboring states or regional associations where feasible). <ul style="list-style-type: none"> <li>▪ Develop standardized contracts, including for third-party ownership models.</li> <li>▪ Develop a regional measurement and verification (M&amp;V) protocol for RH&amp;C technology.</li> </ul> </li> <li>○ Investigate the feasibility of implementing a regional contractor and project certification system. Aggregate available data on building energy use and characteristics and share with the market.</li> </ul> </li> <li>• <b>Support aggregation of installations through community campaigns</b> <ul style="list-style-type: none"> <li>○ Provide direct financial support and access to technical experts to communities to launch 3 to 5 year campaigns that will select qualified installers and negotiate a reduced price for campaign enrollees. Assist communities in dealings with installers.</li> <li>○ Pilot strategies to increase participation of LMI residents and assess effectiveness<sup>4</sup>.</li> <li>○ Annually, compile best practices, and share between communities.</li> </ul> </li> </ul>

<sup>4</sup> Based on potential for savings, impact on affordability and proposed approach.

	<ul style="list-style-type: none"> <li>• <b>Support campus installations</b> <ul style="list-style-type: none"> <li>○ To lower the cost of development and construction, NYSERDA and NYPA will identify clusters of cost-effective RH&amp;C installations on college campuses and at state and local buildings and seek aggregated development and construction bids.</li> <li>○ Provide technical support to conduct screening/feasibility studies, develop system designs, and M&amp;V protocols for large commercial, institutional and government facilities and campuses to build confidence in outcomes and accelerate growth in key market segments</li> <li>○ Leverage existing industry standards to develop and refine specifications for how to evaluate, design and measure the performance of RH&amp;C systems.</li> </ul> </li> <li>• <b>Provide incentives to offset the cost of installation of GSHP systems</b> <ul style="list-style-type: none"> <li>○ Launch short-term open-enrollment incentive program for the deployment of GSHP. The program is expected to be available for 2 years and have a budget of \$15 Million.</li> <li>○ Qualify GSHP service providers and provide an indication of performance to the market to streamline contractor selection. Support training and mentoring where needed, working with industry associations to develop and grow a base of qualified service providers.</li> <li>○ Perform or facilitate design and installation reviews to ensure high quality installations and conformance with industry standards.</li> </ul> </li> </ul>
<p><b>Key Milestones</b></p>	<p><b><u>Milestone 1 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Solicit for and contract with technical support contractor for community campaigns.</li> </ul> <p><b><u>Milestone 2 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Launch GSHP contractor mentoring program.</li> </ul> <p><b><u>Milestone 3 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Release competitive solicitation to select community campaigns (repeat annually).</li> </ul> <p><b><u>Milestone 4 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Release open enrollment solicitation for GSHP incentive.</li> </ul> <p><b><u>Milestone 5 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Provide list of qualified GSHP designers, installers and drillers to market.</li> </ul> <p><b><u>Milestone 6 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Contract with consultants to perform QA and design review for GSHP incentive projects.</li> </ul> <p><b><u>Milestone 7 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Provide marketing toolkit and installer selection model solicitations to pilot community campaigns.</li> </ul> <p><b><u>Milestone 8 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Launch community campaigns (repeat annually).</li> </ul> <p><b><u>Milestone 9 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Contract with consultants to perform screening assessments and schematic designs for college and university campuses and state and local buildings.</li> </ul> <p><b><u>Milestone 10 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Provide standardized contracts and best practices manual to market.</li> </ul>

	<p><b><u>Milestone 11 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Complete assessment of M&amp;V methodologies for system performance and share with market participants.</li> </ul> <p><b><u>Milestone 12 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Disseminate RH&amp;C case studies and design and installation best practices to the market.</li> </ul> <p><b><u>Milestone 13 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Develop aggregated procurement for colleges and universities and state and local buildings.</li> </ul> <p><b><u>Milestone 14 (2024)</u></b></p> <ul style="list-style-type: none"> <li>• Complete commissioning and M&amp;V on large commercial, campuses and state and local building projects.</li> </ul>
<b>Goals Prior to Exit</b>	<p>Cost-effective investment opportunities in RH&amp;C would need to increase by an order of magnitude for RH&amp;C to move from its current niche position to a mainstream market. The activities in this initiative are intended to reduce costs by 10%-20% in communities with campaigns in five years, making progress towards the preconditions for a sustainable market. NYSERDA will evaluate market conditions to determine what subsequent activities are needed to continue to move RH&amp;C towards a sustainable market. Additional costs reductions (potentially from indirect benefits of increased market scale) combined with monetization of grid value<sup>5</sup> and potentially carbon value would likely be needed to create a sustainable mass market industry over the next decade.</p> <p>To exit the initial activities proposed here, the following goals would need to be achieved:</p> <ul style="list-style-type: none"> <li>• RH&amp;C technology projects are built at 5-10 college and university campuses across New York.</li> <li>• RH&amp;C technology projects are built at 5-10 state buildings across New York.</li> <li>• RH&amp;C campaigns are completed in communities in every region of NY and are incorporated into the Clean Energy Communities program if determined to be high impact actions.</li> <li>• Customer acquisition time and costs in communities with campaigns are decreased by 10 to 20%.</li> <li>• Base of qualified consultants, designers and installers is increased by 10% from 2016 levels by 2022.</li> </ul>

19.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• Heat pumps present an opportunity for beneficial electric load that is valuable to utilities, consistent with New York’s Reforming the Energy Vision (REV’s) goal of improving load factor and also reduces emissions. NYSERDA will coordinate its activities with the utilities in RH&amp;C market development, particularly where the utilities offer rebates for systems, to ensure complementary rather than competing programs.</li> </ul>
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<sup>5</sup> <https://www.nyserdera.ny.gov/-/media/Files/Publications/PPSER/NYSERDA/RHC-Framework.pdf>. NYSERDA estimates that the average grid value from heat pumps replacing fossil fuel is in the range of \$200/installed ton per year of installed capacity. Monetization of some portion of this value could substantially increase the economic potential of these RH&C resources.

	<ul style="list-style-type: none"> <li>The GSHP program will be a companion incentive to the PSEG-LI GSHP rebate on Long Island and will accordingly be available in other parts of the State. NYSERDA will coordinate with PSEG on program offerings.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>PSEG-LI offers rebates for ASHPs (up to \$600 per system) and GSHPs (up to \$2,000 per ton).</li> <li>Several of New York’s investor owned utilities offer rebates for the purchase and installation of ASHPs including Con Edison (up to \$500 per ton), NYSEG (commercial only up to \$100 per ton) and Central Hudson (commercial only up to \$125 per ton).</li> <li>National Grid, in the KEDLI (Long Island) service territory, has been approved to implement a pilot program to demonstrate geothermal heating and cooling as an alternative to either new or existing firm or interruptible gas customers. KEDLI is to work with local water utilities and LIPA/PSEG-LI in the program development. Funding for the program consists of \$350,000 in rate year one and \$50,000 in each of rate years two and three. The goal is to use geothermal technologies to potentially displace peak gas consumption versus adding pipeline capacity.</li> </ul>

19.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1. Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
Direct Incentives and Services	\$4,926,675	\$8,560,000	\$7,960,000	\$2,225,000	\$1,625,000	\$25,296,675
Implementation Support	\$750,168	\$1,531,000	\$768,500	\$245,000	\$132,500	\$3,427,168
Tools, Training, and Replication	\$874,300	\$1,938,600	\$1,221,100	\$337,000	\$117,000	\$4,488,000
Total	\$6,551,143	\$12,029,600	\$9,949,600	\$2,807,000	\$1,874,500	\$33,211,843

**Table 2. Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
<b>Total</b>	4%	15%	25%	26%	20%	10%	100%

19.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market

conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

<b>Indicators<sup>6</sup></b>		<b>Baseline (Before/Current)</b>	<b>2019 (Cumulative)</b>	<b>2022 (Cumulative)</b>
Activities/Outputs	# of active community campaigns	1	17	29
	# of community campaign enrollees	200	1,700	2,900
	# of program-qualified GSHP consultants and designers	0	10	15
	# of installers and drillers qualified by community campaigns and GSHP incentive program	0	40	50
	# of large commercial/institutional facility and campus screening studies completed	0	30	75
	# of large commercial/institutional facility and campus schematic designs completed	0	30	72
	# of large commercial/institutional facility and campus installations completed	0	7	36
	# of projects completed by community campaign participants	90	650	2,521
	# of completed projects through the GSHP incentive program	0	430	930
	# of case studies demonstrating successful cost reduction strategies and/or customer value	0	5	20
	Outcomes	Increased awareness of RH&C technologies in communities with campaigns	0%	10%
Cost (\$ per ton) in installed systems in community campaigns and for college and university campuses is reduced		0%	10% decrease	20% decrease
# of communities continuing campaigns without NYSERDA direct financial support		0	0	8
# of International Ground Source Heat Pump Association (IGSHP) - certified designers, installers and drillers active in NYS		82	100	110

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Due to the nature of the activities, estimating energy savings impacts at

<sup>6</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.



this stage is difficult because the specific technologies that will be supported are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

**Table 4. Direct Impacts**

Primary Metrics <sup>7</sup>		2017	2018	2019	2020	2021	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MMBTu Annual	76,200	190,000	207,000	191,000	178,000	841,600
	MMBTU Lifetime	1,910,000	4,750,000	5,160,000	4,770,000	4,450,000	21,040,000
	MW	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MW	-	-	-	-	-	-
CO <sub>2</sub> e Emission Reduction (metric tons) Annual		3,390	8,680	8,850	7,320	6,570	34,810
CO <sub>2</sub> e Emission Reduction (metric tons) Lifetime		84,800	217,000	221,000	183,000	164,000	870,300
Customer Bill Savings Annual (\$ million)		\$0.57	\$1.48	\$1.46	\$1.13	\$0.99	\$5.63
Customer Bill Savings Lifetime (\$ million)		\$14.30	\$37.0	\$36.5	\$28.3	\$24.8	\$140.8
Private Investment (\$ million)		\$4.56	\$15.7	\$27.8	\$30.2	\$44.7	\$122.9

**Table 5. Annual Projected Initiative Participation**

	2017	2018	2019	2020	2021	Total
Participants <sup>8</sup>	155	892	828	804	809	3,487

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within

<sup>7</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 25-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs. Energy Efficiency values represent MMBTU savings from use of renewable heating and cooling technologies; electricity required to utilize the RH&C technology (28,462 MWh cumulative annual and 711,559 MWh lifetime in total) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both MMBTU savings (1,244,602 tons) which add to the emission benefits and additional electricity required to implement the RH&C technology, which was subtracted from the benefits (374,330 tons).

<sup>8</sup> Participants are defined as RH&C projects: large commercial/institutional facility and campus installations completed, projects completed by community campaign participants and projects completed through the GSHP incentive program.

market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 6. Estimated Indirect Market Impact**

Indirect Impact <sup>9</sup>		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	25,900	133,000	161,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		806	4,210	5,140

### 19.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	NYSERDA intends to advance this initiative in a fuel neutral manner. This will provide an opportunity to target more cost-effective applications (such as switching from fossil fuel to GSHP/ASHP) and will help develop a market of scale. Offering the initiative on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$38 per ton of carbon, compared to a cost of \$121 per ton of carbon in an electric only scenario.
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### 19.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <p>Each year, NYSERDA will undertake a reassessment of effectiveness and funding levels and will adjust the program as appropriate. Specifically:</p> <ul style="list-style-type: none"> <li>• NYSERDA will assess the level of enrollment in community campaigns and identify tactics to increase overall enrollment and enrollment from key demographics.</li> <li>• NYSERDA will assess the number of enrollees in community campaigns that acted in a campaign year and identify important trends and tactics for increasing conversion.</li> <li>• NYSERDA will partner with communities between campaigns to conduct focus groups of participants and installers to identify lessons learned, best practices and needed adjustments.</li> <li>• NYSERDA will work with the NYPA and the industry to assess the impact of technical assistance for large campuses and adjust approach as necessary to increase impact</li> </ul>
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<sup>9</sup> Energy Efficiency values represent MMBTU savings from use of renewable heating and cooling technologies; electricity required to utilize the RH&C technology (7.626 MWh cumulative in 2030) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both MMBTU savings which add to the emission benefits (9,148 tons) and additional electricity required to implement the RH&C technology (4,012 tons), which was subtracted from the benefits.

	<ul style="list-style-type: none"> <li>• NYSERDA will work with stakeholder groups such as NY GEO to regularly assess the participation and level of success of the GSHP incentive program and make necessary adjustments</li> </ul> <p><b>Heat Pumps and Solar Thermal Strategy M&amp;V</b></p> <ul style="list-style-type: none"> <li>• Performance data will be collected through the incentive program, by community campaigns and through M&amp;V, where possible, using a common/standardized web platform and on-board/technology integrated tools.</li> </ul> <p><b>Market Evaluation</b></p> <p>This intervention will include surveys/interviews with market participants at various stages and levels of involvement to assess:</p> <ul style="list-style-type: none"> <li>• Improvements in awareness and customer confidence in Renewable Heating and Cooling</li> <li>• Effectiveness of tools such as the customer targeting tool, RFP template, marketing materials and standard protocols for assessments, feasibilities, design and M&amp;V</li> <li>• Installed cost by category</li> <li>• Size of the qualified installer base</li> </ul> <p><b>Impact Evaluation/Field Verification</b></p> <p>Impact evaluation will leverage data collected by community campaigns, through technical assistance studies and the GSHP incentive program. The evaluation will involve field verification of a sample of projects, and focus on:</p> <ul style="list-style-type: none"> <li>• Renewable heating and cooling energy produced</li> <li>• Fossil fuel displaced</li> </ul>
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## 19.2 Renewable Heat New York

### 19.2.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"> <li>• Thermal energy used in the residential and commercial sectors for space heating, hot water, and cooling accounts for 37% of net energy consumption and 32% of all combustion-based greenhouse gas (GHG) emissions in the state.</li> <li>• Wood is used as a primary heat source in approximately 140,000 households, as a supplemental heat source in 500,000 households, and is the largest producer of emissions of carbonaceous fine particulate matter (PM) in rural NYS counties.<sup>10</sup></li> <li>• There is a wide range of performance for wood heating technologies in use throughout the state. Many low to moderate income households rely on older, less efficient, and dirtier biomass heating appliances, and lack the capital necessary to upgrade to cleaner, more efficient technology.</li> </ul>
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<sup>10</sup> New York State Wood Heat Report: *An Energy, Environmental, and Market Assessment*. Albany: New York State Energy Research and Development Authority  
<https://www.nyserra.ny.gov/-/media/Files/Publications/Research/Biomass-Solar-Wind/15-26-NYS-Wood-Heat-Report.pdf>

	<ul style="list-style-type: none"> <li>• In 2014 NYS launched the Renewable Heat NY initiative, a long-term commitment to supporting the high-efficiency and low-emission biomass heating industry.</li> <li>• Since its inception in 2014 Renewable Heat NY has provided support to the high-efficiency and low-emission biomass heating industry, resulting in annual savings of 6,680 gallons of fuel oil, 16 tons of PM emissions, 115 tons of carbon monoxide emissions, and 0.095 tons of sulfur dioxide emissions.</li> <li>• The sharp decline in fossil fuel (home heating oil) prices from \$30 - \$25 per MMBtu at the beginning of 2015 to \$15 per MMBtu in the beginning of 2016 has slowed interest in the high-efficiency and low-emission biomass heating market, but the potential remains to have a meaningful impact on near-term opportunities and long-term goals.</li> </ul>
<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• Through Renewable Heat NY, New York is pursuing a multi-pronged market support strategy to promote development in a manner that will enable individuals who choose to heat their building with biomass and support best available, high efficiency, low emissions biomass installations. Support includes: <ul style="list-style-type: none"> <li>○ Direct incentives for installations to encourage adoption</li> <li>○ Research and development to advance high-efficiency and low-emissions technologies</li> <li>○ Workforce development to train a skilled workforce</li> <li>○ Education and outreach to inform consumers and market participants</li> <li>○ Policy development support for state and local governments</li> </ul> </li> <li>• As developing this market requires capturing the benefits of scale, particularly in local communities, this initiative will seek to develop activity in focused geographic areas to initiate market traction. For example, clustered development of installations and pellet deliveries will enable cost reductions in the associated service areas.</li> <li>• While the program components will be available statewide, NYSERDA will deploy a co-op marketing campaign in local clusters with the potential for market growth, and will collaborate with local stakeholders to promote positive health and safety impacts. NYSERDA will also focus on replacement of inefficient wood heating appliances with efficient wood heating appliances for health and safety concerns.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Renewable Heat New York,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Support a New York State market for high-efficiency and low-emission biomass heating equipment and feedstock supply/infrastructure that is cost-effective and environmentally sound.</li> <li>• Attract private sector capital investment in all segments of the advanced wood heating sector, including pellet production and distribution, sustainable forest management and forest products industry, equipment manufacturing, sales and installation, and workforce training and development.</li> <li>• Replacement of over 1,300 inefficient wood heating appliances with efficient wood heating appliances.</li> <li>• Estimated emissions reductions of 124.7 ton/yr of PM 2.5, 867 ton/yr of carbon monoxide, 0.613 tons/yr of sulfur dioxide, and 1,296 ton/yr of CO<sub>2</sub>e.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	Broadly, the 2015 New York State Energy Plan calls on NYSERDA to help “make renewable energy solutions more competitive in the energy market.” <sup>11</sup> It also specifically puts forth the Renewable Heat NY initiative as an “approach to develop

<sup>11</sup> 2015 New York State Energy Plan: *The Energy to Lead*. (Page 75). Albany: New York State Energy Planning Board <https://energyplan.ny.gov/-/media/nysenergyplan/2015-state-energy-plan.pdf>

	a vibrant and sustainable market for advanced heating technologies” and a commitment to supporting advanced wood heating equipment purchases and installations, improving pellet supply, supporting research and development for continued efficiency and emissions advances, and creating new workforce opportunities.
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### 19.2.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<p>The target market for direct incentive programs includes:</p> <ul style="list-style-type: none"> <li>• Residential, small commercial, and large commercial customers currently using inefficient wood technologies for heat or customers that decide to switch from oil or propane to high efficiency, low emissions wood heating</li> <li>• State facilities as potential large customers</li> </ul> <p>The target market for research and development activities includes:</p> <ul style="list-style-type: none"> <li>• High-efficiency and low-emission biomass heating technology manufacturers</li> <li>• Bulk pellet producers and suppliers</li> <li>• State and Federal regulatory agencies (e.g. New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH), United States Environmental Protection Agency (USEPA))</li> </ul> <p>The target market for workforce development activities includes:</p> <ul style="list-style-type: none"> <li>• Local code enforcement officers</li> <li>• Heating, ventilation and Air Conditioning (HVAC) contractors</li> <li>• Design engineers</li> <li>• Energy auditors</li> </ul> <p>The target market for education and outreach activities includes:</p> <ul style="list-style-type: none"> <li>• Residential, small commercial, and large commercial customers currently using oil, propane, or inefficient wood technologies for heat</li> <li>• Local code enforcement officers</li> <li>• HVAC contractors</li> <li>• Design engineers</li> <li>• Energy auditors</li> </ul> <p>The target market for policy development activities includes:</p> <ul style="list-style-type: none"> <li>• Local code enforcement officers</li> <li>• State and Federal regulatory agencies (e.g. NYSDEC, NYSDOH, USEPA)</li> </ul>
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Building owners interested in utilizing advanced biomass heating technologies</li> <li>• HVAC contractors</li> <li>• Pellet stove suppliers and installers</li> <li>• Biomass boiler and system component manufacturers</li> <li>• Biomass fuel producers/suppliers</li> <li>• Design engineers</li> <li>• Energy auditors</li> <li>• Academic institutions</li> <li>• National laboratories</li> <li>• Equipment test facilities</li> <li>• Industry organizations</li> </ul>

<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• The volatility of fossil fuel prices and lack of natural gas availability has forced consumers to look at alternative heating technologies, such as wood. While a sizable portion of the market heats with wood, there is a wide range of performance of wood heating technologies available in the market today.</li> <li>• Due to the variability in technologies, the timing is key for NYSERDA help educate and steer consumers toward more efficient and environmentally healthy technologies. The activities conducted under Renewable Heat NY are intended to prepare and steer the biomass heating market in New York State toward cleaner, more efficient biomass heating technologies.</li> <li>• Consumers have indicated that they value cleaner, more efficient technologies as these technologies lead to reduced fuel consumption and greater cost savings.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Incentive programs will provide a reduction in up-front capital cost to the customer, which will result in a more economically feasible project and further encourage the adoption of advanced technologies over older, less efficient technologies.</li> <li>• The development of realistic test methods for advanced biomass heating devices will provide consumer protection by ensuring that all devices are evaluated using consistent standards.</li> <li>• Developing standards for advanced biomass heating appliances that can be adopted into state and local building codes will enable state and local officials to incorporate the more advanced technologies, helping to ensure the health and safety of New York State residents.</li> <li>• Through proper training, designers and installers will be better able to size and install these systems properly, resulting in fewer service call-backs and increased customer satisfaction.</li> <li>• Partnering with local stakeholder groups for education and outreach on the negative health and safety impacts of wood smoke will promote a healthier environment for all members of the community, not just those who choose to heat their buildings with biomass.</li> </ul>

19.2.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• As NYSERDA has worked to foster this nascent industry, it has a strong understanding of and is in frequent communication with market participants and stakeholders across the state. These interactions have helped to inform and shape the initiative as described herein.</li> <li>• NYSERDA has also established a formal Renewable Heat NY Advisory Group comprised of manufacturers, installers, fuel providers, design engineers, and independent engineering consultants to gauge the state of the market and seek input on potential program adjustments in a more structured manner. NYSERDA intends to convene this Advisory Group no less frequent than semi-annually.</li> <li>• NYSERDA engages in communication with other states such as Maine, Vermont, Massachusetts, New Hampshire, Washington, Michigan, Oregon, and Arkansas on the topic of advanced biomass heating technologies and market development strategies.</li> <li>• NYSERDA also anticipates additional future engagements with Regional Economic Development Councils, community improvement organizations, counties and municipalities, and colleges and Universities.</li> </ul>
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19.2.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Up-front costs for advanced wood heating equipment can be prohibitive when compared to incumbent technologies.</b> Historically low home heating oil prices have slowed the advance of the high-efficiency and low-emission biomass market and impeded the development of innovative business models. Low home heating oil prices disincent the switch from traditional fossil fuels to alternative fuels. Incentive programs are in place to offset up-front costs and make project economics more favorable.</li> <li>• <b>Errors in system design, installation, commissioning, and controls integration lead to underperformance and operational issues.</b> The design and installation of high-efficiency and low-emission biomass boiler systems requires a high level of skill and understanding. Renewable Heat NY has invested in the training of HVAC contractors and system designers as part of an ongoing effort to educate the industry on proper design and installation practices for biomass boiler systems. NYSERDA's list of qualified installers contains 19 companies. A subset of those (approximately 9) are currently active. Training and education will need to continue and evolve as the industry matures.</li> <li>• <b>Lack of a reliable fuel supply network contributes to customer apprehension.</b> The bulk pellet delivery network in NY is still in its infancy. Several bulk pellet delivery trucks have only very recently been deployed throughout the state as part of the first phase of Renewable Heat NY. Continued support is needed to build this network to a point where bulk pellets can be delivered to customers economically.</li> <li>• <b>Advanced technologies are often viewed as untested and unreliable.</b> There is currently an emergent network of manufactures and distributors of high-efficiency and low-emission biomass heating technologies in NYS. NYSERDA is working with them to improve equipment performance as well as manufacturing capabilities.</li> <li>• <b>Customers are unaware of their options for cleaner technologies.</b> NYSERDA interactions with consumers at public events indicate that people are becoming increasingly aware of their options for cleaner, more efficient biomass heating systems. Through continued outreach and educational efforts, consumer awareness will continue to grow while the industry aligns itself with new federal clean air regulations.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA provides incentives to improve the economics of installing a high-efficiency, low emissions biomass heating appliances, then more consumers will choose to do so.</li> <li>• If high-efficiency, low-emissions biomass heating appliances are made cleaner and more efficient, then the customer value proposition will improve and installations will increase.</li> <li>• If suggested standards and language on high-efficiency biomass technology for building and related codes exists then it will be adopted into building codes at the county-level, making it easier to install advanced biomass technologies.</li> <li>• If reliable supply chain and service networks are fully developed, then the likelihood of high-efficiency, low-emissions biomass heating appliances to be viewed as favorable to the next-best alternative will increase.</li> <li>• If education and outreach on high efficiency, low emission biomass heating appliances is increased, then consumer awareness of and confidence in the technology will increase.</li> <li>• If less efficient biomass heating appliances are replaced with high-efficiency, low-emissions biomass heating appliances then there will be a positive impact on ambient air quality.</li> </ul>

<p><b>Activities</b></p>	<p><b>Direct Incentives:</b></p> <ul style="list-style-type: none"> <li>• Continue standard offer, first-come first-served incentive programs statewide. Monitor market interest and adjust incentives as appropriate.</li> <li>• Seek further soft cost reductions by providing financial support through community sponsored purchasing campaigns (similar to the Solarize<sup>12</sup> model for solar PV).</li> </ul> <p><b>Research and Development:</b></p> <ul style="list-style-type: none"> <li>• Develop test methods for wood stoves and wood boilers under realistic operational conditions in collaboration with USEPA, Northeast States for Coordinated Air Use Management (NESCAUM), and Brookhaven National Laboratory (BNL).</li> <li>• Provide financial support to the Alliance for Green Heat’s competitive woodstove design challenges, where multi-functional teams compete to submit the most innovative and high performing pellet stoves and prototype stove models, with the goal of advancing high-efficiency, low-emissions technologies.</li> <li>• In collaboration with the Energy-related Environmental Research Initiative, commission studies of wood smoke and public health utilizing established partnerships to assist NYSDEC, NYSDOH, and local communities in addressing older more polluting units. This work is included in this investment plan due to its highly localized and industry specific nature.</li> <li>• Issue a competitive solicitation to seek proposals from advanced biomass heating equipment manufacturers to improve design, package components, and reduce costs, and evaluate performance.</li> </ul> <p><b>Policy development:</b></p> <ul style="list-style-type: none"> <li>• Provide suggested standards and language on high-efficiency biomass technology for building and related codes for adoption at the county-level.</li> </ul> <p><b>Workforce Development:</b></p> <ul style="list-style-type: none"> <li>• Evaluate current Renewable Heat NY training program for content and demand. Conduct a follow-up survey to participants to inform adjustments that might be necessary and to gather industry data. Revise training program in response to feedback and re-issue in the market.</li> <li>• Educate engineering/design firms and mechanical contractors throughout the state regarding proper sizing, piping design, controls, and system integration. Incorporating one-on-one training into large commercial projects will help to ensure that these systems are properly designed, installed, and commissioned.</li> <li>• Offer targeted training for HVAC contractors, facility owners, and professional engineers to disseminate new information and keep designers and installers up-to-date on high-efficiency, low-emissions biomass industry best practices. Trainings will be provided in strategic regions of the state with guidance from NYSERDA staff based on market needs.</li> <li>• Hold “Lunch and learn” webinars/sessions targeted toward system designers and installers on large advanced biomass system sizing, measurement and verification and other advanced biomass technology efficiency topics.</li> </ul> <p><b>Education and Outreach:</b></p> <ul style="list-style-type: none"> <li>• Issue a targeted co-op marketing campaign which will focus resources in geographic areas where fuel suppliers and qualified installers have been active and stimulate qualified installers that have not been active.</li> <li>• Leverage the existence of local stakeholder groups and low-income assistance programs, such as the Low-Income Heating Assistance Program (LIHEAP) and USEPA’s Burn-Wise campaign, promote positive health, and safety impacts per the New York State Wood Heat Report<sup>13</sup>.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Convene the Renewable Heat NY Advisory Group on a semiannual basis to discuss ways that NYSERDA can best support generating awareness of the benefits of advanced biomass.</li> </ul>
<b>Key Milestones</b>	<p><b><u>Milestone 1 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Modify incentives to reflect current market conditions and re-issue open enrollment solicitation.</li> </ul> <p><b><u>Milestone 2 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Contract with Alliance for Green Heat to provide funding to Wood Stove Design Challenge on an annual basis through 2019.</li> </ul> <p><b><u>Milestone 3 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Launch marketing campaign.</li> </ul> <p><b><u>Milestone 4 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Contract with research partners to provide studies on wood smoke and public health.</li> </ul> <p><b><u>Milestone 5 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Launch community sponsored purchasing campaigns.</li> </ul> <p><b><u>Milestone 6 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Contract with manufacturers selected under competitive solicitation.</li> </ul> <p><b><u>Milestone 7 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation to seek proposals from advanced biomass heating equipment manufacturers on technology improvements.</li> </ul> <p><b><u>Milestone 8 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Reissue workforce development program based on market feedback.</li> </ul>
<b>Goals Prior to Exit</b>	<p><b><u>Direct Incentives</u></b></p> <ul style="list-style-type: none"> <li>• 20% increase in equipment providers and quality installers.</li> <li>• Private investment in new depots for fuel storage and new trucks for bulk fuel delivery.</li> </ul> <p><b><u>Research and Development</u></b></p> <ul style="list-style-type: none"> <li>• Advances in biomass heating system components and emissions control technology adopted in the market</li> <li>• Availability of low-moisture premium wood pellet feedstocks that will further drive down PM2.5, CO, and SO<sub>2</sub> emissions by as much as 90%.</li> <li>• Certification of new test methods and products in the market</li> <li>• Manufacturing automation to reduce equipment costs implemented in the market</li> </ul>

<sup>12</sup> Solarize campaigns are locally organized community outreach efforts aimed at getting a group of homes and businesses in one area to go solar. When groups of neighbors—including residents and businesses—learn about solar and the installation together, they can often get better pricing and share the tasks. Group members can contribute their strengths and learn new skills. NYSERDA provides technical assistance, marketing materials, and other support for these efforts.

<sup>13</sup> Jarnefeld, Judy. New York State Wood Heat Report: *An Energy, Environmental, and Market Assessment*. Albany: New York State Energy Research and Development Authority  
<https://www.nyserdera.ny.gov/-/media/Files/Publications/Research/Biomass-Solar-Wind/15-26-NYS-Wood-Heat-Report.pdf>

	<p><u>Workforce</u></p> <ul style="list-style-type: none"> <li>75% of biomass heating system design and installation workforce are trained in best practices.</li> <li>In New York State counties where high-efficiency biomass technology for building and related codes have been adopted, code enforcement officers are educated on the technologies and applicable codes.</li> </ul> <p><u>Policy Drivers</u></p> <ul style="list-style-type: none"> <li>Advanced biomass standards and language incorporated in NYS building codes.</li> </ul>
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### 19.2.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	Utilities are not currently involved in biomass heating appliances.
<b>Utility Interventions in Target Market</b>	Utilities are not currently involved in biomass heating appliances.

### 19.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 7. The annual expenditure projection is included in Table 8. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 7. Annual Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
Direct Incentives and Services	\$1,569,000	\$2,066,000	\$2,234,000	\$2,152,000	\$1,606,000	\$9,627,000
Research and Technology Studies/Development/Demos	\$300,000	\$300,000	\$300,000	\$-	\$-	\$900,000
Business Support	\$250,000	\$300,000	\$300,000	\$300,000	\$100,000	\$1,250,000
Tools, Training, and Replication	\$-	\$-	\$100,000	\$100,000	\$100,000	\$300,000
Implementation Support	\$207,000	\$222,000	\$299,000	\$326,000	\$356,000	\$1,410,000
<b>Total</b>	<b>\$2,326,000</b>	<b>\$2,888,000</b>	<b>\$3,233,000</b>	<b>\$2,878,000</b>	<b>\$2,162,000</b>	<b>\$13,487,000</b>

**Table 8. Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
Total	13%	16%	18%	20%	16%	13%	4%	100%

## 19.2.7 Progress and Performance Metrics

Table 9 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 9. Initiative Specific Metrics**

Indicators <sup>14</sup>		Baseline (Before/Current)	2021 (Cumulative)
Activities/Outputs	Large commercial Projects (>88 kW)	4	9
	Residential / Small Commercial Projects (<88 kW)	23	170
	Residential Pellet Stove Projects	89	1,450
	Workforce Development – Training (Individuals Trained)	279	400
	Supply Chain Support – R&D (Projects Completed)	0	20
Outcomes <sup>15</sup>	Reduction in PM <sub>2.5</sub> from funded systems	15.8 tons/yr	140.5 tons/yr
	Reduction in CO from funded systems	114.8 tons/yr	981.8 tons/yr
	Reduction in SO <sub>2</sub> from funded systems	0.087 tons/yr	0.7 tons/yr

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Percentage of installations in the market following Renewable Heat NY standards
- Monetize the health benefits of Renewable Heat NY

Benefits shown in Tables 10 and 11 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

<sup>14</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>15</sup> Baseline value for reductions in PM<sub>2.5</sub>, CO, and SO<sub>2</sub> reflect reductions achieved through Renewable Heat New York to date. 2021 cumulative value reflects reductions based on targeted program activity.

**Table 10. Direct Impacts**

Primary Metrics <sup>16</sup>		2017	2018	2019	2020	2021	TOTAL
Energy Efficiency	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MMBtu Annual	3,460	4,130	4,400	3,870	1,780	17,640
	MMBtu Lifetime	69,300	82,600	87,900	77,400	35,700	352,900
	MW	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MW	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		255	303	323	284	131	1,296
CO2e Emission Reduction (metric tons) Lifetime		5,090	6,070	6,460	5,690	2,620	25,920
Customer Bill Savings Annual (\$ million)		\$0.09	\$0.11	\$0.11	\$0.10	\$0.05	\$0.45
Customer Bill Savings Lifetime (\$ million)		\$1.77	\$2.11	\$2.25	\$1.98	\$0.91	\$9.03
Private Investment (\$ million)		\$ 2.55	\$3.26	\$3.57	\$3.37	\$2.61	\$15.36

**Table 11. Annual Projected Initiative Participation**

	2017	2018	2019	2020	2021	Total
Participants <sup>17</sup>	370	426	435	344	54	1,629

Benefits shown in Table 12 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 12. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	-	-	-
	MMBTu Cumulative Annual	-	6,510	23,500
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		-	478	1,730

<sup>16</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<sup>17</sup> Participants are those individuals or businesses who received an incentive to install high-efficiency, low-emissions biomass heating equipment.

## 19.2.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<p>NYSERDA intends to advance this initiative in a fuel neutral manner. The high-efficiency, low-emissions biomass heating units emit less greenhouse gases per unit of heat delivered than conventional biomass heating units, including a significant reduction in PM, its black carbon<sup>18</sup> component and methane. For example, traditional wood boilers emit ~125 times the particulate matter than high-efficiency, low-emission units. The biogenic nature of the wood used in these heating units results in lower GHG emission on a life-cycle basis when compared to other available means of heating.<sup>19</sup></p>
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## 19.2.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>As an initiative in support of an emerging industry, the Initiative will implement the most promising strategy approaches in a mode of learning from the market and from experience. The performance of the program will be continually assessed to determine how well the goals of the effort are being met, and whether progress against the identified barriers (or new ones) is being adequately achieved. Strategies will be monitored and evaluated for each program component, including wood supply, fuel manufacturing, fuel delivery, wood heat appliance manufacturing, and service. These parameters will be tracked through program-level data collection as well as by direct communication with market actors to assess the prevailing state of the market.</p> <p>Key metrics to monitor by segment for this test/measure/adjustment purpose include:</p> <ul style="list-style-type: none"> <li>• Installed costs</li> <li>• Customer economics</li> <li>• Actual market penetration vs planned market penetration</li> <li>• Growth of supplier businesses</li> <li>• Private investment</li> <li>• Continuous reassessment of barriers</li> </ul> <p>The results of this assessment will be used to determine if components of the program need adjustment, expansion, or replacement, or if funds should be redistributed between Renewable Heat NY activities. Incentives may be adjusted or removed if other federal or local incentive mechanisms become available.</p> <p><b><u>Program M&amp;V</u></b>  Programmatic measurement and verification activities will include:</p> <ul style="list-style-type: none"> <li>• Post installation inspection on each biomass boiler project and a percentage of pellet stove projects.</li> <li>• Measurement and verification of all large commercial boiler projects.</li> <li>• Verification of compliance with Renewable Heat New York program rules.</li> </ul> <p><b><u>Market Evaluation</u></b>  Market Evaluation will draw on the logic model and will include baseline and longitudinal measurements of key indicators of programmatic and broader market</p>
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<sup>18</sup> Black carbon is a type of particle resulting from incomplete combustion. By absorbing sunlight, it contributes to global warming.

<sup>19</sup> NYSERDA follows EPA protocols with assumes carbon neutrality of biogenic materials such as wood: <http://www3.epa.gov/climatechange/emissions/usinventoryreport.html>.

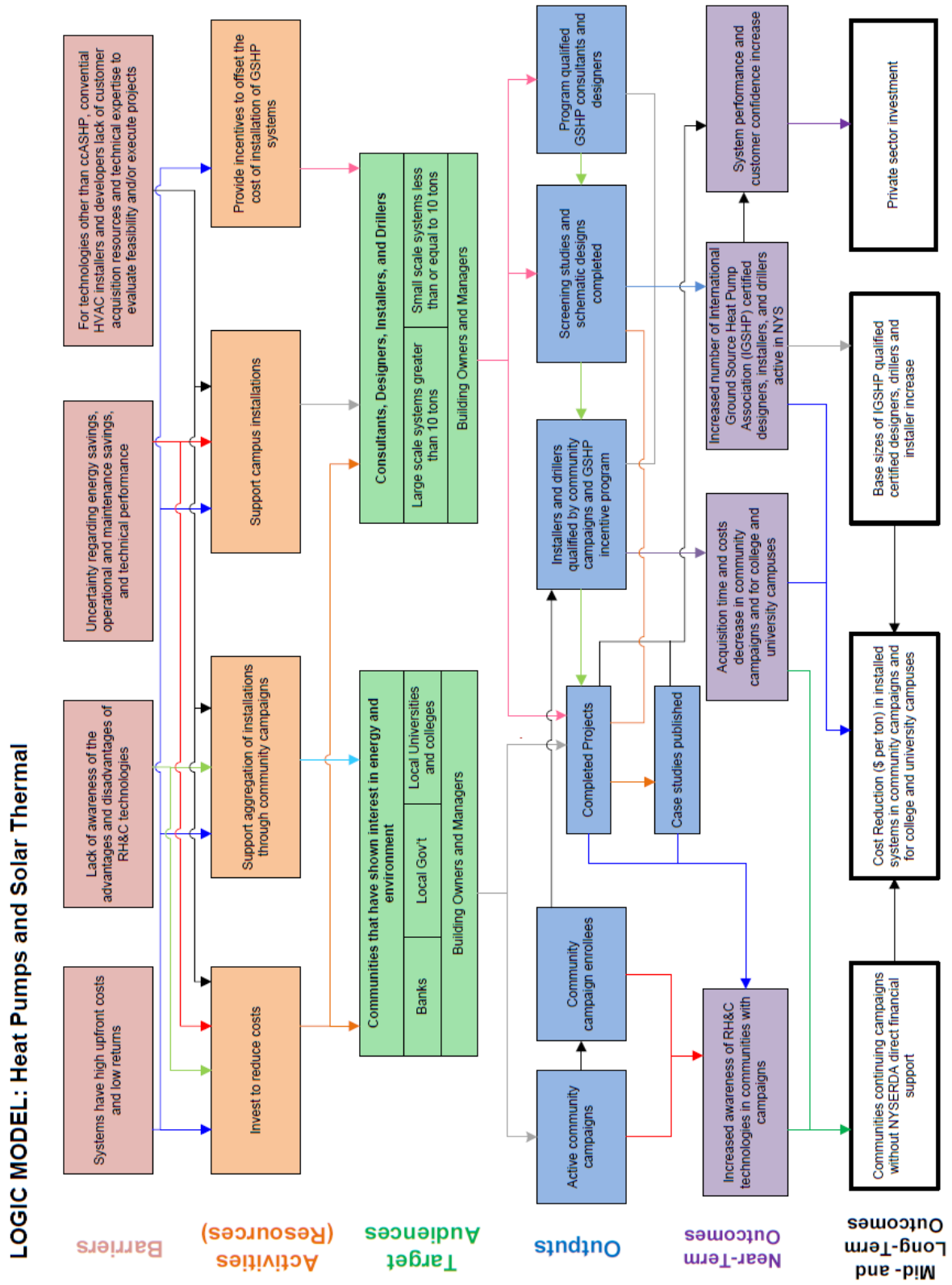
success. Baseline measurements of key market indicators will occur soon following initiative approval and leverage programmatic data to provide additional insights to adjust the strategy. Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change will occur once the initiative is underway. Sources of data include intervention data, data from pilots and demonstrations, commercially available data (e.g., HARDI data), and primary data collection through surveys of key market actors. Possible indicators for market evaluation include:

- Size of existing base of biomass HVAC installers, designers, and engineers relative to size of those qualified under Renewable Heat New York
- Sales of NYSERDA qualified biomass boilers compared to sales of all biomass boilers statewide
- Percentage of installations in the market that were completed by Renewable Heat NY installers
- Incorporation of Program’s suggested standards and language on high-efficiency, low-emissions biomass technology for buildings and related codes at the county level
- Customer satisfaction with installers and equipment after first heating season and with equipment two years after installation, and installer satisfaction with program

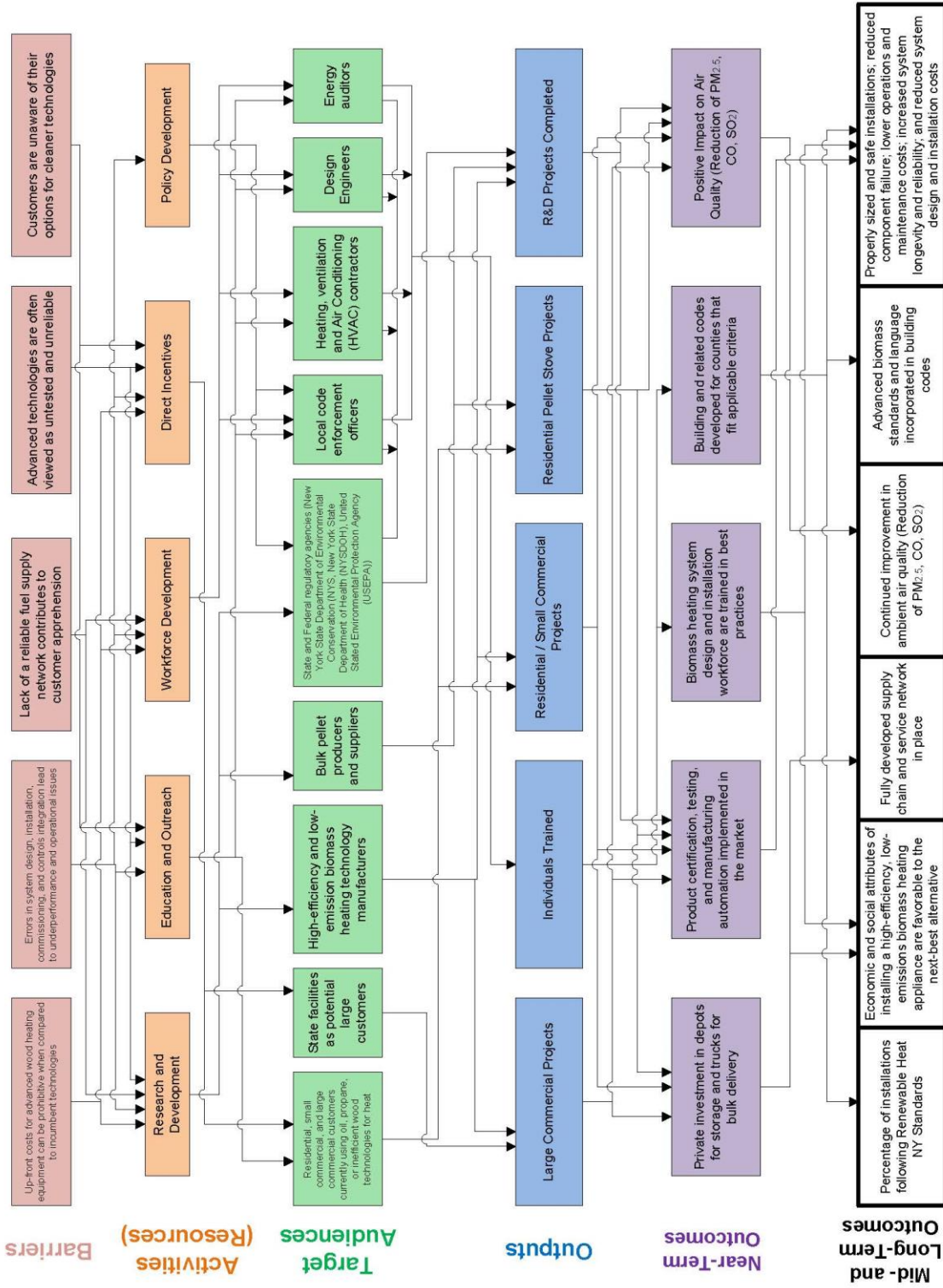
**Impact Evaluation/Field Verification**

Impact evaluation will be conducted to assess system operation and performance after at least one heating season for a sample of projects. Impact evaluation will apply the IPMVP methods most appropriate for the type of projects and expected level of energy impact and may involve engineering analysis, billing analysis, site visits and metering.

# Appendix A – Logic Models



# LOGIC MODEL: Renewable Heat New York





## Appendix B – Investment Plan Review Supplement

### Heat Pumps and Solar Thermal

#### Results to Date – Metrics

The Heat Pumps and Solar Thermal Initiative will begin recording benefits once project commitments are made. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2021)	% of Total Target through Initiative Completion (2021)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	38,100	-	841,600	-
	MMBtu Lifetime	-	-	-	-	-	955,000	-	21,040,000	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	1,700	-	34,810	-
	Lifetime Tons	-	-	-	-	-	42,400	-	870,300	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	\$0.29	-	\$5.63	-
	Lifetime Dollars	-	-	-	-	-	\$7.15	-	\$140.80	-
Private Investment (millions)	Dollars	-	-	-	-	-	\$2.28	-	\$122.90	-
Participants	Participants	-	-	-	-	-	77	-	3,487	-

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2019 Target	2022 Target	June 2017 Actual <sup>1</sup>
			(Cumulative)	(Cumulative)	(Cumulative)
<b>Activity/ Outputs</b>	# of active community campaigns	1	17	29	TBD
	# of community campaign enrollees	200	1,700	2,900	TBD
	# of program-qualified GSHP consultants and designers	0	10	15	3
	# of installers and drillers qualified by community campaigns and GSHP incentive program	0	40	50	29
	# of large commercial/institutional facility and campus screening studies completed	0	30	75	TBD
	# of large commercial/institutional facility and campus schematic designs completed	0	30	72	TBD
	# of large commercial/institutional facility and campus installations completed	0	7	36	TBD
	# of projects completed by community campaign participants	90	650	2,521	TBD
	# of completed projects through the GSHP incentive program	0	430	930	TBD
	# of case studies demonstrating successful cost reduction strategies and/or customer value	0	5	20	TBD

### Performance Against Key Milestones

The Heat Pumps and Solar Thermal Initiative is early in its development but is making progress toward its current milestones. Current milestones that are not yet complete are or will soon be in progress. The solicitation is under development and is expected to be released Q3 2017. Also, an RFQ for mentors expected to be issued Q4 2017. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

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<sup>1</sup> Outputs with "TBD" in the June 2017 Actual column were not yet measured as of the end of June but will have progress included in future reporting.

Complete ✓	Time Frame	Milestone
	2017	Solicit for and contract with technical support contractor for community campaigns
	2017	Launch GSHP contractor mentoring program.
	2017	Release competitive solicitation to select community campaigns (repeat annually).
✓	2017	Release open enrollment solicitation for GSHP incentive.
✓	2017	Provide list of qualified GSHP designers, installers, and drillers to market.
	2017	Contract with consultants to perform QA and design review for GSHP incentive projects.

Plan for Continuation/Modification/Termination

The Heat Pumps and Solar Thermal initiative has been progressing following the activities and timeline laid out in the investment plan. There are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

## Renewable Heat NY

### Results to Date – Metrics

The Renewable Heat NY initiative launched in May 2017 and, through June 2017, had not yet recorded any benefits against its targets. The initiative did not begin utilizing CEF funds until Q3 2017; previously it was utilizing RGGI money. Additional information can be found in NYSERDA’s Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2021)	% of Total Target through Initiative Completion (2021)
Energy Efficiency	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MMBtu Annual	-	-	-	-	-	1,730	-	17,640	-
	MMBtu Lifetime	-	-	-	-	-	34,700	-	352,900	-
	MW	-	-	-	-	-	*	-	*	-
Renewable Energy	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
	MW	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	128	-	1,296	-
	Lifetime Tons	-	-	-	-	-	2,550	-	25,920	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	\$0.04	-	\$0.45	-
	Lifetime Dollars	-	-	-	-	-	\$0.89	-	\$9.03	-
Private Investment (millions)	Dollars	-	-	-	-	-	\$1.28	-	\$15.36	-
Participants	Participants	-	-	-	-	-	185	-	1,629	-

### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSERDA’s current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators		Baseline	2021 Target	June 2017 Actual
			(Cumulative)	(Cumulative)
Activity/ Outputs	Large commercial Projects (>88 kW)	4	9	0
	Residential / Small Commercial Projects (<88 kW)	23	170	0
	Residential Pellet Stove Projects	89	1,450	0
	Workforce Development – Training (Individuals Trained)	279	400	0
	Supply Chain Support – R&D (Projects Completed)	0	20	0

### Performance Against Key Milestones

The Renewable Heat NY launched in May 2017 and is making progress toward completing its current milestones. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
	2017	Modify incentives to reflect current market conditions and re-issue open enrollment solicitation.
	2017	Contract with Alliance for Green Heat to provide funding to Wood Stove Design Challenge on an annual basis through 2019.
	2017	Launch marketing campaign.

### Plan for Continuation/Modification/Termination

The Renewable Heat NY initiative has been progressing following the activities and timeline laid out in the investment plan. The initiative began utilizing CEF funds in Q3 2017, and expects to begin reporting progress against the metrics and NYSERDA's Q3 report. The initiative will likely achieve the 2017 targets by early 2018, as such there are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative to determine if any changes are needed.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Clean Energy Products Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

May 8, 2017

## 20 Clean Energy Products

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Through its Clean Energy Products strategy, NYSERDA will implement approaches and interventions that accelerate the adoption of certain underutilized clean energy products – those with proven savings but limited adoption - by working to develop supply chains and service networks. Accelerating adoption of these products requires that they are available in the market and supported by key actors, such as distributors and contractors. Key stall points and barriers must be identified and addressed throughout the supply chain to increase stocking and servicing. Tools to help market actors empower their customers to make informed decisions must be readily available for use, and awareness and trust among consumers must be increased to spur adoption.

NYSERDA has worked in the Products space since 1999, successfully promoting underutilized technologies and helping to transform markets in areas such as residential lighting and appliances. In addition, NYSERDA has also offered programs that address quality maintenance for commercial rooftop air conditioning units through the Business Partners Program. These initiatives actively partnered with supply chain actors to promote technologies and services through a combination of resources, education, and incentives. These programs provide a model for the interventions that NYSERDA will seek moving forward, as well as a basis for relationships with certain market actors that will be key to the success of the initiatives in this chapter.

NYSERDA will focus initially on Air-Source Heat Pumps (ASHPs) and Advanced Rooftop Units (ARTUs).<sup>1</sup> ASHPs provide heating and cooling for both residential and commercial spaces; they regulate temperature by moving heat rather than creating heat, making them more efficient than other technologies. ARTUs are packaged heating, ventilation, and air conditioning (HVAC) units for commercial spaces that are controllable and highly efficient. Extensive research and communication with stakeholders confirms that these two nascent technologies offer customers improved performance over other code-compliant HVAC technologies, with reduced energy bills and a much lower carbon footprint, but have not been widely adopted in New York. Each technology also utilizes mature supply chains that can support expansion, as well as regional/national organizations that are building coalitions and leading the development of shared resources. The initiative will aim to overcome barriers impeding progress including: lack of availability in the local supply chain, higher upfront cost, lack of consumer awareness and education related to performance and savings, and lack of contractors with the knowledge and experience to sell and install high-performance products.

The initiative in this chapter is closely related to and coordinated with the Heat Pumps and Solar Thermal initiative in the Renewable Heating and Cooling chapter, and the ASHP components of both chapters complement one another. The initiative in this chapter focuses on upstream tools, resources, and incentives to support growth in ASHPs products sales through manufacturers and distributors, as ASHPs share the same supply chain as ARTUs, making it more efficient to address these technologies together. With respect to ASHPs, the Heat Pumps and Solar Thermal initiative

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<sup>1</sup> With respect to ASHPs, NYSERDA intends to start with cold-climate ASHPs in order to expand the market, but will then expand beyond that, particularly in climate zone 4 where high-efficiency, non-cold climate units can provide necessary heating.

focuses on more general awareness of renewable heating and cooling generation and cost reductions through community campaigns and other activities that can improve cost effectiveness in the long-term.

Program investments and activities will continue to be informed through ongoing research, technical analysis, and engagement with stakeholders and subject matter experts.

## 20.1 Underutilized Product Support

### 20.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Energy efficiency technologies continue to show improved performance, lower energy use and decreasing costs. However, some proven technologies continue to be underutilized. Matching these underutilized technologies to market needs is key for future success.</li> <li>• NYSERDA’s engagement with the market has identified several barriers that are limiting consumers’ awareness, acceptance, and ultimately broader adoption of these underutilized technologies, including: lack of availability in the local supply chain, higher upfront costs, lack of trusted documentation of energy and cost impacts, lack of sizable contractor participation in installation and sales trainings, and lack of consumer awareness and education on the benefits of the technologies.</li> <li>• Two underutilized technologies, advanced rooftop units (ARTUs) and air source heat pumps (ASHPs), have shown through pilots and demonstrations that they can match the comfort and exceed the performance provided by incumbent technologies. ARTUs promise more than 55% savings over current baseline models, which can waste from \$1,000 to \$3,700 per unit annually, depending on building size and type.<sup>2</sup> By moving heat rather than producing heat, ASHP can heat and cool a space two to four times more efficiently than more traditional code-compliant heating and cooling equipment, saving an average customer more than \$500 per year on their energy bills. Despite these demonstrated savings, neither technology has been widely adopted in the market.             <ul style="list-style-type: none"> <li>○ ARTUs currently make up 15% of new RTU purchases, even though they can provide 55% energy savings over RTUs.</li> <li>○ Globally, ASHPs are well accepted in residential applications – they currently make up an estimated 98% of the Asian residential HVAC market and 50-70% of the European market. However, despite the international popularity, they have been slow to take hold in the U.S., and make up less than 5% of the residential market in New York.<sup>3</sup></li> </ul> </li> </ul>
<p><b>Intervention Strategy</b></p>	<p>The initiative will address the barriers identified above and work to bolster availability of advanced products in the supply chain, expand demand for more advanced HVAC technologies among end-users, and support successful business models in the market to increase sales. For ASHPs, this initiative will encourage displacement of more traditional code-compliant heating equipment rather than full replacement, in recognition that ASHPs on their own will not always provide the required building heat load. The goal is to displace a large percentage of heating load to eliminate significant amounts of fossil fuel ignitions on site. In this situation, high efficiency ASHPs can operate efficiently for the vast majority of the year. Initial focus will be on cold-climate ASHPs, but other high-efficiency ASHPs can produce similar savings at lower costs if</p>

<sup>2</sup> NEEP Northeast-Mid-Atlantic High Performance Rooftop Unit Market Transformation Strategy Report – December 2016, Page 1

<sup>3</sup> Optimal Energy Inc., *Heat Pumps Potential for Energy Savings in NYS*, 26.



	<p>they are sized properly, especially in Climate Zone 4 and in commercial spaces. NYSERDA will:</p> <ul style="list-style-type: none"> <li>• Increase awareness of and demand for underutilized products, initially focusing on ARTUs and ASHPs, by developing tools such as cost comparison calculators, case studies, and engaging in additional marketing and outreach efforts. These tools and education materials will provide contractors with verified, independent information to provide to customers, allowing them to make more informed decisions when choosing an HVAC technology.</li> <li>• Create a centralized database of all manufacturer trainings and distribute to contractors.</li> <li>• Provide incentives to distributors and/or contractors to decrease retail costs.</li> <li>• Test and validate HVAC sales models, such as equipment leasing, investing in successful models to reduce the risk for market actors such as contractors and energy services companies.</li> </ul> <p>Continued monitoring and research of underutilized technologies will complement this work to better inform additional technologies to target through these tactics.</p> <p>For a visual representation of this strategy, please reference the flow charts entitled “Logic Model: Products”, which can be found in Appendix A.</p>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Reduce costs to purchase and install underutilized technologies</li> <li>• Increase availability of underutilized products in the supply chain</li> <li>• Increase installations of underutilized products</li> <li>• Improve the quality of installations</li> <li>• Increase customer awareness of and confidence in the benefits of underutilized technologies.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<p>The 2015 New York State Energy Plan calls on NYSERDA to “address supply chain limitations and lack of knowledge of clean and efficient product options” in the market. Furthermore, it suggests NYSERDA should focus on upstream supply chain barriers through partnerships with manufacturers, distributors and contractors, as well as retail level education, outreach, and training. Together, these efforts can help increase market share of underutilized technologies which can help to reduce costs and greenhouse gas emissions.</p>

20.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<ul style="list-style-type: none"> <li>• The target market for ARTUs is small to medium businesses, particularly retail and food chains which may facilitate scaling in the market. NYSERDA will also target businesses with aging RTUs, such as office and multi-tenant light commercial buildings.</li> <li>• The target market for ASHPs is residential customers who heat with fuel oil/propane or electricity, particularly those who are interested in installing central air conditioning, creating the most cost-effective solution for customers in terms of savings potential and installation.</li> </ul>
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• HVAC Contractors</li> <li>• HVAC Distributors</li> <li>• HVAC Manufacturers</li> <li>• Energy Service Companies</li> <li>• Engineers, architects, and HVAC and building operator trade groups</li> <li>• NYS Electric Utilities</li> </ul>

	<ul style="list-style-type: none"> <li>• NYS Local Governments</li> <li>• NYS Communities</li> </ul>
<b>Market Readiness</b>	<p><u>Advanced Rooftop Units</u></p> <ul style="list-style-type: none"> <li>• DOE has launched the “Advanced RTU Campaign” to encourage replacement of old RTUs with ARTUs in commercial buildings through the use of technical support, tools to educate customers, and publishing of case studies. NYSERDA has been an active Supporter of this Campaign, but its tools and resources have seen limited adoption in New York. NYSERDA intends to build on these tools and resources to make them more directly applicable to contractors in New York, and believes that when coupled with the direct incentives of this Clean Energy Products initiative, will help to spread their use throughout the supply chain.</li> <li>• Federal Standards will completely phase out the most widely used refrigerant for HVAC equipment (HCFC-22 or R-22) starting in 2020. While new units already use a different refrigerant, most units currently in service are maintained using R-22. These changes will spur customers to start making changes in advance of 2020 before refrigerant prices increase dramatically, providing an opportunity to upgrade the full system to more advanced and efficient technologies.</li> <li>• Distributors and manufacturers have expressed interest in support from NYSERDA in the form of third party verified tools and marketing, as well as incentives to lower the upfront costs to help increase demand for the technology they are currently selling.</li> <li>• The use of alternative business models, such as equipment leasing, that are currently implemented in Europe may provide an opportunity to increase quality installation, maintenance, and inventory of ARTUs in New York.</li> </ul> <p><u>Air Source Heat Pumps</u></p> <ul style="list-style-type: none"> <li>• Market demand for ASHPs is beginning to increase in New York. HVAC contractors indicate that ASHPs have gained popularity as a cost-effective alternative to window or central air conditioning, especially in older building stock without ducting, but action is needed to accelerate their adoption.</li> <li>• Manufacturers, distributors, and contractors have indicated that third party validation for their savings and comfort claims, support for contractor training, and contractor incentives to encourage stocking and selling of these units and potentially reduce customer first costs would provide needed support as they seek to grow the market for these products.</li> <li>• Other northeast states have exceeded NY in ASHP sales by as much as 30%<sup>4</sup>, indicating the efficacy of existing efficiency programs in the northeast.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Manufacturers will see increased sales volume because of promotional and outreach support.</li> <li>• Distributors and contractors will see increased sales volume and faster payments, resulting in increased profit and greater cashflow.</li> <li>• Through sales and installation support, HVAC Contractors and other service providers will gain the tools and knowledge needed to better understand and effectively sell ARTUs and ASHPs. Improved installations will also result in fewer call-backs and more satisfied customers.</li> <li>• End use customers will have access to more reliable and consistent product information that can be used to make more educated decisions on capital investments.</li> <li>• Ultimately, the more advanced technologies will lead to energy bill savings and greater comfort.</li> </ul>

<sup>4</sup> NYSERDA Ductless Mini-split Heat Pump Market Characterization Study March 2017.

### 20.1.3 Stakeholder/Market Engagement

<b>Stakeholder/ Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA has and will continue to conduct in-person meetings and webinars with contractors, distributors and manufacturers to discuss key stall points and barriers, including increasing the number of qualified contractors, and boosting availability and sales across the state. Interviews with potential partners and customers will provide real time feedback and insight on what kind of market support is needed. To-date, these interactions have helped to understand the current HVAC market and find places where NYSERDA can effectively intervene to promote more efficient and controllable products.</li> <li>• Coordination will continue with the City of New York, which is focusing on decarbonizing residential heating through the OneNYC plan, to identify opportunities to foster public-private collaborations that can scale deployment of residential renewable heating and cooling (RH&amp;C) technologies, particularly ASHPs</li> <li>• NYSERDA will also continue to participate in the HVAC working groups for Northeast Energy Efficiency Partnerships (NEEP) and Consortium for Energy Efficiency (CEE) to share market insights and trends through research and peer exchanges.</li> </ul>
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### 20.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• <b>Higher upfront cost than standard HVAC technology.</b> Decisions by customers on HVAC technologies are often made at the time of failure and are based on cost and availability. New technologies tend to have higher initial costs due to more expensive components, lack of contractor experience with the technology (which may impact contractor bids), and low stocking and increased opportunity cost. By focusing on specific technologies with incentives to drive down cost, and tools to improve bidding, adoption will increase and eventually drive down costs. As a result of increased awareness of life cycle advantages, customers will be more willing to accept higher first costs in return for savings and comfort.</li> <li>• <b>Lack of understanding by contractors of energy, cost, and peak demand savings impacts.</b> Customers and market actors are often not as comfortable with the potential cost and energy savings associated with a new technology. While the technology may have been in the market for a while, without wide adoption, there is not a popular consensus that contractors and customers can rely on. Providing verified, independent savings information (leveraging data and tools from pilot projects and regional and national partners) will provide consistent information and increase market confidence.</li> <li>• <b>Lack of sizable contractor participation in quality installation and sales training.</b> Customers rely on information from their HVAC contractors to inform quick turnaround decisions, and if contractors are not well-informed about new technologies, and not comfortable selling and installing them, they will not recommend a new product. Having trainings easily accessible to contractors will increase their participation and increase the chances of them selling new products.</li> <li>• <b>Lack of consumer awareness.</b> With new technology products, if a customer does not know about them, they are unlikely to purchase them, especially if there is a price premium. By working with current market actors to amplify their messages through joint campaigns, and helping them to more effectively identify potential customers, customer awareness can be increased.</li> </ul>
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<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA promotes installation training for underutilized technologies, more contractors will learn how to properly install these products based on manufacturer specifications, ensuring quality installations and reducing customer call-backs.</li> <li>• If NYSERDA supports and promotes accurate savings calculators for underutilized technologies, giving contractors an independent tool to demonstrate the savings and payback to customers, sales of these products will increase.</li> <li>• If NYSERDA offers manufacturers and contractors the opportunity to collaborate or co-brand on consumer awareness and educational campaigns, then adoption of and demand for these products will increase.</li> <li>• If NYSERDA provides incentives to distributors and/or contractors to increase the stocking, promotion, and sales of underutilized products, they will become more widely available and sales will increase.</li> <li>• If NYSERDA promotes sales trainings, contractors will learn the benefits and selling points of underutilized products and be better able to promote the technology to their customers.</li> <li>• If NYSERDA supports the development of a mapping tool to assist manufacturers, distributors and contractors in targeting prime candidates for the underutilized technology, then an increase in the adoption of these systems will occur.</li> </ul>
<p><b>Activities</b></p>	<p><b><u>Tools &amp; resources for contractors</u></b></p> <p>As new products and services come into the market, contractors need new tools and resources to learn about the technology, including how to sell and install it. They also need to demonstrate to customers that this new technology is worth the investment. To ensure that contractors are prepared for new technologies, NYSERDA will:</p> <ul style="list-style-type: none"> <li>○ <b>Facilitate information sharing:</b> Leverage existing tools and resources already in the market from partners like NEEP and DOE’s Better Buildings Campaign, adapt them to New York State-specific needs, and expand their use and deployment throughout the supply chain to create consistent and effective messaging in the market</li> <li>○ <b>Develop efficiency &amp; cost calculators:</b> Collaborate to develop and disseminate energy and cost savings assessment tools that can be used by contractors to demonstrate trustworthy savings estimates to customers. <ul style="list-style-type: none"> <li>○ Promote and encourage contractor use of a calculator, such as the DOE Pacific Northwest National Laboratory (PNNL) ARTU Calculator, as a sales tool to demonstrate ARTU savings and benefits to potential customers.</li> <li>○ Issue a competitive solicitation to develop a third-party validated cost-savings savings calculator that HVAC distributors and contractors can utilize to more accurately provide customers with unbiased estimates of energy and cost savings (especially related to fuel switching and displacement of existing heat) associated with ASHP installations.</li> </ul> </li> <li>○ <b>Promote mapping tool:</b> Develop and disseminate a mapping tool for contractors to identify targeted geographic areas that are good candidates for ASHPs (i.e. homes heating predominately with oil).</li> <li>○ <b>Develop and disseminate contractor training opportunities:</b> <ul style="list-style-type: none"> <li>○ Assess availability of installation trainings to ensure contractors are being trained to install the systems in a high-quality manner, and sales trainings to ensure that contractors are being trained to communicate the benefits meaningfully and consistently to prospective customers.</li> <li>○ Collaborate with HVAC manufacturers and distributors and regional partners (e.g. NEEP) on the development and dissemination of additional installation and sales trainings to fill any demonstrated training gaps (e.g. installation training specific to cold-climates).</li> </ul> </li> </ul>

- Promote sales training through supporting and co-branding existing manufacturer training, as well as by identifying sales tools and resources to assist contractors with bids and transactions.
- Increase availability and access to contractor training by developing and sharing an online training database with trade group, distributor and manufacturer websites.
- Work with utility programs to share this information with existing contractor networks to maximize participation.
- Perform random quality checks on installed systems to ensure that contractors are installing systems properly.

**Consumer awareness & education**

In the HVAC space, awareness and timing are key issues that must be addressed. Customers often do not have full knowledge of the available products, and even when they do, often default to the least expensive option. This impact is amplified because decisions are often made in a reactionary manner that requires products to be in stock immediately. To address these issues, NYSERDA will:

- **Provide marketing & outreach support**
  - Develop promotional messages and materials, including case studies, to increase consumer awareness on the benefits of these technologies and disseminate in the market. These efforts will be tightly coordinated with manufacturers and distributors to help amplify their messaging in the market.
  - Issue a standard offer first come, first served solicitation to support opportunities to promote awareness and education in the market. This could support activities like co-op advertising to expand existing campaigns and outreach in the market.
  - Create peer exchanges to enable building owners that have adopted these technologies to share the benefits with owners that are considering making investments, thus increasing awareness of the technologies.
- **Enable customer targeting & acquisition**
  - Issue an RFP to identify ways to find and contact customers at or in advance of key decision points (e.g. through permitting data).
- **Expand data availability**
  - Continue participation in HVAC working groups with DOE, NEEP, and CEE to share program insights and strategies to increase technology availability and adoption.

**Midstream incentives**

The first cost for these advanced systems continues to be higher than standard code compliant equipment.

- **Launch incentive program**
  - Issue standard offer, first come, first served solicitation to provide incentives to distributors and/or contractors to decrease the wholesale cost of the products and encourage sales, stocking, service expansions, and/or promotion of early retirement or displacement.

**Technology & business model analysis**

While the underlying technology associated with these products and the business models used to deliver them to market are proven, there is room to improve both areas.

	<ul style="list-style-type: none"> <li>• <b>Technology solicitation</b> <ul style="list-style-type: none"> <li>○ Issue a competitive solicitation for technology pilots to identify and deploy solutions for the integration of traditional and advanced systems in the residential and small commercial markets, based on current technologies and strategies being deployed in other sectors.</li> </ul> </li> <li>• <b>Business model solicitation</b> <ul style="list-style-type: none"> <li>○ Issue a competitive solicitation to test and validate alternative business models for HVAC service and equipment, encouraging HVAC contractors, vendors, and ESCOs to adopt alternative business models by providing incentives to reduce the risk of implementing new methods. Some examples include efficiency-as-a-service, equipment leasing, and energy service agreements. The alternative business models will be tested on a regional basis (specific regions will be dependent on the competitive solicitation responses) to increase stocking and adoption in a more cost-effective manner than providing per-unit incentives. If successful, NYSERDA will issue an open solicitation to expand alternative business models statewide.</li> </ul> </li> <li>• <b>Standards</b> <ul style="list-style-type: none"> <li>○ Provide technical analysis and support for potential state and federal appliance and product standards for technologies as needed.</li> </ul> </li> </ul>
<p><b>Key Milestones</b></p>	<p><b><u>Milestone 1 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Launch open enrollment incentive program for ARTUs.</li> </ul> <p><b><u>Milestone 2 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Release solicitation for shared awareness &amp; education campaigns, as well as customer targeting and acquisition.</li> </ul> <p><b><u>Milestone 3 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• HVAC trainings assessed and compiled to facilitate increased contractor participation.</li> </ul> <p><b><u>Milestone 4 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Case studies developed and deployed in the market, along with current resources from regional and national organizations.</li> </ul> <p><b><u>Milestone 5 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation for technical analysis related to product and appliance standards.</li> </ul> <p><b><u>Milestone 6 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Efficiency &amp; cost calculator released in the market.</li> </ul> <p><b><u>Milestone 7 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Mapping tool for ASHP potential released in the market.</li> </ul> <p><b><u>Milestone 8 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Launch open enrollment incentive program for ASHPs.</li> </ul> <p><b><u>Milestone 9 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation to identify and test alternative business models.</li> </ul> <p><b><u>Milestone 10 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation for pilots to identify and deploy solutions for the integration of traditional and advanced systems, such as ASHPs.</li> </ul>

	<p><b><u>Milestone 11 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Issue open solicitation to expand alternative business models based on results from competitive solicitation in 2018.</li> </ul>
<b>Goals Prior to Exit</b>	<p><u>Advanced Rooftop Units</u></p> <ul style="list-style-type: none"> <li>• 20-25% of <u>new</u> RTU purchases are advanced RTUs.</li> <li>• 1% of installed base is changing over per year via early replacement or retrofit.</li> <li>• 4% of total installed base is ARTUs.</li> <li>• 25% of eligible contractors completing ARTU trainings.</li> <li>• Comparison calculator used by 20% of contractors to better enable customer understanding of costs, savings, and payback.</li> <li>• New business models have been proven and adopted in the market.</li> </ul> <p><u>Air Source Heat Pumps</u></p> <ul style="list-style-type: none"> <li>• 15% of heating/cooling systems purchased are ASHPs.</li> <li>• 10% of installed HVAC systems are replaced per year via early replacement or displacement.</li> <li>• 25% of eligible contractors completing ASHP trainings.</li> <li>• ASHP quotes are included in contractor HVAC bids as a standard practice.</li> <li>• Cost-savings calculator used by 20% of distributors and contractors to better enable customer understanding of costs, savings, and payback.</li> <li>• Mapping tool used by contractors to better enable them to target prime candidates for ASHPs and reduce customer acquisition costs by focusing on areas that have the greatest potential for savings.</li> </ul>

20.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• NYSERDA will continue to work with the teams at the utilities to coordinate efforts and help them understand the investments being made and the interventions that are in the market. <ul style="list-style-type: none"> <li>○ NYSERDA has discussed this initiative with the New York utilities at multiple meetings of the Clean Energy Advisory Council Energy Implementation and Coordination Working Group.</li> <li>○ As these initiatives develop, NYSERDA will seek to gather information on complementary downstream incentives that can be shared directly with contractors, distributors, and/or manufacturers.</li> <li>○ Additionally, NYSERDA will share tools and resources among utility partners and contractors to expand the adoption of these new technologies.</li> </ul> </li> <li>• NYSERDA’s supply chain investments and incentives complement downstream utility programs by bolstering the ability of contractors, distributors, and manufacturers to sell and service these new products. <ul style="list-style-type: none"> <li>○ These initiatives will engage directly with the contractors, distributors, and/or manufacturers who are in the field selling these and other products to customers, allowing NYSERDA to share specific tools and resources that would otherwise not be used and inform them about opportunities, such as utility rebate programs that can further reduce the cost of the technology.</li> </ul> </li> <li>• The Clean Energy Advisory Council’s working group on Clean Energy Implementation and Coordination (CEI&amp;C) will play a key role in ensuring that these programs do not overlap.</li> </ul>
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	<ul style="list-style-type: none"> <li>○ CEI&amp;C will continue to monitor and update the program administrators on upstream and midstream initiatives, especially where there are complementary incentives in the market.</li> <li>• Work with distributors and contractors to effectively disseminate information on available utility incentives</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• Utility performance based incentives are available through all utilities for ARTUs, but have not been widely utilized.</li> <li>• Currently, three utilities (Central Hudson, Con Edison and National Grid) provide incentives for ASHPs, but have not been widely utilized.</li> <li>• NYSERDA activities have been planned as a complement to the utility incentives already in the market. NYSERDA incentives will increase the supply of units available to customers while also encouraging heating savings.</li> </ul>

20.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1. Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Direct Incentives and Services	\$1,000,000	\$6,050,000	\$9,350,000	\$7,700,000	\$24,100,000
Implementation Support	\$950,000	\$1,875,000	\$1,325,000	\$446,000	\$4,596,000
Tools, Training, and Replication	\$150,000	\$25,000	\$15,000	\$10,000	\$200,000
Total	\$2,100,000	\$7,950,000	\$10,690,000	\$8,156,000	\$28,896,000

**Table 2. Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
<b>Total</b>	5%	17%	32%	33%	14%	100%

20.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.



**Table 3. Initiative Specific Metrics**

<b>Indicators<sup>5</sup></b>		<b>Baseline (Before/ Current)</b>	<b>2020 Estimate</b>
<b>Advanced Rooftop Units</b>			
<b>Activity/ Outputs</b>	Vendors using comparison calculator tools	0	100
	Vendors trained	0	200
	Peer exchange events	0	10
	Vendors offering alternative business models for HVAC service	0	20
	Midstream ARTU incentives offered on individual units	0	15,000
	Customers impacted by midstream incentives <sup>6</sup>	0	2,190
<b>Outcomes</b>	ARTUs sold annually	300	9,000
	ARTUs as percentage of RTU installed base	0.15%	4%
	Average decrease in first cost	0%	15%
	Customers using alternative business models for HVAC service	0	125
<b>Air Source Heat Pumps</b>			
<b>Activity/ Outputs</b>	Vendors using the enhanced cost-savings calculator	0	75
	Vendors trained	0	400
	Midstream ASHP Incentives offered on individual units	0	11,430
	Count of completed ASHP control pilot projects related to managing dual-systems	0	2
<b>Outcomes</b>	ASHPs sold annually	32,000	53,000
	ASHPs as percentage of installed residential HVAC base	7%	15%
	Average decrease in first cost	0%	15%
	Vendor use of NYSERDA co-op assistance in promoting ASHPs	0	25

Benefits shown in Tables 4 and 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

<sup>5</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>6</sup> On average, commercial buildings have seven rooftop units per building; this number represents the number of incentives offered on individual units divided by seven.

**Table 4. Direct Impacts**

<b>Primary Metrics<sup>7</sup></b>		<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	2,300	15,800	31,500	40,200	89,790
	MWh Lifetime	29,900	206,000	409,000	522,000	1,167,000
	MMBTu Annual	17,400	154,000	144,000	83,800	399,000
	MMBTU Lifetime	262,000	2,300,00	2,160,000	1,260,000	5,985,000
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		1,880	14,200	22,200	24,300	62,610
CO2e Emission Reduction (metric tons) Lifetime		25,800	197,000	298,000	323,000	844,600
Customer Bill Savings Annual (\$ million)		\$0.57	\$4.42	\$6.37	\$6.61	\$17.96
Customer Bill Savings Lifetime (\$ million)		\$7.93	\$62.1	\$87.1	\$88.5	\$245.5
Private Investment (\$ million)		\$5.78	\$45.6	\$58.0	\$52.0	\$161.3

**Table 5. Annual Projected Initiative Participation**

<b>Participants<sup>8</sup></b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Advanced Rooftop Units	50	390	770	980	2,190
Air Source Heat Pumps	500	4,400	4,130	2,400	11,430
Total	550	4,790	4,900	3,380	13,620

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

<sup>7</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 13-year measure life for ARTU and 15-year measure life for ASHP. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs. Energy Efficiency values represent MWh savings from ARTUs and MMBTU savings from ASHPs; the electricity required to utilize the RH&C technology (26,000 MWh cumulative annual and 397,000 MWh lifetime in total) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both MMBTU savings (439,710 tons) and ARTU MWh savings (614,085 tons), which add to the emission benefits and additional electricity required to implement ASHPs, which was subtracted from the benefits (209,220 tons).

<sup>8</sup> Participants include the number of customers receiving the benefit of midstream incentives (units rebated divided by the average number of units per installation).

**Table 6. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency <sup>9</sup>	MWh Cumulative Annual	-	99,700	256,000
	MMBtu Cumulative Annual	227,000	1,040,000	2,810,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		8,750	92,300	243,000

### 20.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• The ARTU component of this initiative is not being delivered on a fuel neutral basis.</li> <li>• NYSERDA intends to offer the ASHP component of this initiative in a fuel neutral manner. This will help develop the market at the scale needed to achieve New York State’s clean energy goals as only 10% of NYS households heat with electricity, while 30% heat with oil or propane; targeting both expands the reach and potential success of this initiative.</li> <li>• Added electric usage from fuel-switching for ASHPs occur during non-summer months, thus increasing the grid capacity utilization.</li> <li>• Offering ASHPs on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$549 per ton of carbon, compared to a cost of \$847 per ton of carbon in an electric only scenario.</li> </ul>
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### 20.1.9 Performance Monitoring and Evaluation Plans

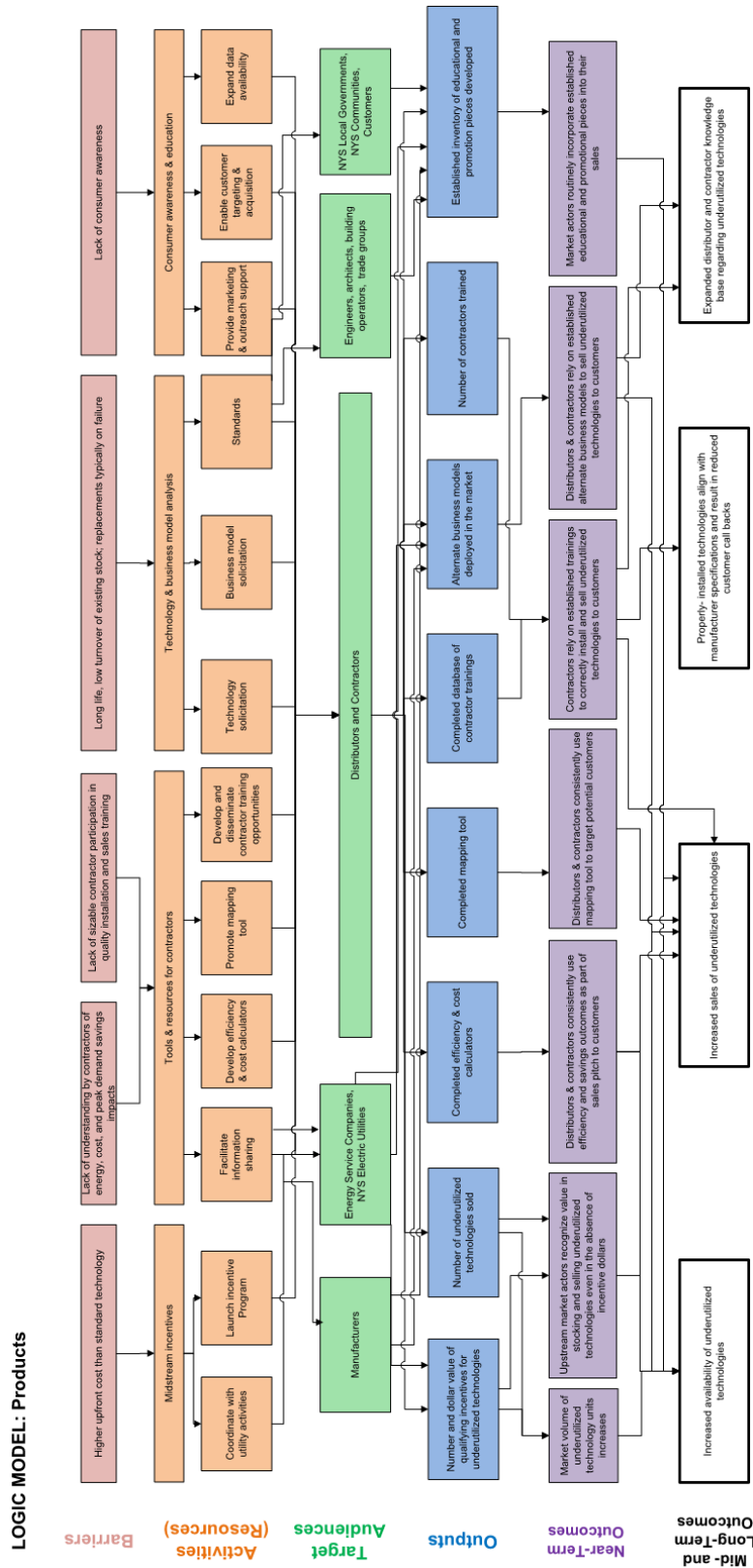
<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>Routine reporting on energy savings to date, project lists developed, and progress against identified annual energy savings goals will be collected and reviewed. Redirecting (as needed) will ensure continued progress against goals.</p> <p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b> Each year, NYSERDA will undertake a reassessment of priorities and funding levels and will adjust the program as appropriate. Specifically:</p> <ul style="list-style-type: none"> <li>• Track and monitor the uptake of incentives and market resources</li> <li>• Use historical sales data to demonstrate market changes, adjusting the programs based on success or need for improvement</li> <li>• Assess the portfolio of projects annually regarding goals, metrics, outputs and outcomes.</li> <li>• Expand current technologies or add additional technologies based on identified need and fit with the strategy.</li> </ul>
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<sup>9</sup> Energy Efficiency values represent MWh savings from ARTUs and MMBTU savings from ASHPs; the electricity required to utilize the RH&C technology (26,000 MWh cumulative annual and 397,000 MWh lifetime in total) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both MMBTU savings (206,220 tons) and ARTU MWh savings (134,830 tons), which add to the emission benefits and additional electricity required to implement ASHPs, which was subtracted from the benefits (98,160 tons).

**Market Evaluation and Market-Based Impact Evaluation**

- Market Evaluation will draw on the logic model and will include baseline and longitudinal measurements of key indicators of programmatic and broader market success.
- Baseline measurements of key market indicators will occur soon following initiative approval and leverage programmatic data to provide additional insights to adjust the strategy. These include but are not limited to: number and dollar value of incentives; availability and use of new sales models, cost-savings calculator, mapping tool, training materials and promotional materials; increased upstream and midstream market actor awareness of the value of units; increased customer understanding of the value of the products; number of units sold; increased demand for units; reduced up-front cost of units; and increased stocking and sales of units.
- Given the upstream-focused, market transformational nature of this initiative, impact evaluation will be market-based, triangulating data such as number of units sold, secondary data such as such as national-level sales data (e.g., HARDI), and data collected from market actors including the influence of the initiative in increasing demand and adoption of targeted products. Deemed savings values will be applied to net unit sales to estimate energy savings.
- Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change will occur once the initiative is underway.
- Sources of data include intervention data, data from pilots and demonstrations; deemed savings values, commercially available data, and primary data collection through surveys of key market actors.

# Appendix A – Logic Models



## Appendix B – Investment Plan Review Supplement

### Underutilized Product Support

#### Results to Date – Metrics

No benefit metrics have yet been attained as this program is anticipated to launch in Q3 2017. Additional information on this initiative can be found in NYSEERDA's Q2, 2017 CEF report.

Resource Acquisition Transition Initiative	Units	Completed Projects through March 31, 2017 with Adjustments	Completed Projects through 4/1/17-6/30/17	Total Completed Projects through June 30, 2017	Current Pipeline Through June 30, 2017 (Committed but not complete)	Grand Total Completed Projects + Pipeline	Cumulative Current Target Through Q2 2017	% of Cumulative Current Target Through Q2 2017	Total Target through Initiative Completion (2020)	% of Total Target through Initiative Completion (2020)
Energy Efficiency	MWh Annual	-	-	-	-	-	1,150	-	89,790	-
	MWh Lifetime	-	-	-	-	-	15,000	-	1,167,000	-
	MMBtu Annual	-	-	-	-	-	8,700	-	399,000	-
	MMBtu Lifetime	-	-	-	-	-	131,000	-	5,985,000	-
Renewable Energy	MW	-	-	-	-	-	*	-	*	-
	MWh Annual	-	-	-	-	-	*	-	*	-
	MWh Lifetime	-	-	-	-	-	*	-	*	-
CO2e Emission Reduction (metric tons)	Annual Tons	-	-	-	-	-	940	-	62,610	-
	Lifetime Tons	-	-	-	-	-	12,900	-	844,600	-
Customer Bill Savings (millions)	Annual Dollars	-	-	-	-	-	\$0.29	-	\$17.96	-
	Lifetime Dollars	-	-	-	-	-	\$3.97	-	\$245.50	-
Private Investment (millions)	Dollars	-	-	-	-	-	\$2.89	-	\$161.30	-
Advanced Rooftop Units	Participants	-	-	-	-	-	25	-	2,190	-
Air Source Heat Pumps		-	-	-	-	-	250	-	11,430	-

#### Results to Date – Outputs/Outcomes

Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation. The table below shows NYSEERDA's current progress against Activity/Output indicators. At this time, the CEF portfolio has not matured enough for a meaningful assessment of change in Outcome indicators so those are not included in this reporting but will be addressed in future reports.

Indicators	Baseline	2020 Target	June 2017 Actual <sup>1</sup>	
		(Cumulative)	(Cumulative)	
<b>Advanced Rooftop Units</b>				
<b>Activity/Outputs</b>	Vendors using comparison calculator tools	0	100	n/a
	Vendors trained	0	200	n/a
	Peer exchange events	0	10	n/a
	Vendors offering alternative business models for HVAC service	0	20	n/a
	Midstream ARTU incentives offered on individual units	0	15,000	n/a
	Customers impacted by midstream incentives	0	2,190	n/a

<sup>1</sup> Outputs are "n/a" because initiative had not launched as of June 2017.

<b>Air Source Heat Pumps</b>				
<b>Activity/Outputs</b>	Vendors using the enhanced cost-savings calculator	0	75	n/a
	Vendors trained	0	400	n/a
	Midstream ASHP Incentives offered on individual units	0	11,430	n/a
	Count of completed ASHP control pilot projects related to managing dual-systems	0	2	n/a

Performance Against Key Milestones

The Underutilized Products initiative is expected to launch in Q3 2017 and as of June 2017 had not made progress against current milestones. Future milestones are not included in this table, but are detailed in NYSERDA's investment plan and quarterly report. Additional information, including explanations of milestone progress, can be found in NYSERDA's Q2, 2017 CEF report.

<b>Complete</b>	<b>Time Frame</b>	<b>Milestone</b>
✓		
	2017	Launch open enrollment incentive program for Advanced Rooftop Units (ARTU).
	2017	Release solicitation for shared awareness and education campaigns, as well as customer targeting and acquisition.
	2017	HVAC trainings assessed and compiled to facilitate increased contractor participation.
	2017	Case studies developed and deployed in the market, along with current resources from regional and national organizations.
	2017	Issue competitive solicitation for technical analysis related to product and appliance standards.

Plan for Continuation/Modification/Termination

The Underutilized Product Support initiative has not yet launched, and as such there are no plans to modify the initiative at this time. NYSERDA will continue to monitor the initiative for progress against 2017 metrics, outputs, and milestones following program launch to determine if any changes are needed.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Multi-Sector Solutions Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

Revised November 1, 2017



Clean Energy Fund Investment Plan: Multi-Sector Solutions Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
June 23, 2017	Original Issue	Original Issue
September 15, 2017	Added the Technical Services initiative.	Multiple
November 1, 2017	Added Clean Energy Advanced Market Performance (AMP) Challenge and Clean Energy Siting & Soft Cost Reduction initiatives.	Multiple

## 21 Multi-Sector Solutions

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NYSERDA is supporting the development and deployment of clean and renewable sources of energy, a more efficient and responsive grid, and more energy efficient buildings. The initiatives in this chapter will address cross-cutting barriers and opportunities that are not specific to one market sector, including reducing soft costs, providing technical assistance, and increasing confidence in clean energy solutions.

The first initiative described in this chapter is the Energy Efficiency Soft Cost Challenge. The objective of the challenge is to identify, develop and demonstrate innovative solutions that will encourage growth of energy efficiency in NY State by addressing soft cost barriers such as: customer acquisition, project and system design and development, training and workforce development, transaction costs, financing, quality assurance, and monitoring and verification. The challenge will act as a conduit to solicit commercially viable solutions from the private market, with the winning ideas ultimately being deployed in the market, enabling the expansion of energy efficiency.

The second initiative described is Technical Services. The initiative will engage consultants and customers in exploring approaches to providing and receiving clean energy recommendations through technical analysis. The strategy builds on NYSERDA's reputation as a source of objective and credible technical advice and information, while also catalyzing private market actors to take advantage of this market opportunity. Technical services will implement pilots to demonstrate the benefits of investing in energy management, increase knowledge, expertise, and confidence in clean energy approaches and technologies, and demonstrate new cost-effective and replicable approaches to clean energy projects. The initiative will also identify and distribute best practices, and continue to provide site-specific assessments through the FlexTech program. Previously filed initiative have included sector and initiative specific technical services, but this initiative combines similar activities across sectors under one umbrella initiative.

The third initiative described in this chapter is the Clean Energy Advanced Market Performance (AMP) Challenge. The objective of the strategy is to increase the level of private investment in clean energy in New York State by allowing large commercial and industrial (C&I) customers to propose carbon reduction goals and funding requests. The projects developed through the challenge would increase market-based clean energy activity in a manner that results in benefits comparable to or better than public programs.

The fourth initiative described is the Clean Energy Siting & Soft Cost Reduction initiative. Its objective is to reduce market barriers inhibiting the deployment of clean energy technologies.

## 21.1 Energy Efficiency Soft Cost Challenge

### 21.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Current energy efficiency penetration in New York State is approximately 3-5%,<sup>1</sup> lower than would be expected from solutions with attractive returns on investment (ROIs) and relatively short payback periods (3-10 years).</li> <li>• This lack of penetration can be attributed, first, to the multi-stage and complex process building owners, service providers, and other market actors must undertake to originate and implement projects. Second, it can be attributed to lack of end-user confidence in the costs and savings. Third, it can be attributed to higher first costs, relative to non-EE alternatives, which are often given more weight in the decision-making process than the benefits of the anticipated saving.</li> <li>• Non-equipment costs (soft costs) often represent a significant fraction (in some cases as much as 30%) of overall energy efficiency project costs, and many of these soft costs can be reduced or eliminated by new tools or approaches.</li> <li>• Market actors are beginning to engage on addressing these soft cost challenges, offering a window of opportunity to meaningfully accelerate progress. For example, residential and multi-family companies like ESSESS and Bright Power are trying to develop analytical tools to identify high-probability customer leads to drive down the cost of customer identification and acquisition.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA will launch a multi-phased challenge designed to accelerate the path to scale of energy efficiency in NY with market based solutions to soft cost barriers. In 2015, the DOE launched a similarly structured challenge called the Sunshot Prize that sought to reduce soft costs such as permitting times from an average 180 days to 7 days. The initial phase of the challenge was ultimately successfully, with five teams awarded prize money to create winning, market-based solutions. that have since been tested in the market.<sup>2</sup></li> <li>• In this challenge barriers to be addressed include:             <ul style="list-style-type: none"> <li>○ Customer acquisition</li> <li>○ Project/system design/development</li> <li>○ Training/Workforce development</li> <li>○ Transaction costs</li> <li>○ Financing</li> <li>○ Quality Assurance/Monitoring &amp; Verification</li> </ul> </li> <li>• Solutions can be proposed within or across several sectors: Low-to-moderate income (LMI), commercial, multifamily residential, single family residential, and industrial.</li> <li>• Two multi-stage challenges will be held to attract innovative ideas and support further development of market-based solutions designed to address cost barriers that are preventing growth of energy efficiency services.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: The Soft-Cost Challenge,” which can be found in Appendix A.</li> </ul>
<p><b>Goals</b></p>	<ul style="list-style-type: none"> <li>• Attract market solutions that reduce or eliminate barriers to scale for energy efficiency solutions.</li> </ul>

<sup>1</sup> This percentage reflects savings attributed to NYSERDA programs from 2009-2016 as a percentage of 2015 NYS energy sales.

<sup>2</sup> Winner of the competition (based on demonstrated results over an 18-month period) will be announced in June 2017. <https://energy.gov/eere/sunshot/sunshot-prize-race-7-day-solar>.

	<ul style="list-style-type: none"> <li>• Increase uptake of energy efficiency solutions by making projects easier and cheaper to originate and complete.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The New York State Energy Plan highlights the importance of energy efficiency and calls on NYSERDA to “seek to address the diverse set of remaining barriers with new programs and strategies that unlock the potential of energy efficiency to reduce operating costs, spur investment, and create jobs throughout the State.” This initiative is one approach to address these identified barriers.</li> <li>• This initiative also supports achievement of the Clean Energy Standard goal for renewable resource electric generation (50% renewable electric generation by 2030 – “50 by 30”) by reducing the overall electric load, and therefore the amount of renewables necessary to meet the 50 by 30 goal.</li> </ul>

21.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<ul style="list-style-type: none"> <li>• The challenge will be market segment agnostic. The target market includes service providers (contractors, Energy Service Companies), energy decision makers (management companies, superintendents, facility managers, homeowners), and tool developers (software and others).</li> </ul>
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• Contractors and energy management systems providers</li> <li>• Building owners and building energy decision makers</li> <li>• Tool Developers</li> <li>• Solution providers</li> <li>• Service Providers for energy efficiency and on-site energy solutions</li> <li>• Real Estate/Management Firms</li> <li>• Software Developers</li> <li>• Financial Institutions</li> <li>• Quality assurance Providers</li> <li>• Marketing and Design Firms</li> <li>• Non-profit and Non-Governmental Organizations</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• NYSERDA, utilities, and other providers have made progress in educating building owners and service providers on the benefits of energy efficiency, yet the market for energy efficiency remains underpenetrated.</li> <li>• Energy efficiency projects often have an attractive ROI due to advancements in technology and service delivery, yet building decision-makers are often skeptical of energy projections, or are not made aware of energy saving opportunities in the right moment in their investment and maintenance cycles.</li> <li>• Applications in other industries, such as using photos for quality assurance and maps for customer acquisition for solar projects, prove that new tools and technological innovations can significantly decrease soft costs and increase customer acquisition and project deployment.</li> <li>• The energy efficiency industry is showing signs of innovation and investment in addressing significant soft cost barriers, such as financing and transaction costs, by offering shared-savings models that reduce the upfront capital required to execute energy efficiency projects, as well as by offering pre-packaged financing options through established relationships with lenders.</li> </ul>
<b>Customer Value</b>	<p><u>Service Providers:</u></p> <ul style="list-style-type: none"> <li>• Lower costs associated with customer identification and customer acquisition.</li> <li>• Increased access to potential financing options for customers, making it easier to sell solutions to customers (especially relevant to residential and LMI customers).</li> <li>• Decreased time cycle from pitch, diagnostic/audit to installation</li> <li>• Increased business.</li> </ul>

	<p><u>Building owners/operators:</u></p> <ul style="list-style-type: none"> <li>• Improved access to service providers.</li> <li>• Greater confidence in energy efficiency performance claims, and therefore in making capital investment decisions around energy efficiency solutions.</li> <li>• Reduced energy expenses.</li> </ul> <p><u>Broader Market:</u></p> <ul style="list-style-type: none"> <li>• It is anticipated that progress in addressing soft costs for energy efficiency will identify soft cost strategies with applications to distributed energy resources (DER), including on-site power, demand response, and energy storage.</li> </ul>
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21.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• Market interviews with utilities, service providers, building owners, university labs as well as other NYS agencies, confirmed the need for solutions to reduce soft costs for energy efficiency to reach significant scale in NYS.</li> <li>• NYSERDA has initiated discussions with several utilities and has received positive feedback on the objectives of the Soft Cost Challenge.</li> <li>• NYSERDA will continue to engage market actors in parallel to the challenge to help refine its learnings and surface additional market insights.</li> <li>• As a part of the challenge NYSERDA will also engage entities in possession of potentially useful data, such as municipal Department of Buildings and other permitting agencies to identify types and sources of relevant data.</li> </ul>
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21.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• <b>High customer acquisition costs:</b> Currently the costs associated with identifying customers, performing energy audits and signing of energy efficiency projects is high. This challenge will seek to develop solutions to make the cost of customer acquisition decrease by utilizing existing data to streamline identifying high-probability customer leads. Where possible, NYSERDA will share NYSERDA program data, as well as other available data sets, with challenge participants.</li> <li>• <b>Lack of standardization of project/system design/development:</b> Given the variability in building types across NYS the costs associated with customization of on-site energy efficiency solutions can be significant. This challenge will seek to surface potential standardization tools by building type, age, size, etc. to help limit costs linked to customization of project/system design.</li> <li>• <b>Lack of appropriate workforce training:</b> Many contractors in NYS do not have the training necessary to execute energy efficiency projects resulting in high training/opportunity costs for service providers. This challenge will seek to surface training tools such as easy to use energy modeling tools that will encourage growth of single-focus contractors into more complex energy efficiency service models.</li> <li>• <b>High transaction costs:</b> In NYS, there are high transaction costs, to the service provider as well as the customer, associated with project execution due to onerous service contracts and leasing structures. This challenge will seek ways to bring efficiency to this step in the service model.</li> <li>• <b>Limited financing:</b> Currently there are limited financing structures for energy efficiency projects which present a barrier for customers. This challenge will</li> </ul>
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	<p>seek to surface financing tools that meet the risk objectives of the customer and the service provider.<sup>3</sup></p> <ul style="list-style-type: none"> <li>• <b>Lack of unbiased system performance information:</b> There is a significant disconnect between pitched ROIs for energy efficiency versus what customers believe. This trust gap is preventing uptake of energy efficiency services in NYS. This challenge will seek to make available transparent and customer-confident assessments of performance.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If solution developers have access to NYSERDA funding support, plus critical data and customer sets, then they will be able to develop innovative solutions to existing soft cost barriers.</li> <li>• If the cost of acquiring new energy efficiency business goes down, and the value proposition to the consumer goes up, then companies will sell more energy efficiency solutions.</li> <li>• Additional barrier-specific hypotheses will be addressed based on solutions derived from pilot studies.</li> </ul>
<b>Activities</b>	<p>The following challenge will occur twice, each time in four phases:<sup>4</sup></p> <p><b><u>Phase 1: Develop Competitive Solicitation</u></b></p> <ul style="list-style-type: none"> <li>• Engage market participants to help refine the content of the solicitation and raise interest in the challenge. Input will help determine key criteria for the challenge, such as feasible levels of carbon savings from soft cost reductions.</li> <li>• Engage philanthropic foundations and environmentally focused organizations to gauge interest in co-sponsoring the Soft Cost Challenge.</li> <li>• Release the competitive Soft Cost Challenge to solicit innovative solutions that address barriers to energy efficiency such as customer identification/acquisition, workforce training, financing of projects and measurement and verification of savings.</li> <li>• Hire an implementation consultant to assist with marketing and promotion of the challenge.</li> <li>• Hold a public forum to explain the goals and structure of the challenge and have a questions and answer session with potential participants.</li> </ul> <p><b><u>Phase 2: Select Preliminary Winners</u></b></p> <ul style="list-style-type: none"> <li>• Evaluate proposals based on criteria including but not limited to market-based approach, replicability by other entities, and applicability to a large portion of potential energy efficiency customers. Potential proposals may include: <ul style="list-style-type: none"> <li>○ Software based tools to better identify and measure energy savings for potential projects</li> <li>○ Building data aggregation tools to create a heatmap of high potential energy efficiency opportunities</li> <li>○ Innovative financing solutions that link performance to price of project</li> </ul> </li> <li>• Select up to ten preliminary winners (in each of the two rounds of the challenge) providing good geographic coverage across the state for initial funding to develop an expanded proposal on how to reduce energy efficiency soft costs, including a detailed business plan that shows how their solution can achieve scale in the market.</li> </ul>

<sup>3</sup> As a part of the Soft Cost Challenge, NYSERDA wants to ensure that ensure that financing projects are included to cover all the potential solutions, and to account for the fact that some proposals could impact more than one barrier. Any particularly promising solutions identified through the challenge will be shared with the NY Green Bank to see if there is any potential role for them to play in further implementing it.

<sup>4</sup> Upon completion of the two competitions, NYSERDA will assess the program performance and decide as to whether additional rounds (with additional funding) would be appropriate.

	<p><b><u>Phase 3: Select Grand Prize Winners:</u></b></p> <ul style="list-style-type: none"> <li>• Preliminary winners present their business plans to a panel of judges comprised of entities such as: <ul style="list-style-type: none"> <li>○ Utilities</li> <li>○ Financiers</li> <li>○ Building owners</li> <li>○ Philanthropies</li> <li>○ Technology Companies</li> <li>○ Private equity investors</li> <li>○ Energy Service Companies (ESCOs)</li> <li>○ NYSERDA</li> <li>○ NYGB</li> </ul> </li> <li>• This panel will then select the grand prize winners based on, at a minimum, the following criteria: <ul style="list-style-type: none"> <li>○ Potential for carbon reduction through 2030 based on proposer estimates.</li> <li>○ Ability to increase energy efficiency uptake and reach commercial viability in the market.</li> <li>○ Level of product differentiation from existing solutions in the market.</li> </ul> </li> <li>• From the preliminary winners, up to five grand prize winners (in each of the two round of the challenge) will be selected to receive financial support, tied to progress-based milestones, to further develop their solutions to a point where they can be deployed in the market to address energy efficiency soft costs at scale.</li> <li>• Monitor progression in market for a period appropriate to the solution being tested.</li> </ul> <p><b><u>Phase 4: Solution Deployment</u></b></p> <ul style="list-style-type: none"> <li>• NYSERDA will work closely with the grand prize winners to help deploy their solutions by: <ul style="list-style-type: none"> <li>○ Assisting in the structuring and design of deployment strategies and pilots.</li> <li>○ Providing in-house knowledge and expertise on the energy efficiency market.</li> <li>○ Where possible under NDA, providing access to NYSERDA program data (anonymized to remove personal identifying information) that could assist in solution tool development.</li> <li>○ Bringing other relevant state and city agencies into the process, if applicable.</li> <li>○ Helping to attract potential private sources of development capital.</li> <li>○ Setting up proper M&amp;V vehicles to measure the impact of solutions/tools once deployed in the market to create fact-based case-studies.</li> </ul> </li> </ul>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation for first round of the challenge.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Select an implementation consultant</li> </ul> <p><u>Milestone 3 (2017)</u></p> <ul style="list-style-type: none"> <li>• Hold bidder’s presentation to answer questions on the challenge.</li> </ul> <p><u>Milestone 4 (2017)</u></p> <ul style="list-style-type: none"> <li>• Select preliminary winners.</li> </ul>

	<p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract projects with ten preliminary winners.</li> <li>• Monitor, provide assistance and resources to preliminary winners</li> </ul> <p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>• Hold business plan presentations to a panel of judges.</li> </ul> <p><u>Milestone 7 (2018)</u></p> <ul style="list-style-type: none"> <li>• Select up to five grand prize winners.</li> </ul> <p><u>Milestone 8 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract projects with first round grand prize winners.</li> </ul> <p><u>Milestone 9 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation for second round of the challenge.</li> </ul> <p><u>Milestone 10 (2018)</u></p> <ul style="list-style-type: none"> <li>• Hold bidder’s presentation to answer questions on the challenge.</li> </ul> <p><u>Milestone 11 (2018)</u></p> <ul style="list-style-type: none"> <li>• Select preliminary winners.</li> </ul> <p><u>Milestone 12 (2019)</u></p> <ul style="list-style-type: none"> <li>• Contract projects with ten preliminary winners.</li> <li>• Monitor, provide assistance and resources to preliminary winners</li> </ul> <p><u>Milestone 13 (2019)</u></p> <ul style="list-style-type: none"> <li>• Hold business plan presentations to a panel of judges.</li> </ul> <p><u>Milestone 14 (2019)</u></p> <ul style="list-style-type: none"> <li>• Select up to five grand prize winners.</li> </ul> <p><u>Milestone 15 (2019)</u></p> <ul style="list-style-type: none"> <li>• Contract projects with second round grand prize winners.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• Grand prize winners are selected to address the six barriers identified across several market sectors.</li> <li>• Consistent with Phase 4, grand prize winners have launched these solutions in the market and contract tasks have been satisfactorily completed.</li> </ul>

21.1.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>• The Program will seek winning solutions that will be market ready and designed to interface with the utilities. Utilities will be included in the winner selection committee to ensure solutions meet their needs and requirements and in ongoing progress monitoring.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• The utilities have programs that provide direct incentives to residential and commercial customers for energy efficiency investments. Current utility programs are mainly focused on the end-user. This challenge will focus on developing tools to enable contractors and service providers to more easily sell energy efficiency to customers – these solutions should work as complements to existing utility programs.</li> </ul>



## 21.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
Direct Incentives and Services	\$250,000	\$3,908,000	\$3,658,000	\$7,816,000
Implementation Support	\$592,000	\$592,000	\$0	\$1,184,000
Tools, Training, and Replication	\$500,000	\$500,000	\$0	\$1,000,000
<b>Total</b>	<b>\$ 1,342,000</b>	<b>\$5,000,000</b>	<b>\$ 3,658,000</b>	<b>\$10,000,000</b>

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
<b>Total</b>	2.5%	19.5%	19.5%	19.5%	19.5%	19.5%	100%

## 21.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation

**Table 3. Initiative Specific Metrics**

<b>Indicators<sup>5</sup></b>		<b>Baseline (Before/Current)</b>	<b>2020 (Cumulative)</b>
<b>Activity/ Outputs<sup>6</sup> Level 1</b>	Number of recipients of phase 1 development funding	0	20
	Number of Phase 2 grand prize-winning solutions	0	10
	Number of companies utilizing winning solutions	0	15
<b>Outcomes</b>	Number of companies that are early adopters of similar solutions outside of the Challenge	0	100
	Increase in number of contracts signed with Service Providers utilizing winning EE solutions	0%	45%

<sup>5</sup>A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>6</sup>Level 1 Activity/Outputs represent indicators that can be measured during the Challenge and are not dependent on the types of solutions that are proposed. Level 2 Activity/Outputs (noted below) are defined by indicators that cannot be measured until after the Challenge has ended and various proposed solutions have been implemented. Furthermore, solutions will differ in the specific Activity/Outputs that are targeted and thus the impact on the associated indicators listed will vary.

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes, as applicable to the proposed solutions:

- Shorter energy efficiency sales cycle lifetime – decrease in time spent from assessment to plug-in
- More energy efficiency (based on increase in number of projects) will be deployed in the market by entities using the proposed solutions

Level 2 Activity/Outputs

- Reduction in customer acquisition costs in the pilots
- Number of QA/M&V approaches developed in the pilots
- Number of workers trained in the pilots
- Reduction in transaction costs in the pilots
- Number of financing structures developed in the pilots

**Table 4. Direct Impacts<sup>7</sup>**

Primary Metrics		2017	2018	2019	TOTAL
Energy Efficiency	MWh Annual	0	8,860	8,860	17,720
	MWh Lifetime	0	88,600	88,600	177,200
	MMBTu Annual	0	295,000	295,000	590,600
	MMBTU Lifetime	0	2,950,000	2,950,000	5,906,000
	MW	0	0	0	0
Renewable Energy	MWh Annual	0	0	0	0
	MWh Lifetime	0	0	0	0
	MW	0	0	0	0
CO2e Emission Reduction (metric tons) Annual		0	23,300	23,300	46,570
CO2e Emission Reduction (metric tons) Lifetime		0	233,000	233,000	465,700
Customer Bill Savings Annual (\$ million)		0	6	6	11
Customer Bill Savings Lifetime (\$ million)		0	56	56	111
Private Investment (\$ million)		0	3	3	7

**Table 5. Annual Projected Initiative Participation**

Additional Performance Tracking Metrics	2017	2018	Total
Participants <sup>8</sup>	10	10	20

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits

<sup>7</sup> Note, the benefits in Table 4 are associated with phase 4 grand prize winners, which will be awarded in 2018 and 2019. While some budget will be committed in 2017 to reflect preliminary winners, benefits will not be committed until grand prizes are awarded.

<sup>8</sup> Participants include Phase 1 and Phase 2 contest winners. The participants reflect all the preliminary winners selected. The number of participants will be down selected overtime to 10 ultimate grand prize winners. The benefits in Table 4 are associated with the grand prize winners, which is why there are reflected as commitments in 2018 and 2019.

that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 6. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	2,140	34,400	107,000
	MMBtu Cumulative Annual	71,400	1,150,000	3,560,000
Renewable Energy	MWh Cumulative Annual	0	0	0
	MW	0	0	0
CO2e Emission Reduction (metric tons) Cumulative Annual		5,630	90,300	281,000

### 21.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• This initiative focuses on energy reductions related to building efficiency. As building systems and controls are often integrated, a successful strategy will support both electric and fuel efficiencies.</li> <li>• Across the residential, commercial, and industrial sectors, electric usage drives 36% of emissions; focusing on electric energy efficiency only would leave 64% of potential carbon reductions from being addressed.</li> <li>• Given the significantly large ratio of fossil fuel usage to electric usage in buildings, the potential economic benefits to NYS are greater with a fuel neutral strategy.</li> </ul>
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### 21.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• Annual starting 2017: Assessment of the solicitation structure to test if this structure is successful in bringing forward compelling and innovative proposals. Assess the responsiveness and innovativeness of these proposals and adjust the program design or activity as needed.</li> <li>• Annual in Years 3 &amp;5: Test to see whether and to what level resulting solutions have reduced soft costs and have increased the revenues attributable to these solutions; adjust the program design or specific activity as needed.</li> <li>• Annual starting 2017: Assess if the application of the resulting solutions has shortened the energy efficiency sales cycle lifetime and increased energy efficiency deployment in underserved markets. Adjust the program design or specific activity as needed.</li> <li>• Annually starting in 2018, assess the award structure for effectiveness in supporting development of solutions.</li> </ul>
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**Market Evaluation**

- Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of programmatic and broader market success.
  - Baseline measurements of key market indicators will occur soon following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These include but are not limited to number of energy efficiency projects undertaken, number of companies using market solutions that reduce or eliminate barriers to scale for energy efficiency services, and energy efficiency sales cycle lifetime (i.e., time spent from assessment to plug-in).
- Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: reduction in customer acquisition and transaction costs, shorter energy efficiency sales cycle lifetime, and increased energy efficiency deployment in underserved markets.
- Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.

**Impact Evaluation/Field Verification**

- When program sponsored M&V is included in each soft cost strategy additional evaluation M&V will not be needed to confirm M&V savings. However, for some strategies, evaluation M&V will be conducted for a sample of participating spaces/buildings, per the International Performance Measurement & Verification Protocol (IPMVP) method(s) most appropriate given the improvements made.

Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.

## 21.2 Technical Services

### 21.2.1 Overview<sup>9</sup>

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Despite the benefits of clean energy technologies, including energy efficiency, demand response, and renewable energy, end-users can be reluctant to make investments due to not fully understanding their energy-related needs, or the risks and opportunities associated with clean energy technologies. While there are energy focused firms that can assist with gaining this understanding, end-users are uncertain of contractor and firm qualifications, or the best approach to procure and engage in clean energy projects.</li> <li>• To address these barriers, NYSERDA currently offers the Flexible Technical Assistance (FlexTech) Program, approved in the Resource Acquisition Transition Chapter through 2019. FlexTech also provides farm energy audits through the Agriculture Energy Audit Program, also approved in the Resource Acquisition Transition Chapter through 2018. FlexTech has been successful at driving clean energy installations; to date the program has a measure adoption rate of 65% and has met or exceeded both its System Benefits Charge and Energy Efficiency Portfolio Standard savings goals. To maintain this success, there is a continued need to provide the reliable, objective, technical assessments of clean energy options that FlexTech offers. New York’s investor owned utilities have discontinued or reduced their study assistance programs and are coordinating with NYSERDA to direct the marketplace to FlexTech.</li> <li>• While FlexTech has been a valuable tool in increasing clean energy installations, and is expected to continue, it is limited in its ability to drive the scale required to meet New York State’s clean energy goals. To supplement this foundational approach, NYSERDA will explore other opportunities to drive greater scale and pace of installations. The pilots described herein are expected to decrease participation in the FlexTech Program as new approaches gain greater market traction.</li> <li>• The Industrial Chapter contains similar pilots and activities that this Plan intends to explore in non-industrial sectors. As example, the Industrial On-Site Energy Manager pilot was approved for a second round in the Industrial Chapter in July 2017. This Plan includes the launch and expansion of that effort to additional sectors.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA will engage consultants and customers in exploring alternatives to site-specific cost-shared energy studies to advance clean energy installations. The strategy builds on NYSERDA’s reputation as a source of objective and credible technical advice and information, while also catalyzing private market actors through the following activities:             <ul style="list-style-type: none"> <li>○ Implement pilots to demonstrate the benefits of investing in energy management, increase knowledge, expertise, and confidence in clean energy approaches and technologies, and demonstrate new cost-effective and replicable approaches to clean energy projects.</li> <li>○ Identify and distribute best practices to various market actors, such as farm management best practices to the agriculture sector and feasibility study scope of work development best practices.</li> </ul> </li> <li>• NYSERDA will also continue to provide site-specific assessments to drive clean energy adoption through its successful FlexTech Program.</li> </ul>

<sup>9</sup> Except where otherwise detailed this initiative lays out barriers, goals and activities that are applicable to the commercial, industrial (including agriculture), and residential and multifamily sectors.

	<ul style="list-style-type: none"> <li>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Technical Services,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>Build the clean energy and energy management capacity, capability, and interest of consultants, energy service companies, and other energy-focused firms to serve the market and provide objective and credible guidance.</li> <li>Prove the efficacy of the pilots and approaches listed herein through participation rates.</li> <li>Stimulate demand for and investment in clean energy improvements by end-users.</li> <li>Increase the rate at which clean energy technologies are identified through studies or best practices.</li> </ul>
<b>State Energy Plan/ Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>The 2015 State Energy Plan identifies buildings as a major source of energy use and greenhouse gas (GHG) emissions in the State. This strategy will reduce energy consumption and GHG emissions associated with buildings, both as a function of how buildings are operated and the efficiency of the installed equipment, contributing to State Energy Plan goals to reduce GHG emissions by 40% and to implement a 600 trillion BTU increase in statewide energy efficiency.</li> <li>This initiative also supports achievement of the Clean Energy Standard goal for renewable resource electric generation (50% renewable electric generation by 2030 – “50 by 30”) by reducing the overall electric load, and therefore the amount of renewables necessary to meet the 50 by 30 goal.</li> </ul>

21.2.2 Target Market Characterization

<b>Target Market</b>	<ul style="list-style-type: none"> <li>The target market includes firms that provide energy services, such as consultants, energy service companies, developers, and vendors who will be able to serve end-users within and across multiple market sectors, including commercial, industrial, agriculture, multifamily and single family residential.</li> <li>End users served by the programs and pilots including all commercial facilities (i.e. hospitals, colleges, commercial office space, retail, etc.), industrial facilities, data centers, agriculture facilities (i.e. dairy farms, greenhouses, vegetable farms and vineyards), and multifamily and residential dwellings.</li> </ul>
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>Energy-focused firms such as consultants, energy auditors, energy service companies, developers and vendors. Building owners, managers, and facility operators</li> <li>Professional and industry associations as applicable to each sector (i.e., Manufacturers Association of Central New York (MACNY), New York State Department of Agriculture and Markets, etc.)</li> <li>New York State investor-owned utilities</li> <li>Trade Associations</li> <li>End users served by the programs and pilots including all commercial facilities (i.e. hospitals, colleges, commercial office space, retail, etc.), industrial facilities, data centers, agriculture facilities (i.e. dairy farms, greenhouses, vegetable farms and vineyards), and multifamily and residential dwellings.</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>NYSERDA FlexTech Consultants have indicated that they are open to new opportunities and approaches beyond engaging end users in cost-shared assessments, with the goal to increase end user confidence and reduce end user reluctance to invest in clean energy. Other energy focused firm beyond those already working in FlexTech will also be engaged to test out new approaches.</li> </ul>

	<ul style="list-style-type: none"> <li>• Both end users and energy-focused firms have expressed interest in partnering with NYSERDA to help demonstrate and de-risk alternate mechanisms to identifying clean energy opportunities, such as on-site energy manager support and aggregated models. NYSERDA has been identified as the objective, trusted source for distributing this information.</li> <li>• End users have indicated that providing unbiased information, case studies and illustrating energy efficiency opportunities for their sector through a variety of trusted forms and approaches would provide assurance to pursue energy improvements.</li> <li>• Other states, including neighboring Connecticut and Massachusetts, have compiled and distributed best practice guides and have indicated success in engaging the businesses with energy efficiency and renewable opportunities.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• End users will benefit from the energy and cost savings associated with installed measures identified by energy-focused firms.</li> <li>• End users will be able to leverage the benefits of their clean energy investigations by applying the knowledge and operating methodologies learned from the initial information across their portfolios.</li> <li>• Identification of qualified energy-focused consultants to participate in pilots and serve customers engaging in pilots or cost-shared energy assessments will reduce customer procurement time and costs, as well as improve public perception of these firms and increase the visibility of actionable clean energy opportunities across multiple sectors.</li> </ul>

21.2.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA has conducted in-person meetings and webinars with end users and energy-focused firms to gather feedback on existing programs, publicly available information, and proposed pilots in this plan. Calls and meetings with FlexTech Consultants and commercial end-users confirmed interest in activities such as on-site energy manager and testing of new aggregation models.</li> <li>• Specific to the agriculture sector, through the Clean Energy Agriculture Task Force, Farm Management Best Practices working group, NYSERDA has investigated and obtained marketplace feedback confirming the value of a best practices guide to assist farms in improving energy efficiency decisions.</li> <li>• As this initiative is implemented, NYSERDA will continue engagement with industry experts and New York stakeholders to review progress and help guide the evolution of strategy to maximize impact, including soliciting suggestions for improving results and NYSERDA's role.</li> </ul>
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21.2.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• <b>Lack of Information.</b> Lack of information and understanding of the energy and non-energy benefits of clean energy improvements limits the likelihood that end users will pursue projects. This creates an opportunity for NYSERDA to develop and disseminate relevant information to encourage the adoption of clean energy.</li> <li>• <b>Competing Priorities.</b> Lack of consideration of clean energy opportunities, given other priorities when it comes to day-to-day management and operation of facilities, which limits potential energy savings from being identified and pursued. NYSERDA can highlight the positive impact of clean energy opportunities through engaging end-users in various pilots.</li> </ul>
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	<ul style="list-style-type: none"> <li>• <b>General Market Uncertainty.</b> Uncertainty of the best approach to procure and engage in clean energy projects is a barrier to end users moving forward on a project. Qualifying and vetting energy-focused firms and studies will increase consumer confidence and subsequently increase clean energy adoption.</li> <li>• <b>Site specificity.</b> Individual site assessments are frequently required to adequately align end user needs and financial ability with potential projects. These individual site assessments are a costlier method of achieving clean energy adoption. Customer acquisition and project identification costs may be reduced through aggregated business approaches, such as paying a fixed dollar amount per kWh or MMBtu of savings recommended, or a fixed dollar amount per end user that implements a minimum level of CO2 reduction, to achieve clean energy adoption at greater scale.</li> <li>• <b>Seasonality.</b> The timeframe to provide information to make energy efficiency improvements often competes with other priorities. For example, working with the agricultural community and leveraging the opportune times around harvesting times or for colleges and universities around semester start and end times.</li> <li>• <b>Lack of comprehensive energy efficiency resource and information.</b> By compiling information into easy to follow best practices, this initiative will make the process of learning about energy efficiency options easier and more effective.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA technical services, such as support of new aggregation models, decrease customer acquisition and project identification costs, then the likelihood of clean energy projects moving forward will increase.</li> <li>• If end-users are provided technical and information resources, then they will have greater confidence in and improved understanding of the value of clean energy projects, leading to a greater number of projects being implemented.</li> <li>• If a customer is presented with a plan demonstrating potential energy savings, incremental project costs, and return on investment, then they will be motivated to choose energy efficient options, change behaviors and culture.</li> <li>• If case studies and testimonials from key market actors are developed then peers will have more confidence in the savings and will replicate energy efficient design and change behaviors and culture. Existing programs, such as FlexTech, do not offer case studies or peer sharing.</li> </ul>
<p><b>Activities</b></p>	<p>NYSERDA will engage in targeted pilots and studies to develop and standardize methods, as appropriate, to optimize the identification and presentation of clean energy opportunities, with continued support for qualified consultants, training, and guidance. When administering the pilots and studies, NYSERDA will structure the offerings to best serve the end user or sector. For example, agriculture energy audits are offered as a component of the FlexTech Program with a different cost-share structure.</p> <p>NYSERDA will qualify consultants to provide the services as needed. This is currently administered by qualifying FlexTech Consultants through an open enrollment solicitation. NYSERDA will continue to assess whether all the expertise and qualifications needed to support each pilot are being provided through the open enrollment solicitation, and modify the process if needed.</p> <p><b><u>Pilot Activities</u></b></p> <p>NYSERDA will fund pilots that engage the energy consultant community through means other than cost-shared energy assessments to demonstrate the benefits of continuously investing in clean energy and energy management. The pilots will also</p>



	<p>engage end-users to demonstrate and prove the benefits of clean energy implementation through the alternative approaches.</p> <p>The pilots are expected to be market testing efforts. Once a pilot proves a successful approach to reaching scale and delivering energy savings, NYSERDA would issue a larger scale effort such as an open enrollment or competitive RFP. At that time, NYSERDA will examine if additional funds are needed and revise this initiative to increase the budget and benefits as needed.</p> <p>Initially, NYSERDA will issue a solicitation for an on-site energy manager pilot, in coordination with NYSERDA efforts outlined in the Industrial Chapter.</p> <ul style="list-style-type: none"> <li>• The on-site energy manager pilot will provide energy management support through the engagement of existing on-site staff, contracted staff, new staff, or a hybrid approach. These staff will inform efficient day-to-day operation and longer-term capital planning of their facility(ies). Regardless of the staff leading the effort, the pilot will train and educate facility and energy managers to ensure transfer of knowledge from consultant to facility.</li> <li>• The pilot will target larger entities (e.g., colleges and universities, healthcare facilities); however, the offering will be open to facilities of all sectors and sizes. Note: the savings and impacts from industrial facilities appear in the Industrial Chapter while non-industrial facilities are accounted for under this Technical Services initiative.</li> <li>• For smaller facilities, one potential approach to explore is the efficacy of procuring energy management services for a combination of smaller facilities. In this instance, the applicant may be required to supply additional documentation to demonstrate how they would be able to coordinate, track, and effectively provide energy management activities across multiple facilities.</li> </ul> <p>NYSERDA will also explore other technical services pilot opportunities, such as the opportunities identified below. NYSERDA will also consider additional pilots as new ideas emerge.<sup>10</sup></p> <ul style="list-style-type: none"> <li>• <i>New Aggregation Models.</i> NYSERDA will explore other opportunities for ways to reduce customer acquisition and project identification costs and provide technical services beyond site-specific energy studies, such as providing the services for an aggregation of sites. This will improve the predictability of returns from investments for end users by providing replicable approaches and assessment tools. To reduce the energy focused firms risk of piloting different customer acquisition and engagement approaches, NYSERDA will reward successful approaches by paying for the results (for example paying a fixed dollar amount per kWh or MMBtu of savings recommended, or fixed dollar amount per end user that implements a minimum level of CO2 reduction).</li> <li>• <i>Technical Review Services.</i> There is a market need for independent advisement, quality assurance, and validation of the findings of energy studies. NYSERDA will explore providing technical review for projects that do not receive cost-shared energy assessments that meet specific requirements for review. These requirements may include a willingness to provide copies of the scope of work, methodology, assumptions, and calculations.</li> </ul>
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<sup>10</sup>Based on the results of initial solicitations, NYSERDA may revise the pilots included in this initiative to add additional pilots, run multiple rounds of the same pilot, or remove efforts that the market indicates are not necessary. NYSERDA will update the initiative if additional funding is needed or anticipated benefits are changed.

	<p><b><u>Studies</u></b></p> <p>NYSERDA will continue the FlexTech Program, which provides site-specific clean energy recommendations to improve the sites operations, align future investment opportunities, and prioritize those investments. NYSERDA will deliver sector specific approaches as necessary to achieve goals and serve the marketplace.</p> <p><b><u>Best Practices</u></b></p> <p>NYSERDA will also engage in the development of information, tools, and resources to demonstrate the benefits of clean energy investments and energy management. There is currently a lack of awareness among end-use customers on how to engage consultants, understand potential clean energy opportunities, and how to interpret the results and outcomes of energy studies. To overcome this awareness barrier, NYSERDA will gather in-house information and utilize a third-party technical resource to:</p> <ul style="list-style-type: none"> <li>• Develop informational materials and templates around common measures and results, case studies, and testimonials across sectors to demonstrate potential clean energy opportunities. For example, NYSERDA will develop, market, maintain and update an energy-related, farm management best practice guide.</li> <li>• Provide best practices on scope of work development and review and interpretation of calculations for customers lacking resources knowledgeable on clean energy project development.</li> <li>• Develop tools and resources, for example, preventative and proactive maintenance checklists, for initiating, identifying, and interpreting projects and outcomes.</li> <li>• Explore sector specific needs, including analyzing data for commonalities across projects that could allow for standardization in approaches and measures across space and building characteristics. NYSERDA will leverage existing resources for this data, including FlexTech program data and impact evaluation results.</li> <li>• NYSERDA will share the findings from the aggregated data with the marketplace to spur replication, improve tools, and inspire advancements in technologies. This information could be used to better inform the energy-focused firms on end user commonalities, measure successes, and clean energy areas of opportunities.</li> <li>• NYSERDA will disseminate the best practice materials across multiple platforms, including the NYSERDA website, partner organizations, through trade allies such as sector-based organizations and consortiums, and other NYS entities with similar market participants. Farm management best practice guides will also be specifically delivered to end users.</li> <li>• NYSERDA will also establish peer-to-peer exchanges between and among end-users and consultants to solicit feedback on obstacles and successes as well as identify market needs.</li> </ul>
<p><b>Key Milestones</b></p>	<p><b><u>Milestone 1 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Identify qualified energy-focused consultants to participate in pilots and serve customers engaging in pilots or cost-shared energy assessments.</li> </ul> <p><b><u>Milestone 2 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue solicitation for On Site Energy Manager pilot.</li> </ul> <p><b><u>Milestone 3 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Award funding to initial entities selected under On-Site Energy Manager pilot.</li> </ul>

	<p><b><u>Milestone 4 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue solicitation, New Aggregation Models pilot.</li> </ul> <p><b><u>Milestone 5 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Contract with third-party to support best practices development including the farm management best practices guide.</li> </ul> <p><b><u>Milestone 6 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Award funding to initial entities selected under New Aggregation Models pilot.</li> </ul> <p><b><u>Milestone 7 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Disseminate best practices materials.</li> </ul> <p><b><u>Milestone 8 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Issue revised open enrollment Agriculture Energy Audit component of FlexTech.</li> </ul> <p><b><u>Milestone 9 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Begin examining the results of pilot(s) to determine if additional rounds of the same pilot are needed in the market or if new pilots are needed. Subsequent milestones will be updated accordingly based on the result of this review.</li> </ul> <p><b><u>Milestone 10 (2020)</u></b></p> <ul style="list-style-type: none"> <li>• Issue revised open enrollment FlexTech Program.</li> </ul> <p><b><u>Milestone 11 (2022)</u></b></p> <ul style="list-style-type: none"> <li>• Issue third pilot solicitation. It is anticipated that the third pilot will be available through 2024.</li> </ul>
<b>Goals Prior to Exit</b>	<p>Due to the nature of this work, the lead time associated with customer acquisition and adoption, and end users fundamental need for credible and objective information, NYSERDA envisions continuing to pursue technical services for the duration of the CEF. Priorities and approaches will shift as the various pilots are tested and new market needs are identified. NYSERDA anticipates exiting the activities described in this initiative when:</p> <ul style="list-style-type: none"> <li>• Consultants, energy service companies, and other energy-focused firms embrace the piloted business models and incorporate these models as a standard service</li> <li>• List of qualified energy-focused firms is used as a reference and resource by the marketplace without NYSERDA assistance.</li> <li>• Information provided by NYSERDA on clean energy best practices is incorporated in to other best practice efforts that currently lack this information. For the agriculture sector, this means NY Farm Bureau, Cornell Cooperative Extension and stakeholders trusted by the agriculture community incorporate clean energy best practices in to their activities.</li> </ul>

21.2.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>• NYSERDA has shared information and met with each of the investor owned utilities (IOUs) as well as with the Joint Utilities (JU) to discuss various NYSERDA initiatives. Additional coordination will be undertaken on this specific initiative to provide a clear path for opportunities that are identified to seek out incentive support from IOU energy programs. The best practice guides may provide information on how to access utility programs to support the implementation of</li> </ul>
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	<p>energy and process efficiency projects. NYSERDA will maintain current collaboration with the utilities to ensure the guides provide up-to-date information.</p> <ul style="list-style-type: none"> <li>Starting in 2016, utilities have been removing or decreasing funds to support their own technical services initiatives and instead, directing potential customers to NYSERDA.</li> <li>NYSERDA will also take advantage of the Clean Energy Advisory Council (CEAC) Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>While none of the investor owned utilities currently have a dedicated Technical Services initiative, the target market is coincident with stakeholders targeted for utility initiatives. NYSERDA will coordinate with the investor owned utilities on key accounts to optimize the overall impact of both NYSERDA and utility offerings and to avoid confusion and multiple outreach efforts.</li> <li>Utility prescriptive and custom incentive programs currently exist in the market through National Grid, NYSEG, RG&amp;E, Central Hudson, Con Edison, and Orange &amp; Rockland.</li> </ul>

21.2.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 7. The annual expenditure projection is included in Table 8. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only. The budget reflects 8-years of funding for multiple rounds of pilots and continuation of FlexTech (which includes Agriculture audits) from 2019-2025 at reduced funding levels than currently approved in the Resource Acquisition Transition Chapter. It is anticipated that budgets and goals will be revisited annually with re-filings and specifically when pilot results are known.

**Table 7. Annual Market Development Budget Allocation – Commitment Basis**

Commitment Budget	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Incentives & Services	\$ -	\$2,025,000	\$1,639,000	\$3,789,000	\$2,539,000	\$2,764,000	\$1,764,000	\$1,354,000	\$1,004,000	\$16,878,000
Tools, Training, and Replication	\$ -	\$295,000	\$75,000	\$125,000	\$115,000	\$95,000	\$ -	\$ -	\$ -	\$705,000
Implementation Support	\$125,000	\$625,000	\$1,131,440	\$605,000	\$651,440	\$185,000	\$972,160	\$ 10,000	\$10,000	\$4,315,040
Total	\$125,000	\$2,945,000	\$2,845,440	\$4,519,000	\$3,305,440	\$3,044,000	\$2,736,160	\$1,364,000	\$1,014,000	\$21,898,040

**Table 8. Annual Expenditures Projection**

Expenditures	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Total	1%	3%	11%	14%	13%	14%	14%	11%	10%	6%	2%

## 21.2.7 Progress and Performance Metrics

Table 9 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 9. Initiative Specific Metrics**

Indicators <sup>11</sup>		Baseline (Before/ Current)	2019 (Cumulative)
<b>Activity/Outputs</b>	Number of buildings participating in the pilots	0	26
	Number of qualified and active energy-focused firms (FlexTech Consultants)	39	49
	Number of case studies developed	0	2
	Number of best practice guides delivered	0	2,330
<b>Outcomes</b>	Number of energy-focused firms participating in pilots	0	5
	Increase or maintain the rate at which clean energy technologies are adopted by participants <sup>12</sup>	65%	65%
	Increase the rate at which clean energy technologies are adopted by non-participants through sharing of best practices and case studies	25% <sup>13</sup>	30%

Benefits shown in Table 10 and Table 11 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

<sup>11</sup> A 0 (zero) denotes the actual value is currently believed to be zero for baseline/market metrics.

<sup>12</sup> The FlexTech Program has had the highest measure adoption rate (MAR) in the nation for individual cost-shared energy studies. Technical Services strives to maintain, and hopefully increase, this notable MAR through various cost-effective pilots.

<sup>13</sup> The FlexTech Program has a current spillover rate of 25%, this initiative will strive to improve this.

**Table 10. Direct Impacts**

Primary Metrics <sup>14</sup>		2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Energy Efficiency	MWh Annual	20,200	12,300	19,600	10,900	12,300	5,700	3,470	2,880	87,310
	MWh Lifetime	343,000	208,000	333,000	186,000	209,000	96,800	59,100	49,000	1,484,000
	MMBtu Annual	114,000	54,900	121,000	62,900	73,200	26,900	12,500	5,930	471,300
	MMBtu Lifetime	1,940,000	933,000	2,060,000	1,070,000	1,240,000	458,000	212,000	101,000	8,012,000
	MW	-	-	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	185	235	235	235	235	235	235	50	1,645
	MWh Lifetime	3,150	4,000	4,000	4,000	4,000	4,000	4,000	850	27,970
	MW	-	-	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		16,900	9,540	17,000	9,280	10,600	4,580	2,630	1,860	72,280
CO2e Emission Reduction (metric tons) Lifetime		287,000	162,000	288,000	158,000	179,000	77,800	44,600	31,700	1,229,000
Customer Bill Savings Annual (\$ million)		\$3.4	\$2.0	\$3.4	\$1.9	\$2.1	\$0.93	\$0.54	\$0.42	\$14.66
Customer Bill Savings Lifetime (\$ million)		\$58.2	\$33.7	\$57.5	\$31.7	\$35.9	\$15.8	\$9.23	\$7.17	\$249.2
Private Investment (\$ million)		\$19.3	\$13.4	\$17.6	\$11.3	\$12.0	\$7.30	\$5.77	\$4.37	\$91.12

**Table 11. Annual Projected Initiative Participation**

	2018	2019	2020	2021	2022	2023	2024	2025	Total
Participants <sup>15</sup>	15	170	240	230	230	230	190	140	1445

Benefits shown in Table 12 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

<sup>14</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 17-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<sup>15</sup> Participants are defined as end-users, those who receive information on clean energy projects. This includes FlexTech, the pilots listed and agriculture audits.

**Table 12. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	2,270	28,700	69,100
	MMBtu Cumulative Annual	9,870	192,000	486,000
Renewable Energy	MWh Cumulative Annual	34	688	1,740
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		1,750	25,800	63,500

**21.2.8 Fuel Neutrality**

<b>Fuel Neutrality</b>	<p>NYSERDA intends to offer this program in a fuel neutral manner, offering cost-sharing to encourage more efficient use of all fuel types. Based on past program performance, it is anticipated that most savings will be electric in nature, however, all systems regardless of fuel type will need to be included to provide an accurate picture of energy consumption. This will help develop the market at the scale needed to achieve New York State’s clean energy goals.</p> <p>Offering the program on a fuel neutral basis will allow NYSERDA to achieve a ton of carbon savings at a cost of \$309/metric ton, compared to a cost of \$477/metric ton in an electric only scenario.</p>
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**21.2.9 Performance Monitoring and Evaluation Plans**

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>• Collect, analyze and report on progress of the initiative by comparing progress against identified goals on a regular basis (i.e., quarterly, bi-annually).</li> <li>• The strategy design will be tested to gauge the target population’s reaction to the strategy. This information will be used to help inform decisions about how to allocate time and resources within the initiative and to confirm market interest and preparedness for full scale implementation.</li> <li>• Insights as to how the initiative can be optimized will be gathered and applied to future initiative design to ensure greatest market impacts within the identified market sectors.</li> <li>• Aggregate and analyze data from NYSERDA-supported projects to verify realized energy savings and persistence of savings.</li> </ul> <p><u>Market Evaluation</u></p> <ul style="list-style-type: none"> <li>• Market evaluation will draw on the logic model and will include baseline measurements of key market indicators. Regular longitudinal measurements (e.g., annual or biennial) will include updates of the baseline metrics as well as additional measurements to assess market change resulting from the initiative.</li> <li>• Key market indicators will include, but not be limited to, the number of qualified and active energy-focused firms; rate at which clean energy technologies are adopted and replicated by participants and non-participants; knowledge of and confidence in the benefits of clean energy approaches and technologies; and impact of any incentive offering changes on measure adoption and participation.</li> </ul>
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	<ul style="list-style-type: none"><li>• As appropriate, the market evaluation will leverage sector-level market studies as well as publicly and commercially available data to inform the tracking of key market indicators.</li></ul> <p><u>Impact Evaluation/Field Verification</u></p> <ul style="list-style-type: none"><li>• Evaluation M&amp;V will be conducted according to the IPMVP<sup>16</sup> method(s) most appropriate given the measure promoted by this initiative. Data from the impact evaluation can be used to help lend confidence in the market, especially among other end users.</li><li>• Evaluation M&amp;V of direct savings will focus on areas of greatest impact and will draw upon project-level data collected by the program.</li><li>• Depending on the extent of replication identified in market evaluation activities, impact evaluation may be conducted on a sample of replication projects to assess outcomes.</li></ul>
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<sup>16</sup> The International Performance Measurement and Verification Protocol. [www.ipmvp.org](http://www.ipmvp.org).



## 21.3 Clean Energy Advanced Market Performance (AMP) Challenge

### 21.3.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Customers invest in clean energy for many reasons, including reducing costs, increasing reliability and resilience, managing volatility and risk, marketing opportunities, and corporate sustainability goals. Various market barriers, however, often limit investment in the clean energy solutions. .</li> <li>• Some large Commercial and Industrial (C&amp;I) customers have indicated that they would be able to make additional clean energy investments if they had guaranteed access to their System Benefits Charge (SBC) contributions, and increased flexibility in use of these funds.</li> <li>• The New York Public Service Commission’s (PSC’s) Clean Energy Fund Order<sup>17</sup> directed Department of Public Service (DPS) staff to work through the Clean Energy Advisory Council (CEAC)<sup>18</sup> to develop and file a proposal that maximizes energy efficiency and distributed energy resource deployment in the commercial and industrial sectors through incentives for voluntary investments in clean energy technology that help accelerate and increase achievement of the Clean Energy Standard (CES) and State Energy Plan goals.</li> <li>• To accomplish this, the CEAC Steering Committee tasked the Voluntary Investment &amp; Other Market Development Working Group with the development of parameters necessary to facilitate voluntary investment pilots which were presented in the .<sup>19</sup></li> <li>• The Report identified five core pilot criteria:             <ul style="list-style-type: none"> <li>○ Define the target market</li> <li>○ Identify a barrier to market engagement</li> <li>○ Additionality to public benefits programs</li> <li>○ Contribute to the State’s clean energy and carbon reduction goals</li> <li>○ Can be replicated in the marketplace</li> </ul> </li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA will issue a Clean Energy Advanced Market Performance (AMP) Challenge solicitation to provide opportunities for large C&amp;I customers to receive a three-year funding award to partially offset clean energy projects costs.<sup>20</sup> The AMP Challenge will provide flexible funding that can be used for energy efficiency and distributed energy resource projects, and interim payments (e.g., a portion of documented expenditures on clean energy projects). This will reduce the amount of upfront capital required to implement potential clean energy projects, while still achieving CEF goals on a \$/ton CO<sub>2</sub>e reduced basis.</li> <li>• The solicitation will require proposers to develop a 3-year carbon savings goal and an associated funding request to develop clean energy projects. Proposals will be selected based on the ambitiousness of the company’s goal and reasonableness of the funding request.</li> </ul>

<sup>17</sup> Case 14-M-0094, Proceeding on Motion of the Commission to Consider a Clean Energy Funder, Order Authorizing the Clean Energy Fund Framework, issued January 21, 2016.

<sup>18</sup> The CEAC was established by the PSC in the CEF Order, and operates through the structure of a Steering Committee and Working Groups convened by the Steering Committee to address specific areas of focus.

<sup>19</sup> The Voluntary Investment Pilot Parameters Report was filed with DPS on December 21, 2016 (Matter 16-01010 – In the Matter of the CEAC’s Voluntary Investment & Other Market Development Working Group). A February 23, 2017 letter from DPS Director of Program Management and Planning to the PSC Secretary proposed that NYSERDA’s CEF serve as the means to establish a process and assessment criteria for potential pilots of voluntary investment actions that induce clean energy investments and outcomes that are above-and-beyond what the public program would otherwise have resulted in.

<sup>20</sup> Defined in this initiative as capital and operations & maintenance energy efficiency and distributed energy resource projects.

	<ul style="list-style-type: none"> <li>On an annual basis, NYSERDA will assess the effectiveness of the challenge and will use learnings to update processes. Proven program elements or solutions will be shared internally, with NYS utilities, and the market.</li> <li>For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Clean Energy Advanced Market Performance (AMP) Challenge,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>Reduce the amount of upfront capital required to implement clean energy projects and provide greater assurance of capital availability to large C&amp;I customers.</li> <li>Provide increased flexibility and customization in achieving carbon reductions from the largest C&amp;I customers to support advanced and continued investment by these large energy customers.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>This initiative will contribute to the achievement of New York State’s greenhouse gas (GHG) emissions reduction goals identified in the 2015 New York State Energy Plan — targeting 40% reduction of GHG emissions by 2030, and 80% by 2050. The engagement of large C&amp;I customers has the potential to accelerate achievement of these clean energy and greenhouse gas emissions reduction goals.</li> <li>This initiative also supports achievement of the Clean Energy Standard goal for renewable resource electric generation (50% renewable electric generation by 2030 – “50 by 30”) by reducing the overall electric load, and therefore the amount of renewables necessary to meet the 50 by 30 goal.</li> </ul>

21.3.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<ul style="list-style-type: none"> <li>The target market is the largest C&amp;I customers in NYS interested in advancing their investment in clean energy solutions to reduce their carbon emissions.</li> </ul>
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>Large C&amp;I facility owners, managers, and operators</li> <li>Energy-focused firms such as consultants, energy service companies, developers, vendors, and financiers</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>NYS utilities launched a self-direct program for large energy users in January 2017 allowing some large C&amp;I customers to ‘self-direct’ funds directly into facility energy efficiency investments outside existing policies and programs. Various stakeholders have expressed an interest in broadening the self-direct program model to include NYSERDA CEF funds.</li> <li>Potential participants have indicated they have a pipeline of clean energy projects that they would pursue if additional funding was available.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>Participants will see reduced energy costs due to the implementation of clean energy projects.</li> <li>Participants will be better able to achieve their corporate sustainability goals due to dedicated capital.</li> <li>Vendors and consultants will see increased demand for energy services and products.</li> </ul>

21.3.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>This initiative was informed by and is consistent with the CEAC’s Voluntary Investment and Other Market Development Working Group’s Voluntary Investment Proposal Parameters Report,<sup>21</sup> which included discussion of voluntary investment programs.</li> </ul>
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<sup>21</sup> Voluntary Investment Proposal Parameters Report. December 21, 2016. Matter 16-01010 – In the Matter of the CEAC’s Voluntary Investment & Other Market Development Working Group.

	<ul style="list-style-type: none"> <li>Working group members that contributed to the findings in the report include TRC, the NY investor-owned utilities, Multiple Intervenors, SolarCity, Citizens for Local Power, Independent Power Producers of New York, New York Power Authority, NextEra, New York City Energy Efficiency Corporation, New York Battery &amp; Energy Storage Technology Consortium, and Alliance for Clean Energy New York.</li> <li>In addition to the official working group, NYSERDA also interviewed large C&amp;I customers to gather feedback on design parameters for the AMP Challenge.</li> </ul>
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21.3.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li><b>Resource constraints of the customer:</b> Large C&amp;I customers have both internal competition for capital and constraints on staff time, which can lead to ad-hoc energy decision-making rather than conscious long-term planning. By allowing stakeholders to propose 3-year carbon reduction goals and funding requests, resource constraints will be eased. Interim payments will reduce the cost of capital for selected participants by buying down a portion of a project’s cost at the outset rather than at the post-implementation stage. This reduces the amount of upfront capital required to fund clean energy projects and allows them to allocate available capital to other internal priorities.</li> <li><b>Limited ability to implement bundled energy solutions:</b> Currently, large C&amp;I customers would have to participate in multiple NYSERDA programs to pursue funding for energy efficiency and renewable energy projects. By creating one channel for participation NYSERDA will seek to minimize administrative burdens on large C&amp;I customers and facilitate the bundling of clean energy projects.</li> <li><b>Uncertainty of project benefits:</b> Many large C&amp;I customers do not conduct independent measurement &amp; verification of clean energy projects, and therefore are not confident in the energy savings and financial benefits. In addition, there is a significant disconnect between pitched ROIs for clean energy solutions and what customers believe. The lack of data to support clean energy project benefits can be an impediment to pursuing future clean energy projects. By providing independent, verified performance data to customers, this strategy will seek to improve confidence in clean energy solution benefits.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>If large C&amp;I energy users establish carbon reduction goals and are provided with dedicated funding to use over a three-year span, then these customers will implement more clean energy projects and achieve more carbon reductions at a lower cost than other rate-payer supported programs.</li> <li>If large C&amp;I energy users are given the flexibility to use their dedicated funds to pursue clean energy projects that meet their specific needs, then carbon reduction goals set by participants will be achieved.</li> <li>If independent project measurement &amp; verification is required and provided by NYSERDA, participants will have improved confidence in the benefits associated with clean energy projects.</li> </ul>
<p><b>Activities</b></p>	<p><b>1) Develop Competitive Solicitation</b></p> <ul style="list-style-type: none"> <li>Issue a competitive request for proposals to solicit large C&amp;I customers that are willing to establish carbon reduction goals for a three-year period. Successful proposals must provide carbon reduction levels that meet or exceed what CEF programs would achieve. Projects implemented with AMP funding will be ineligible for support from other utility or NYSERDA programs.</li> <li>Hold a webinar to explain the goals and structure of the AMP Challenge and have a question and answer session with potential participants.</li> </ul> <p><b>2) Select Proposals to Fund</b></p> <ul style="list-style-type: none"> <li>Evaluate proposals based on criteria including but not limited to:</li> </ul>

	<ul style="list-style-type: none"> <li>○ Proposed carbon reduction goal, requested amount of funding, and cost effectiveness of the proposed \$/ton achievement.</li> <li>○ Private sector leverage.</li> <li>○ Additional impact associated with the CEF investment.</li> <li>○ Assessment of the proposed clean energy action plan and the proposer’s ability to achieve the stated carbon reduction goal.</li> <li>○ Executive commitment and staff resources.</li> <li>○ Previous clean energy project performance.</li> <li>○ Commitment to a robust M&amp;V plan, completed with third-party assistance provided by NYSERDA, to assess clean energy project impact and ROI</li> </ul> <ul style="list-style-type: none"> <li>● Select at least 2 proposals to receive financial support of up to \$5 million each to fund implementation.</li> </ul> <p><b>3) Implementation</b></p> <ul style="list-style-type: none"> <li>● NYSERDA will work closely with selected proposers to help with implementation and track progress to ensure that milestones and deliverables are met. NYSERDA will also provide third party M&amp;V contractors to measure the impact of implemented projects. A portion of each funding award will be held until M&amp;V is complete and paid based on performance.</li> </ul> <p><b>4) Assessment</b></p> <ul style="list-style-type: none"> <li>● During and after implementation, NYSERDA will assess outcomes and determine how learnings could be applied to the utility self-direct offering and/or other NYSERDA offerings.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>● Issue competitive solicitation.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>● Contract with selected participants.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>● Finalize participants’ Clean Energy Action Plans for 2019 during participants’ capital planning cycles. Clean Energy Action Plan updates will be conducted on an annual basis with updates for 2020 and 2021 being made during capital planning cycles in 2019 and 2020, respectively.</li> </ul> <p><u>Milestone 4 (2020)</u></p> <ul style="list-style-type: none"> <li>● Conduct M&amp;V for implemented 2019 projects. M&amp;V will be conducted on an ongoing basis through 2022.</li> <li>● Assess program performance and participant satisfaction to test, measure, and adjust on an annual basis.</li> </ul> <p><u>Milestone 5 (2022)</u></p> <ul style="list-style-type: none"> <li>● Issue AMP Summary report detailing lessons learned to date and potential for replicability.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>● Awarded participants achieve goals and milestones identified during the selection process, as verified through project M&amp;V.</li> </ul>

21.3.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>● NYSERDA will collaborate with utilities and exchange information on projects being implemented by AMP Challenge participants and lessons learned through this initiative.</li> </ul>
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<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>In its REV Track One Order<sup>22</sup>, the PSC directed the utilities to implement self-direct programs for large energy users by January 1, 2017. The utilities have already offered their customers the option to opt-in to this program. These customers will pursue new energy efficiency projects of their choosing over the course of three years using funds that they would otherwise be paying through the utility’s system benefits charge (SBC). These projects must achieve savings at a better cost than the utility’s portfolio average. Self-direct projects are still in early development and have not yet resulted in demonstrated results.</li> </ul>
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21.3.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 13. The annual expenditure projection is included in Table 14. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 13. Annual Market Development Budget Allocation – Commitment Basis**

Budget	2018	2019	2020	Total
Direct Incentives and Services	\$10,000,000	\$-	\$-	\$10,000,000
Implementation Support	\$500,000	\$-	\$-	\$500,000
Total	\$10,500,000	\$-	\$-	\$10,500,000

**Table 14. Annual Expenditures Projection**

Expenditures	2018	2019	2020	2021	2022	Total
Total	0%	14%	20%	30%	36%	100%

21.3.7 Progress and Performance Metrics

Table 15 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

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<sup>22</sup> Order Adopting Regulatory Policy Framework and Implementation Plan. February 26, 2015. Matter 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision.

**Table 15. Initiative Specific Metrics**

Indicators <sup>23</sup>		Baseline (Before/Current)	2020 (Cumulative)
Activity/Outputs	Number of sites impacted	0	2
Outcomes	Lifetime carbon savings from selected participants meet or exceed CEF program benchmark <sup>24</sup>	\$27/ton	\$27/ton

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Customers implement more clean energy projects than prior to receiving AMP funding.
- Carbon reduction goals set by participants are achieved.

Benefits shown in Table 16 and Table 17 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 16. Direct Impacts**

Primary Metrics		2018	TOTAL
Energy Efficiency	MWh Annual	25,900	25,900
	MWh Lifetime	389,000	389,000
	MMBTu Annual	152,000	152,000
	MMBTU Lifetime	2,280,000	2,280,000
	MW	-	-
Renewable Energy	MWh Annual	4,690	4,690
	MWh Lifetime	70,400	70,400
	MW	4.00	4.00
CO2e Emission Reduction (metric tons) Annual		24,700	24,700
CO2e Emission Reduction (metric tons) Lifetime		370,000	370,000
Customer Bill Savings Annual (\$ million)		\$3.46	\$3.46
Customer Bill Savings Lifetime (\$ million)		\$51.9	\$51.9
Private Investment (\$ million)		\$54.5	\$54.5

**Table 17. Annual Projected Initiative Participation**

	2018	Total
Participants <sup>25</sup>	2	2

<sup>23</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>24</sup> NYSERDA's CEF Market Development portfolio funding and minimum carbon savings target serves as the minimum benchmark for this initiative. The Clean Energy AMP Challenge strives to equal, and hopefully exceed, this benchmark. NYSERDA derived the \$27/ton (lifetime) benchmark for the CEF Market Development portfolio based on the funding authorized (Appendix E) and the lifetime CO2 tons expected to be contributed by Market Development (pp 41) within the Commission's Order Authorizing the Clean Energy Fund, Issued and Effective June 21, 2016. \$2,610 million for Market Development program, administration and cost recovery fees, exclusive of Evaluation funds, divided by 96.6 million lifetime tons (restated from 76 million lifetime tons based on application of the most current electricity grid emission factor) gives this benchmark.

<sup>25</sup> Participants are defined as proposals contracted and the number of participants illustrated is the most conservative value. Actual participants may be greater based on number of awards made.

It is unclear what types of projects will be implemented under AMP and therefore what market dissemination activities and associated budget may be required in the future. Therefore, at present, indirect impacts are assumed to be not applicable. Depending on the success of the initiative, NYSERDA may revise the initiative to add market dissemination funding and indirect benefits would be added at that time.

### 21.3.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• NYSERDA intends to offer this strategy in a fuel neutral manner. Offering the strategy on a fuel neutral basis will allow NYSERDA to achieve a ton of carbon savings at a cost of \$425, compared to a cost of \$652 in an electric only scenario.</li> </ul>
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### 21.3.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• Assess the responsiveness and ability of the proposers to meet and expand on the minimum criteria for participation.</li> <li>• NYSERDA project managers will have bi-monthly or quarterly meetings with participants and 3<sup>rd</sup> party M&amp;V consultants to continually monitor performance and improve processes if necessary.</li> </ul> <p><b><u>AMP Strategy M&amp;V</u></b></p> <ul style="list-style-type: none"> <li>• M&amp;V plans will be developed for each of the selected participants based on the specifics of the implemented projects. M&amp;V work will be funded out of the Implementation Support budget included in this plan.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Case studies and testimonials from participants will be developed to communicate lessons learned, confidence in achieving savings, potential for replicability, and document the experience of participation when implementing clean energy measures, and assess the customers’ level of investment in clean energy projects pre/post participation</li> <li>• Surveys or interviews will be conducted to assess:             <ul style="list-style-type: none"> <li>○ Effectiveness of program design and implementation (e.g., programmatic terms and conditions, clarity of solicitation)</li> <li>○ Decision making related to the adoption of energy efficiency absent participation in this initiative</li> <li>○ Assess interest in future clean energy investments</li> <li>○ Barriers to adoption of clean energy measures and processes</li> </ul> </li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>• Project specific M&amp;V is included within the implementation plans and separate evaluation M&amp;V is not envisioned at this time.</li> </ul>
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## 21.4 Clean Energy Siting & Soft Cost Reduction

### 21.4.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"><li>• On August 1, 2016, the Public Service Commission issued an order adopting a Clean Energy Standard (CES), which mandates that clean energy sources generate 50% of New York’s electricity by 2030. Meeting the 50% goal will require accelerated market growth in numerous sectors, including clean energy generation, energy efficiency and energy storage.</li><li>• Increasing the financial attractiveness of clean energy projects can drive significant growth in these markets. As capital costs continue to decline for many clean energy technologies, a key area to drive greater cost efficiencies is reducing non-equipment costs. These costs are referred to as soft costs or balance-of-system (BOS) costs. Current clean energy soft cost barriers include inefficient and inconsistent local regulations, one-time costs (e.g. land siting and interconnection and environmental studies), and ongoing costs (e.g. customer acquisition and management). A prime example of the growing impact of non-equipment costs is solar development. Soft costs are becoming a larger fraction of the total cost of solar systems and now make up more than half the total cost of residential and commercial systems.<sup>26</sup></li><li>• NY-Sun, in addition to providing financial incentives to reduce the capital costs of investment in solar electric equipment, has led several initiatives to reduce soft costs, including the PV Trainers Network (PVTN). The PVTN was launched in 2014 primarily as a training and workforce development program, but has evolved to provide educational materials and remote technical assistance, helping to address non-financial barriers. NYSERDA’s Clean Energy Communities program has also provided some technical assistance via the PVTN, but this assistance focused narrowly on implementing solarize campaigns and adopting the unified solar permit.</li><li>• At the present time, there are more than 6,000 MW of Large Scale Renewables (LSR) in either the New York Independent System Operator (NYISO) Interconnection Queue or in the Article 10 process. These projects represent approximately 56% of the needed incremental generation to achieve the Clean Energy Standard goal. While NYSERDA has not engaged in targeted soft cost reduction activities related to LSR to date, the significant increase in LSR necessary to achieve the Clean Energy Standard goals will require a focused effort to reduce all system cost components.</li><li>• Despite considerable progress through existing soft cost reduction efforts, barriers to clean energy deployment remain. Many local governments are encountering large-scale clean energy development for the first time, and are not equipped to efficiently and appropriately manage it. Many local governments struggle with issues such as payment-in-lieu-of-tax (PILOT) agreements, environmental impact studies and zoning.<sup>27</sup> Additionally, new clean energy models and regulatory paradigms, such as the Value of Distributed Energy Resources (VDER), can create additional questions and uncertainty that local governments need to understand and navigate.</li></ul>
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<sup>26</sup> Gallagher, Ben. “U.S. Solar PV Price Brief H1 2016: System Pricing, Breakdowns and Forecasts.” *Green Tech Media Research*. June 2016.

<sup>27</sup> U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy. “Soft Costs.” Accessed at <https://energy.gov/eere/sunshot/soft-costs>.



	<ul style="list-style-type: none"> <li>Reducing soft costs associated with local governments, as well as other soft costs such as customer acquisition costs or community acceptance issues, will make clean energy deployment faster, easier and more affordable, contributing to the goal of creating self-sustaining markets.</li> </ul>
<b>Intervention Strategy</b>	<p>Addressing soft cost barriers is critical to reducing the overall price of clean energy, maintaining market growth, and meeting the State’s ambitious clean energy deployment goals. NYSERDA will launch a Clean Energy Siting &amp; Soft Cost Reduction initiative to coordinate a portfolio of activities that aggressively target the most urgent soft cost barriers to clean energy market growth. The Clean Energy Siting &amp; Soft Cost Reduction initiative will coordinate soft cost reduction activities through a framework that will improve collaboration and communication among stakeholders, and will systematically address market barriers inhibiting greater clean energy adoption in NYS. This framework will:</p> <ul style="list-style-type: none"> <li>Synchronize and lead projects across NYSERDA and other state agencies, integrating and coordinating expertise and resources to best advance the State's clean energy goals.</li> <li>Create a central forum for representatives from industry, authorities having jurisdiction (AHJs),<sup>28</sup> and utility companies to address soft cost barriers and collaboratively identify solutions.</li> <li>Research and develop soft cost solutions to support the many stakeholders involved in clean energy deployment.</li> <li>Provide comprehensive direct technical assistance for AHJ officials across New York State in a demand-driven fashion, based on requests from AHJ officials and jurisdictions facing significant clean energy development challenges.</li> <li>Provide financial assistance to encourage soft cost solution innovation, and recognize communities that have taken steps to significantly reduce soft costs.<sup>29</sup></li> </ul> <p>Initial projects for the Clean Energy Siting &amp; Soft Cost Reduction initiative will focus on distributed solar and LSR projects. NYSERDA will continually evaluate opportunities to utilize the Clean Energy Siting &amp; Soft Cost Reduction framework to pursue soft cost reduction strategies for other clean energy technologies (e.g. energy storage or combined heat and power), leveraging tools and related engagements with communities and AHJs.<sup>30</sup></p>
<b>Goals</b>	<ul style="list-style-type: none"> <li>Optimize the project permitting, interconnection and approval process within each clean energy technology project development cycle.</li> <li>Increase the number of clean energy projects successfully completing the project permitting, interconnection and approval process.</li> <li>Contribute to reducing distributed solar soft costs in New York State 20% on average in each category by 2020 (relative to a 2016 baseline study<sup>31</sup>).</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>The Clean Energy Siting &amp; Soft Cost Reduction initiative will play a critical role in achieving the 2015 State Energy Plan (SEP) and Clean Energy Standard by reducing the cost of clean energy deployment. The initiative will expand clean</li> </ul>

<sup>28</sup> AHJs are defined as local and state entities and officials that have a decision-making role in clean energy project development.

<sup>29</sup> NYSERDA will coordinate internally as appropriate with programs such as the Energy Efficiency Soft Cost Challenge and Clean Energy Communities to ensure activities are complimentary and not duplicative.

<sup>30</sup> It is envisioned that this Investment Plan will be amended in the future as additional soft cost reduction opportunities utilizing this framework are identified for other clean energy technologies.

<sup>31</sup> Manson, Cynthia. “Solar Balance-Of-System Costs Baseline Cost Study.” Prepared for NYSERDA by Industrial Economics, Incorporated (IEC). May 2017.

	<p>energy in the state’s electricity mix by reducing the cost of deployment and increasing the percentage of projects in the interconnection queue that are completed.</p> <ul style="list-style-type: none"> <li>• The initiative will also contribute to the SEP’s economic development goals by creating and retaining jobs in New York, lowering energy costs, reducing greenhouse gases, and lessening the need for new fossil fuel power plants. The SEP notes, “To accelerate market transformation, REV initiatives will focus on identifying, mitigating, and removing common market barriers to clean energy deployment.” The Clean Energy Siting &amp; Soft Cost Reduction initiative is designed to fulfill that specific purpose.</li> </ul>
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## 21.4.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The Clean Energy Siting & Soft Cost Reduction initiative targets clean energy technologies at the residential, commercial and utility scale, including the Community Distributed Generation market.
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• NYS AHJs (e.g. mayors, sustainability officers, code officials, fire officials, planning and zoning board members, inspectors and other municipal officials)</li> <li>• NYS agencies</li> <li>• NYS utilities and the New York Independent System Operator</li> <li>• Clean energy companies, developers and trade associations</li> <li>• National labs / U.S. Department of Energy (DOE)</li> <li>• Universities</li> <li>• Non-profit organizations (e.g. environmental, economic development)</li> <li>• Schools, fire districts and other public organizations</li> <li>• Tribes</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• New York State recently enacted several policies to drive growth in clean energy electricity generation. These policies are attracting national and international attention, making New York an attractive market for clean energy development.</li> <li>• Developers and community members have identified clean energy project siting, permitting, interconnection and community acceptance as significant contributors to project cost and the risk of project failure. To effectively capitalize on the convergence of a favorable policy environment and declining hardware costs, New York must reduce soft cost barriers inhibiting clean energy development. Soft cost reductions are necessary to drive clean energy development to the scale needed to meet the State’s clean energy goals.</li> <li>• Because of the numerous market actors and varied requirements and regulations across the State, NYSEDA is well positioned to help drive economies of scale and standardize the clean energy development process across multiple jurisdictions and stakeholders, including AHJs, solar developers, state agencies, universities and utility companies.</li> <li>• The solar market provides an example of the need to reduce soft cost barriers. In the United States, solar energy established itself for the first time in 2016 as the largest source of newly installed electrical capacity.<sup>32</sup> Last year U.S. developers added 14.6 GW of new solar capacity, nearly doubling the amount added to the grid in 2015.<sup>33</sup> Despite significant solar capacity growth nationally and in New</li> </ul>

<sup>32</sup> Solar Energy Industries Association. “U.S. Solar Market Grows 95% in 2016, Smashes Records.” Feb. 14, 2017. Accessed <http://www.seia.org/news/us-solar-market-grows-95-2016-smashes-records>.

<sup>33</sup> Ibid.

	<p>York, the state’s solar market continues to face soft cost barriers that hinder greater growth and are becoming increasingly important to address. While NY-Sun has developed several initiatives to support New York’s solar market, significantly reducing soft costs will require a new platform to lead stakeholder collaboration, develop soft cost solutions, and deliver technical assistance across a broader suite of technologies and project sizes.</p>
<p><b>Customer Value</b></p>	<p>The Clean Energy Siting &amp; Soft Cost Reduction initiative will support the continued growth of New York’s clean energy industry, making the state’s energy system more efficient and resilient, achieving ratepayer savings, increasing consumer choice and protecting the environment. The Clean Energy Siting &amp; Soft Cost Reduction initiative specifically will provide customer value in the following ways:</p> <ul style="list-style-type: none"> <li>• Customers who purchase or lease clean energy systems will benefit from soft cost reductions through lower system prices. Customers will also realize savings on their monthly utility bills.</li> <li>• As soft costs fall, clean energy generation will become more competitive with conventional energy sources, which will attract investment in clean energy development, spurring continued industry and job growth in New York.</li> <li>• A combination of tools, resources, education and technical assistance will provide a strong foundation for AHJs to independently manage future clean energy development in their communities.</li> <li>• Increasing clean energy generation reduces harmful air pollution and greenhouse gasses.</li> <li>• Engaging communities in the development process can increase satisfaction with hosting utility-scale wind and solar projects, which will increase acceptance of LSR development and improve perceptions across the state.</li> </ul>

21.4.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA staff communicates regularly with clean energy project developers and AHJs on requests for information and technical assistance, as well as assistance with delayed projects. These interactions revealed a significant need among local governments for greater knowledge and technical capacity on clean energy development issues. For example, AHJs communicated their desire to develop distributed solar energy projects but lacked the necessary expertise and experience on issues such as solar permitting, planning, zoning and property taxes. This initiative was designed to meet these needs in communities across the state.</li> <li>• AHJs communicated an asymmetry of information between developers and communities regarding the planning, zoning, taxation, health and environmental impacts of LSR project development. Local officials and community leaders with a decision-making role in planning and zoning frequently lack the resources to assess the costs and benefits of LSR development, and have voiced a desire for an excess of conservatism in working with project developers. This approach commonly leads to project delays, the erosion of public support and project failure.</li> <li>• Future Engagement: <ul style="list-style-type: none"> <li>○ NYSERDA will periodically query market stakeholders to assess program effectiveness, identify new program opportunities, and refine program strategies.</li> <li>○ NYSERDA will organize in-person workshops and online webinars to announce new market solution products, and to share the results of research, pilot projects and case studies.</li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>○ NYSERDA will share the findings and experience of the Clean Energy Siting &amp; Soft Cost Reduction initiative to inform soft cost reduction initiatives and interventions in other market segments.</li> </ul>
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#### 21.4.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>● <b>AHJs lack resources to manage clean energy development.</b> They often lack staff capacity and technical knowledge, inhibiting their efforts to efficiently and appropriately manage clean energy development. Providing information, resources and technical assistance will help AHJs incorporate new clean energy technologies into local protocols (e.g. planning, zoning, land use, permitting, inspection and access).</li> <li>● <b>Local concerns about clean energy development impede deployment.</b> While some communities embrace clean energy development, some local governments and residents express concern about the pace and extent of it. Concerns stem in part from a lack of objective information about the impacts of clean energy development and ways to mitigate those impacts.</li> <li>● <b>Soft costs among clean energy developers and other stakeholders remain high.</b> These include one-time costs such as land siting, interconnection engineering and associated processes, and environmental studies, as well as ongoing costs such as customer acquisition and management, operation and maintenance, decommissioning, financing, supply chain costs, installation labor, profit and transaction costs. Identifying solutions to reduce these soft costs will make clean energy projects more affordable and attainable.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>● If NYSERDA conducts outreach and provides education for AHJ officials, then their capacity to efficiently manage clean energy development will improve.</li> <li>● If NYSERDA provides direct, one-on-one technical assistance to AHJs, then local regulations will become more conducive to clean energy development.</li> <li>● If NYSERDA provides one-on-one technical assistance to AHJs, then permitting and approval times will decrease and project approval rates will increase.</li> <li>● If NYSERDA provides technical analysis and support related to the NYISO interconnection queue, it will increase the likelihood that the NYISO will meet its goal of completing a class year<sup>34</sup> interconnection study process and commence a new class year process every year.</li> <li>● If NYSERDA makes available funding opportunities that recognize AHJ efforts to reduce clean energy soft costs, then AHJs will be incentivized to take further steps to reduce these soft costs.</li> <li>● If NYSERDA provides funding for soft cost research and special projects, then award recipients will identify innovative soft cost reduction opportunities and strategies.<sup>35</sup></li> </ul>
<b>Activities</b>	<p><b>Create and refine soft cost solutions</b></p> <ul style="list-style-type: none"> <li>● NYSERDA will create and refine soft cost solutions, including manuals, factsheets, case studies and technical reports that provide information on best practices to overcome soft cost barriers. Products may address soft costs of a single clean energy technology or may cover multiple clean energy technologies that experience a common soft cost barrier.</li> </ul>

<sup>34</sup> NYISO class year studies evaluate the cumulative impact of a group of projects that have completed similar milestones.

<sup>35</sup> This effort will be coordinated with the Energy Efficiency Soft Cost Challenge to avoid overlap and to share lessons learned across efficiency and distributed generation.

- Specific products may include informational resources on Article 10, guidance on setbacks for wind and solar, studies on property value impacts of wind and solar development, and financial guidance tools for communities.
- NYSERDA will also conduct technical assessments and outreach around interconnection inefficiencies for LSR projects to reduce interconnection costs and timelines. Analysis of the LSR interconnection process from the perspective of the NYISO, the Transmission Owner and the project developer will be evaluated to identify areas for improvement from a technical and policy standpoint. The results of the analysis will be presented and discussed through NYISO committees.

**Develop a comprehensive outreach and education campaign for AHJ officials across New York State.**

- NYSERDA will conduct an outreach and education campaign. The campaign will utilize online resources, webinars, workshops, and events to disseminate soft cost solutions and products. It will leverage NYSERDA’s network of existing AHJ contacts as well as membership organizations (e.g., the New York Association of Towns and the New York Conference of Mayors). The campaign will draw upon the statewide outreach and education efforts of NYSERDA’s Clean Energy Communities program.
- Workshops will occur at the county level to maximize efficiency, expand access and facilitate collaboration among AHJs. The outreach and education campaign will serve to disseminate soft cost solutions and raise awareness of the availability of technical assistance.
- As part of this campaign, NYSERDA will convene and facilitate regional meetings for community stakeholders in probable LSR areas to advance objective information on the costs and benefits of LSR development, encourage proactive planning and zoning for clean energy, expand relationships with community or regional leaders to better facilitate information-sharing, and increase awareness of the challenges and successes of LSR development in specific regions of New York State.

**Provide targeted, one-on-one technical assistance**

- NYSERDA will provide technical assistance to local governments on clean energy development issues. NYSERDA will train all technical assistance providers and review all materials to ensure consistent content and services leveraging a pool of contractors who can provide on-the-ground assistance. NYSERDA will also solicit feedback from AHJ officials to ensure providers are meeting their needs.
- Technical assistance offerings will include remote and in-person troubleshooting and consultations, including assisting AHJ officials with implementing soft cost solutions. Efforts will include describing the fundamentals of the project development process, interpreting manuals, factsheets and technical reports, and making connections to other communities with existing LSR projects. NYSERDA will prepare community-specific materials relevant to LSR development for use during one-on-one technical assistance sessions.
- NYSERDA will provide assistance to communities considering property tax agreements to facilitate a smooth process with increased satisfaction from both communities and developers. This effort will involve connecting communities that have successfully negotiated tax agreements with communities beginning the process, so they may share experiences and resources. NYSERDA will also offer training to Industrial Development Agencies (IDA) across New York State to educate them on LSR project economics.

	<p><b>Funding Opportunities</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will coordinate with the Clean Energy Communities (CEC) program to recognize communities that actively reduce clean energy soft costs. As background, the CEC program sets out 10 high-impact actions for AHJs to complete. The CEC program has a dozen coordinators across the state to help AHJs complete the high-impact actions. However, some coordinators lack the necessary technical expertise to properly advise AHJs on the high-impact actions.<sup>36</sup></li> <li>• To supplement the CEC program for clean energy technologies, NYSERDA will issue a competitive solicitation to offer grants to communities that reduce clean energy technology soft costs (regarding permitting, zoning, planning, taxation, etc.). Grant funding will support additional specified actions to further reduce soft costs, such as comprehensive plans that incorporate clean energy development. NYSERDA will highlight successful AHJs in media outlets and through partner organizations. This recognition will help spur AHJs to improve their capabilities to independently and efficiently manage clean energy development.</li> <li>• NYSERDA will also issue a competitive solicitation for Soft Cost Innovation, which will support innovative practices that significantly reduce soft costs and accelerate clean energy adoption. Proposals may include market research, product development, software implementation or demonstration projects.<sup>37</sup> Proposal selection criteria will include project size, cost-effectiveness, replicability and the incorporation of efficiency measures, as well as portfolio-level considerations such as geographic balance, diversity of approaches and the overall number of distinct awardees.</li> </ul> <p><b>Establish a Soft Cost Working Group</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will convene and lead a soft cost working group to facilitate communication and collaboration on soft costs among market stakeholders. The working group will advise on efforts to develop and deploy soft cost solutions, tools and resources.<sup>38</sup> It will research and provide recommendations on specific soft cost barriers, working in collaboration with NYSERDA contractors to develop solutions. The soft cost working group will make its products publicly available to encourage adoption by relevant market stakeholders.</li> <li>• Working group membership will be open to all interested parties and could include AHJs, state agencies, clean energy developers, utility companies, universities, national laboratories, trade associations, non-governmental organizations and consumer advocates, and others. NYSERDA staff will participate in other state-level energy working groups to coordinate efforts.</li> <li>• The working group will initially focus on distributed solar barriers. NYSERDA will leverage this experience and related findings to address soft cost issues for other distributed energy resources, inviting stakeholders from other clean energy technologies when appropriate.</li> </ul>
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<sup>36</sup> The CEC program does not specifically address soft costs, nor does it address the needs of the commercial or utility-scale clean energy markets. AHJs currently have the greatest needs for technical assistance in these market segments because of the introduction of community solar and large-scale renewable projects.

<sup>37</sup> Examples of possible proposals could include a developer survey regarding installation practices, a GIS tool to assist AHJ siting, utility interconnection software, or photo-sharing practices for local inspectors. Results from the solicitation will be coordinated and synthesized with the Energy Efficiency Soft Cost Challenge to maximize soft cost reduction efforts.

<sup>38</sup> Soft cost solutions, tools and resources may include consumer education and protection documents; a model PILOT agreement and calculator; decommissioning guidance; customer acquisition studies; research on customer management and billing; GIS siting resources for AHJ officials; and factsheets on issues relevant to current market issues.

<p><b>Key Milestones</b></p>	<p><b><u>Milestone 1 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Establish a soft cost working group.</li> </ul> <p><b><u>Milestone 2 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue a solicitation to select a pool of contractors and organizations to develop, disseminate, and implement soft cost solutions.</li> </ul> <p><b><u>Milestone 3 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Contract with a pool of contractors and organizations.</li> </ul> <p><b><u>Milestone 4 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Complete trainings for technical assistance providers.</li> </ul> <p><b><u>Milestone 5 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Launch a statewide outreach and education campaign to publicize soft cost solutions and technical assistance services, including convening regional meetings for LSR stakeholders.</li> </ul> <p><b><u>Milestone 6 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue the incentive grant solicitation for AHJs taking significant steps to reduce solar soft costs.</li> </ul> <p><b><u>Milestone 7 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue the Soft Cost Innovation solicitation.</li> </ul> <p><b><u>Milestone 8 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Contract with Soft Cost Innovation award recipients.</li> </ul> <p><b><u>Milestone 9 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Compile and publish a document of all case studies to highlight best soft cost reduction strategies and clean energy-friendly communities.</li> </ul>
<p><b>Goals Prior to Exit</b></p>	<ul style="list-style-type: none"> <li>• Communication and collaboration among market stakeholders has demonstrably improved.</li> <li>• Innovative soft cost research and pilot projects have found new ways for market stakeholders to reduce soft costs, and the soft cost solutions developed have been deployed into the market.</li> <li>• AHJ officials' awareness of and capability to efficiently manage clean energy development in key markets has improved.</li> <li>• Project delays and failures related to local issues are significantly reduced for LSR projects.</li> <li>• The development process is accelerated for communities that are supportive of LSR development.</li> <li>• A self-sustaining network of communities is established for information-sharing and support of LSR siting without NYSERDA involvement.</li> <li>• Host community satisfaction with LSR projects increases</li> <li>• Per-watt distributed solar soft costs in New York State have been meaningfully reduced, with a goal of a 20% reduction by 2020 (relative to a 2016 baseline study).</li> </ul>

## 21.4.5 Relationship to Utility/REV

<p><b>Utility Role/Coordination Points</b></p>	<ul style="list-style-type: none"> <li>• The Joint Utilities will serve as key partners in soft cost reduction activities, especially on interconnection issues, customer data mining, customer management and billing, and identifying constrained areas of the grid to inform clean energy deployment. NYSERDA will build off its extensive collaboration with the Joint Utilities via the Interconnection Policy Working Group and the Interconnection Technical Working Group.</li> <li>• Utilities may also serve as pilot and demonstration project partners to vet and scale soft cost solutions. The State Interconnection Ombudsmen will continue to facilitate active and ongoing collaboration between the Joint Utilities and clean energy developers.</li> <li>• The activities described here will play an integral role in assisting the State’s ongoing efforts to address DER interconnection issues. As such, it will contribute to other activities both internal and external to NYSERDA. The activities will:             <ul style="list-style-type: none"> <li>○ Coordinate closely with the NYS interconnection working groups.</li> <li>○ Integrate with the work of the NYS Interconnection Ombudspersons.</li> <li>○ Consider and support related policy imperatives (e.g. REV Connect, REV pilots, and NY Prize) to ensure optimal leverage of time and resources.</li> </ul> </li> </ul>
<p><b>Utility Interventions in Target Market</b></p>	<ul style="list-style-type: none"> <li>• The Joint Utilities are currently implementing the Interconnection Management Plan and Cost Allocation Mechanism, which the Commission approved on January 25, 2017. The purpose of the Interconnection Management Plan is to clear inactive projects from the utilities’ interconnection queues and allow more advanced projects to progress to construction. The purpose of the Cost Allocation Mechanism is to split grid upgrade costs among all solar developers benefiting from them. These working groups and the soft cost solutions they developed provide a model for future Clean Energy Siting &amp; Soft Cost Reduction collaborations.</li> <li>• The Joint Utilities are coordinating with solar developers and customer management companies to allocate net metering credits and manage ratepayer participation in CDG projects. Opportunities may exist to reduce soft costs by streamlining these operations.</li> </ul>

## 21.4.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 18. The annual expenditure projection is included in Table 19. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

Considering the new Value of Distributed Energy Resources (VDER) order and evolving solar market needs, NYSERDA plans to complete a comprehensive assessment of its budgetary commitments and remaining funds under the NY-Sun program. This will include an assessment of the MW Block program as well as the need for the remaining Program Implementation budget. Once the assessment is finalized, NYSERDA will recommend funding reallocations for the NY-Sun program. Some funding from NY-Sun may be available for Clean Energy Siting & Soft Cost Reduction activities to offset the current budget in Table 18. NYSERDA will then file an amendment



to this investment plan chapter specifying the budget revisions for such activities. Clean Energy Fund resources provided under this investment plan will allow NYSERDA to immediately address the market barriers described herein.

**Table 18. Annual Market Development Budget Allocation - Commitment Basis**

<b>Commitment Budget</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Tools, Training, and Replication	\$500,000	\$500,000	\$500,000	\$1,500,000
Direct Incentives and Services (Distributed Generation)	\$1,765,000	\$1,765,000	\$1,765,000	\$5,295,000
Direct Incentives and Services (LSR )	\$700,000	\$700,000	\$600,000	\$2,000,000
Total	\$2,965,000	\$2,965,000	\$2,865,000	\$8,795,000

**Table 19. Annual Expenditures Projection**

<b>Expenditures</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
<b>Total</b>	34%	34%	32%	100%

#### 21.4.7 Progress and Performance Metrics

Table 20 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 20. Initiative Specific Metrics**

Indicators <sup>39</sup>		Baseline (Before/Current)	2020 (Cumulative)
Activity/ Outputs	Number of NYSERDA-led meetings on soft costs with market stakeholders	0	12
	Number of soft cost solutions created	3	8
	Number of outreach and education campaigns	1	3
	Number of soft cost reduction incentive grants awarded	0	50
	Number of regional LSR community meetings	0	6
	Number of Distributed Solar Soft Cost Innovation awards made	0	5
Near-Term Outcomes	Percentage of working group members reporting improved communication and collaboration among market stakeholders, based on a pre- and post- intervention survey	N/A	50%
	Number of AHJs receiving up to 100 hours of direct technical assistance on distributed solar projects	0	50
	Number of AHJs receiving direct technical assistance on LSR wind and solar projects	0	10
	Number of AHJs completing additional Clean Energy Community-specified steps to reduce soft costs	0	50
	Number of research projects and pilot projects completed	0	5
Mid- and Long-term Outcomes	Reduce distributed solar soft costs in New York State 20% by 2020	2016 Baseline Soft Costs: <sup>40</sup>  Residential: Con Ed: \$2.46/W Long Island: \$2.00/W Rest of State (ROS): \$2.18/W  Commercial Roof-Mount: Con Ed: \$0.97/W Long Island: \$0.42/W ROS: \$1.66/W  Commercial Ground-Mount: ROS Fixed: \$1.01/W ROS Tracking: \$1.03/W	20% reduction in average distributed solar soft costs relative to baseline data
	Percentage of developers that experience a reduction in project delays and failures due to local issues as compared to prior development experiences in NYS	N/A	80%
	Percentage of AHJs expressing satisfaction with hosting an LSR energy project, based on a pre- and post- intervention survey	N/A	80%

<sup>39</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>40</sup> Manson, Cynthia. "Solar Balance-Of-System Costs Baseline Cost Study." Prepared for NYSERDA by Industrial Economics, Incorporated (IEC). May 2017.

Impact Evaluation will be completed for the NY-Sun portfolio , and will include solar projects developed under the Clean Energy Siting & Soft Cost Reduction initiative. This initiative will support NY-Sun and its efforts to complete current and future solar projects in the MW Block Incentive Program. This investment plan does not claim direct benefits in addition to those already accounted for by NY-Sun. Accordingly, benefits impacts are not included herein.

The investment in LSR soft cost reduction will not have any direct, near-term benefits in energy efficiency, clean energy generation or CO2 emission reductions. Reducing project costs related to LSR development will support the achievement of the Clean Energy Standard goals and therefore the benefits from reducing LSR soft costs will be included in the evaluation of benefits resulting from the Clean Energy Standard.

Table 21 provides the projected participation associated with this initiative’s projects.

**Table 21. Annual Projected Initiative Participation**

<b>Participants<sup>41</sup></b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Authorities Having Jurisdiction (AHJs)	40	40	20	100
Working Group Participants	20	20	20	60
Total	60	60	40	160

#### 21.4.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>This program will not be offered on a fuel-neutral basis.</li> </ul>
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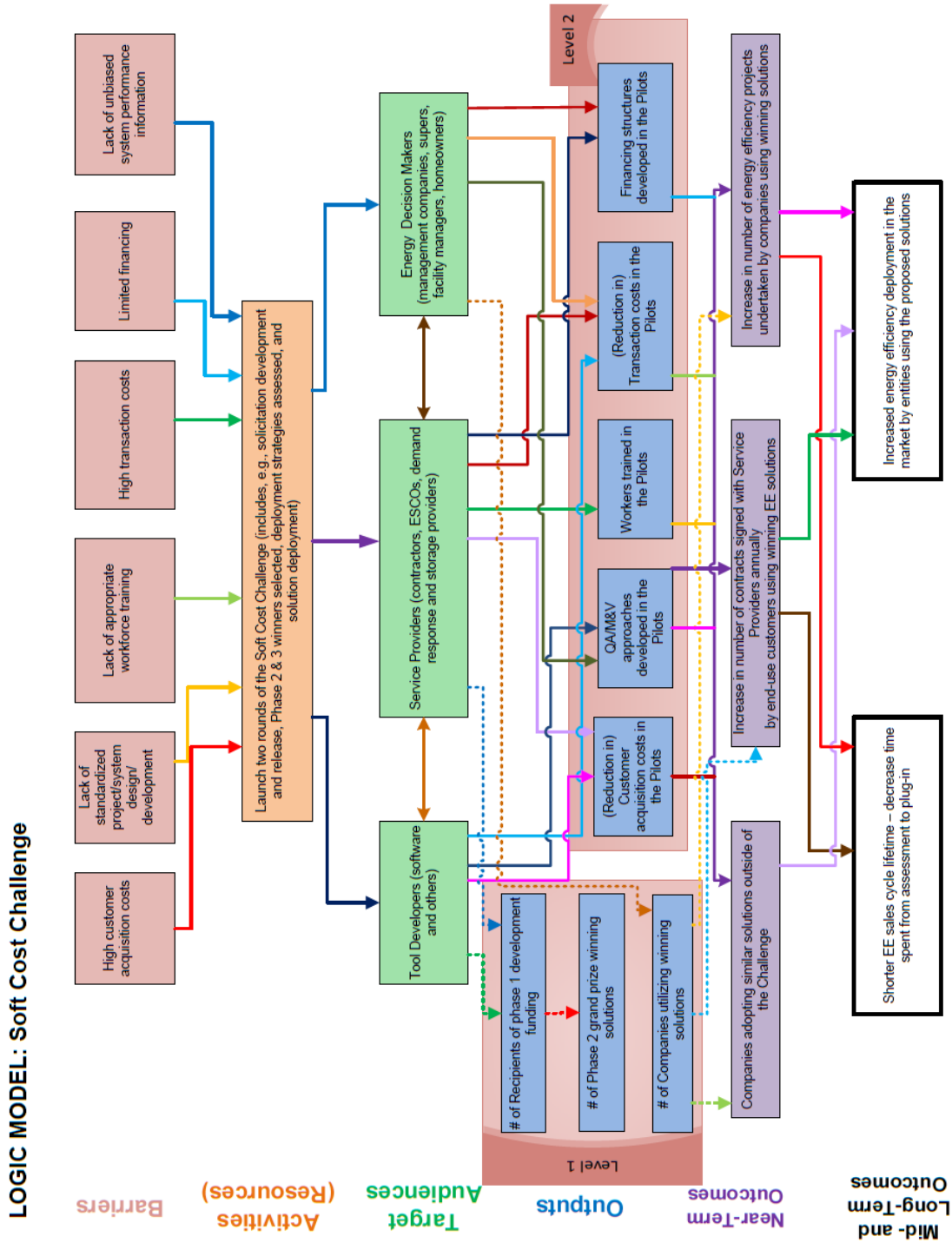
#### 21.4.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>NYSERDA will monitor standard output metrics of all activities described above, including the creation and activities of the Soft Cost Working Group, the procurement and provision of technical assistance services, and the administration of funding opportunities. Funds may be redirected (as needed) to ensure continued progress against program goals.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>Market Evaluation draws on the theory of change of the related logic model and will include baseline and longitudinal measurement of key indicators of success.</li> <li>Baseline measurements of key performance indicators are in place based on the 2016 study of solar soft costs in New York State. The study will be updated in 2019 to track progress.</li> <li>Regular updates to key performance indicators and measurement of market change, including the number of soft cost solutions developed and deployed, and</li> </ul>
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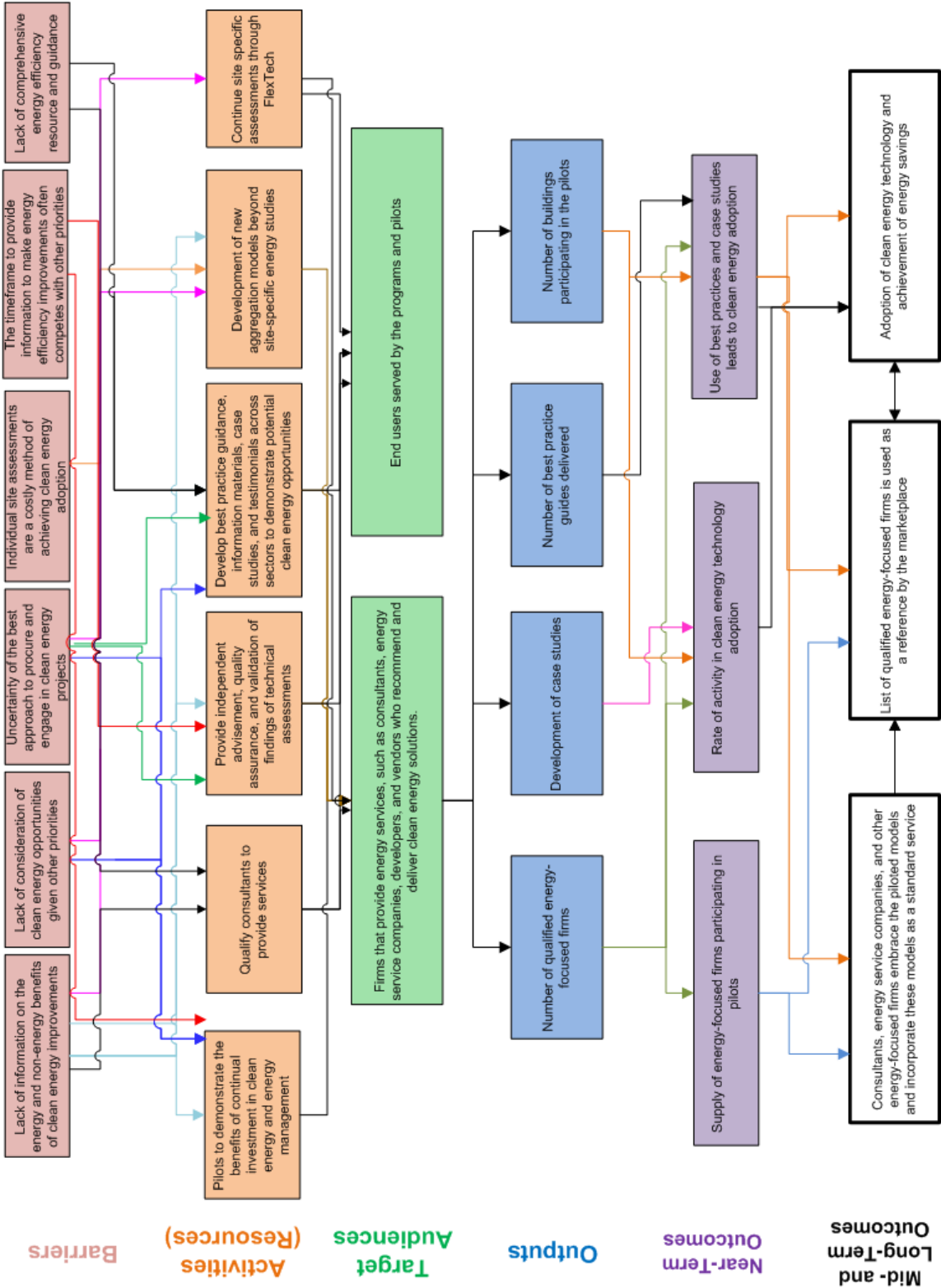
<sup>41</sup> Participants include AHJ technical assistance recipients, AHJ grant recipients, Innovation grant recipients, and working group members (including solar developer, utility, non-profit and national expert representatives).

	<p>the number of AHJs recipients of technical assistance services, will occur once the SMA is launched.</p> <ul style="list-style-type: none"> <li>• Sources of data will include NYSERDA tracking data, public and commercially available data, balance of system research conducted by the national labs and other organizations (e.g., GTM Research), and primary data collection through surveys of key market stakeholders, including AHJs, solar developers and the Joint Utilities.</li> <li>• A formal Market Evaluation is not planned for LSR as part of this initiative, beyond aspects addressed in the Test-Measure-Adjust Strategy.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>• Impact Evaluation will be completed for the NY-Sun portfolio as a whole. NYSERDA will develop an approach to identify these projects in the NY-Sun portfolio and to represent them in the evaluation.</li> <li>• Impact evaluation/field verification is not planned for LSR wind technology.</li> </ul>
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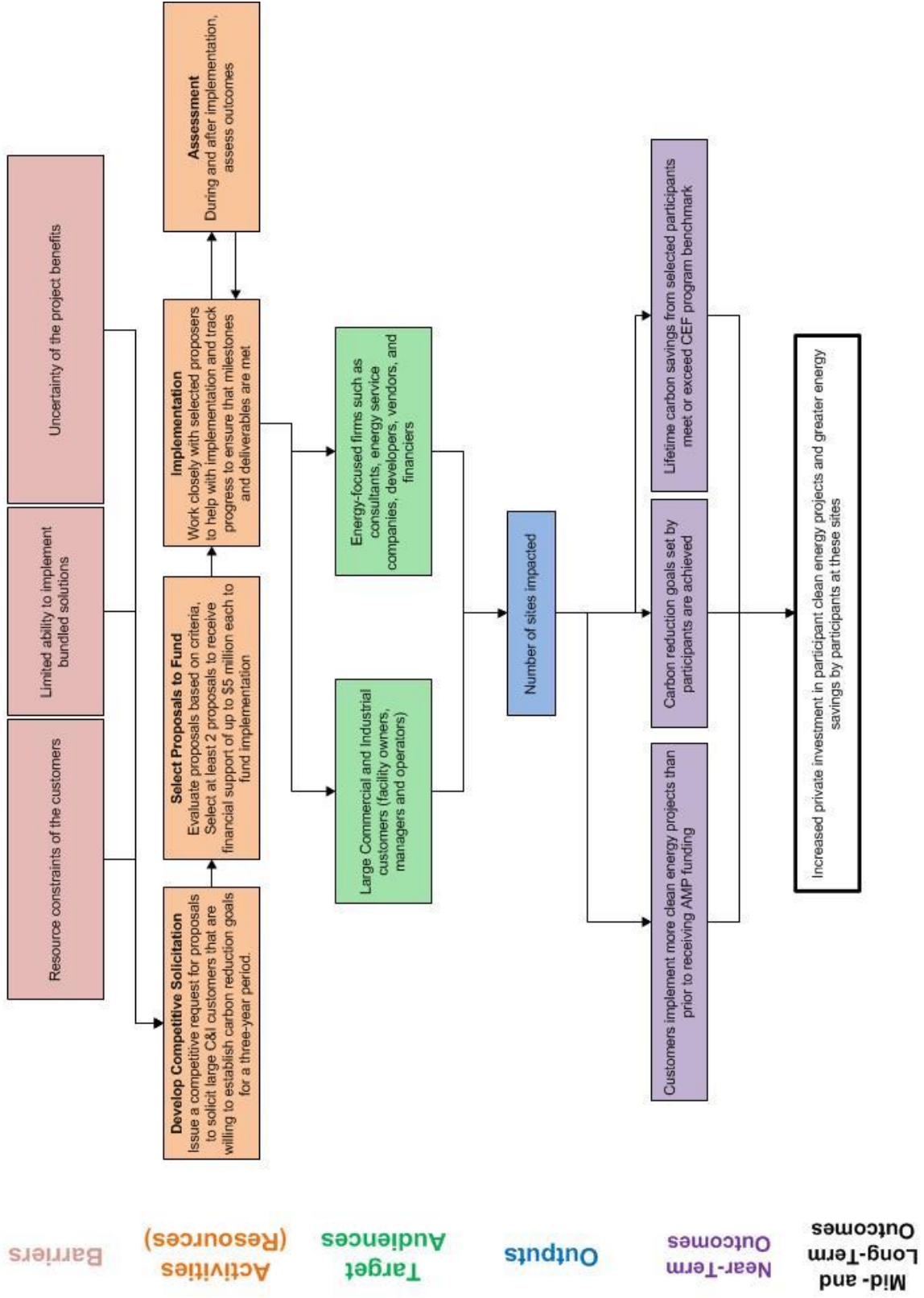
# Appendix A – Logic Models



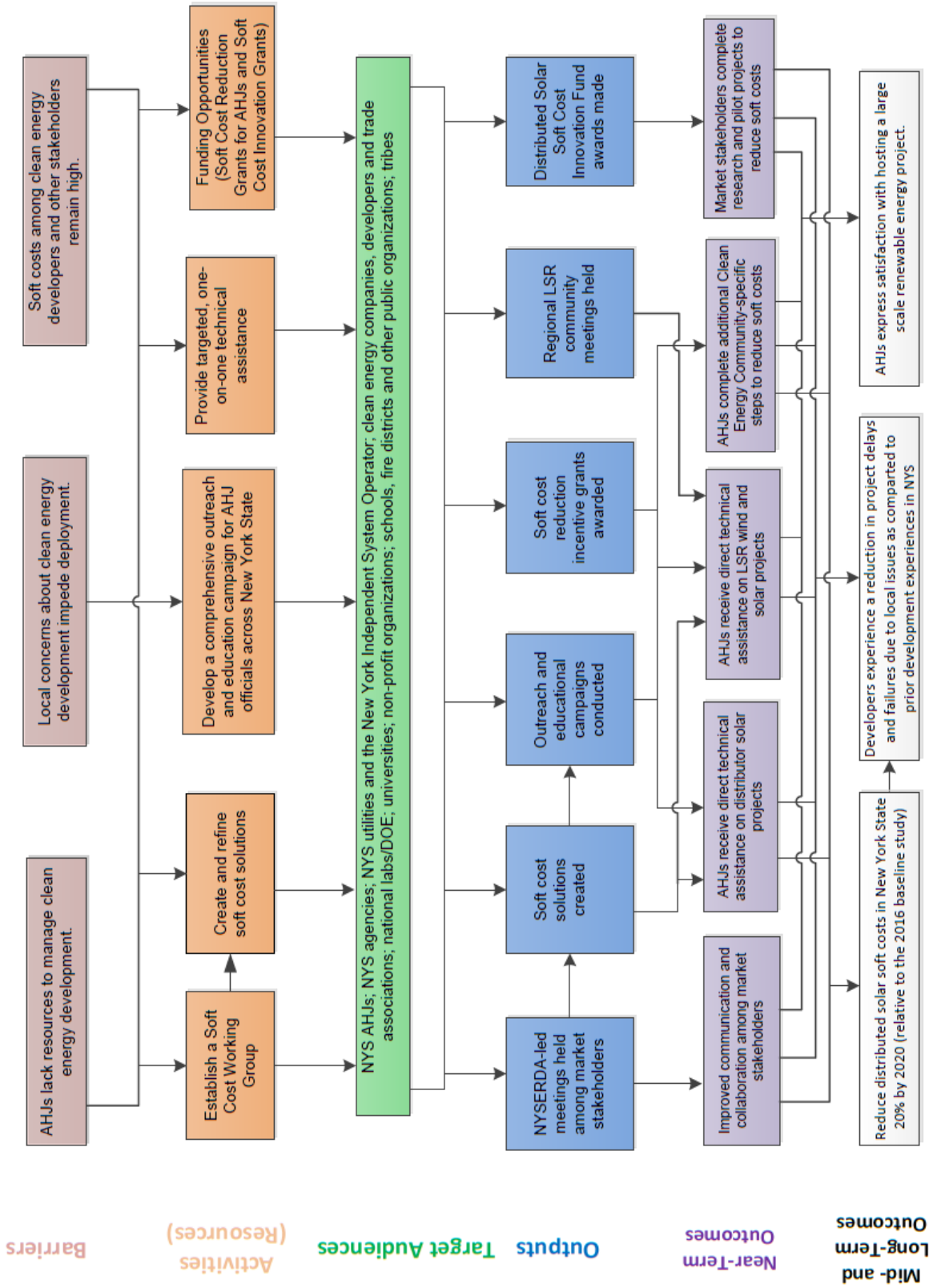
# LOGIC MODEL: Technical Services



# LOGIC MODEL: Clean Energy AMP Challenge



# LOGIC MODEL: Clean Energy Siting & Soft Cost Reduction





## Appendix B –Investment Plan Review Supplement<sup>1</sup>

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<sup>1</sup> As this report includes performance through Q2 2017 and the Energy Efficiency Soft Cost Challenge Initiative was not accepted until Q3 2017, the Technical Services Initiative was filed in Q3 2017, and the Clean Energy AMP Challenge and Clean Energy Siting & Soft Cost Reduction Initiatives were filed in Q4 2017, those initiative are not included herein.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Codes Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

November 1, 2017

Clean Energy Fund Investment Plan: Codes Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
November 1, 2017	Original Issue	Original Issue

## 22 Codes

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Energy codes set minimum energy efficiency requirements for designing, constructing and renovating buildings, thereby broadening adoption of energy efficient construction to the market. When enforced, energy codes promise long-term energy and cost savings over the lifetime of a building.

New York State's Energy Conservation Construction code (ECCCNYS) is established by the Department of State. The ECCCNYS is based off of the national model codes, the International Energy Conservation Code (IECC) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1. Local jurisdictions adopt the energy code in whole, or they may submit amendments or revisions to the state fire and building code council. An amended or revised energy code must be more stringent than the ECCCNYS.

To maximize the effectiveness of energy codes, NYSERDA seeks to work with stakeholders, participants in building design and construction, and communities to strengthen compliance and enforcement, test approaches to advance the development of codes with higher performance goals, and assist in the enactment of energy codes.

The first initiative described in this Chapter is Code to Zero, which aims to overcome barriers impeding compliance and enforcement. In addition it will seek to establish a path towards the development of a "stretch-to-zero" energy code that moves the market in a way that is actionable, cost effective and enforceable. Finally, the initiative will assist in the enactment of State and local energy codes.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 22.1 Code to Zero

### 22.1.1 Overview

<b>Present Situation</b>	<ul style="list-style-type: none"><li>• While the actions of early adopters, informational programs, and financial support often can persuade many in the market to act, energy codes set minimum energy efficiency requirements for designing, constructing and renovating buildings, thereby broadening adoption to the rest of the market, and, when enforced, promising long-term energy and cost savings over the lifetime of a building.</li><li>• However, a 2015 NYSERDA-sponsored survey indicated that energy code compliance in New York State was approximately 74% for commercial new construction and 77% for residential new construction,<sup>1</sup> indicating a lack of understanding by designers, builders and others in the construction process regarding compliance to the energy code and the need for additional compliance and enforcement focused activities.<sup>2</sup></li><li>• Historically, NYSERDA's efforts have focused on strengthening compliance and supporting the adoption of codes with higher performance goals, thereby improving compliance rates in an environment of increasingly stringent performance requirements. Based on NYSERDA's compliance assessment results, it is likely that compliance rates improve by at least 10% during a 3-year code cycle. Process evaluations<sup>3</sup> on the code training provided during the legacy Advanced Energy Codes Program found that NYSERDA's training had a positive impact on compliance. Additionally, a majority of the more than 7,000 code officials, architects, engineers, and other participants in NYSERDA's training activities have indicated that NYSERDA's training on code compliance helped them grapple with the complexities of the energy code and improve compliance.</li><li>• There remains the opportunity to build on this success: It is forecasted that an average of over 253 million square feet of new commercial and multifamily buildings,<sup>4</sup> and over 16,000 low-rise residential<sup>5</sup> dwelling units will be built in New York State annually over the next 5 years. In addition, a significant amount of commercial and multifamily space will undergo renovations that include energy systems, thereby triggering code compliance.</li><li>• In addition, the Energy Conservation Construction Code of New York State (ECCCNYS) and the national model energy codes it follows<sup>6</sup> do not adequately address all aspects of a building's energy use or energy production needed to maximize energy savings and meet the state's greenhouse gas reduction goals.</li><li>• Stretch energy codes can introduce technologies and strategies that lead buildings to achieve greater efficiencies. However, to date only a handful of</li></ul>
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<sup>1</sup> "Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results," Industrial Economics Incorporated for NYSERDA, February, 2016, p.5.

<sup>2</sup> Activities identified in NYSERDA's investment plan for New Construction Comprehensive Strategy – distinct from those covered here – will complement this effort by providing financial support for incorporation of more advanced energy technologies and designs in new buildings, thereby providing demonstrated market performance that can be used to help justify adoption of codes with higher performance goals.

<sup>3</sup> <https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/Codes-Process-Evaluation-Report.pdf>

<sup>4</sup> Dodge Data. Multifamily buildings greater than 3 stories.

<sup>5</sup> Dodge Data. Low-rise residential includes 1-4 family homes and multifamily buildings of 3 stories or less.

<sup>6</sup> The national model energy standards are the International Energy Conservation Code (IECC) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1.

	<p>jurisdictions have already adopted or have expressed interest in adopting a stretch code.</p> <ul style="list-style-type: none"> <li>• Furthermore, State and local code enforcement staff face challenges due to the complexity of the energy code, attrition, local budget cuts, and reduction in technical support from the Department of State.<sup>7</sup> Presently, most building departments in the state do not have staff that specialize in energy code enforcement.<sup>8</sup> The staff that is available needs regular training to stay current on changes to codes, technology and other innovations. Officials typically do not know successful compliance applications and enforcement strategies or compliance issues that may exist, and therefore cannot address them.<sup>9</sup></li> <li>• Exacerbating these challenges, results of a 2014 survey of code enforcement officials<sup>10</sup> found that 31% of code officials in the United States plan to retire by 2019, with an additional 51% retiring by 2029. The survey also indicated that there aren't enough young people entering the building inspection field to offset these losses, further increasing the need for training activities and alternative enforcement business structures.</li> </ul>
<p><b>Intervention Strategy</b></p>	<p>NYSERDA will build on its past efforts to help support adoption of energy codes with higher performance goals and strengthen compliance and enforcement by:</p> <ul style="list-style-type: none"> <li>• Supporting code compliance and enforcement, including general support services (e.g., training, compliance platforms, etc.) for local jurisdictions statewide, and customized support services for jurisdictions that pay into the System Benefits Charge (SBC).</li> <li>• Promoting code development and advancement activities, including stakeholder engagement, market research of stretch codes, and validation of savings from advanced technologies.</li> <li>• Conducting pilots to identify barriers and opportunities surrounding code development and advancement, test alternative code enforcement structures, and assess approaches to stretch and zero codes.</li> <li>• Enacting code, including support for the enactment of ECCCNY and stretch codes,<sup>11</sup> on a statewide basis.</li> <li>• Developing a path to energy codes that addresses all aspects of a building's energy use and moves the market in a way that is prompt and supportive without being disruptive.</li> </ul> <p>For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Code to Zero," which can be found in Appendix A.</p>
<p><b>Goals</b></p>	<ul style="list-style-type: none"> <li>• Develop a path to codify a stretch code to zero as a baseline code by 2030.</li> <li>• Increase the percentage of buildings that are code compliant.</li> <li>• Increase the number of jurisdictions that adopt stretch codes.</li> <li>• Increase the number of jurisdictions that adopt alternative enforcement structures to improve code enforcement.</li> <li>• Accelerate the advancement of the energy code and stretch codes to achieve greater carbon reductions.</li> </ul>

<sup>7</sup> "New York Gap Analysis," prepared by the Trust for Conservation Innovation/Building Codes Assistance Project, April 2016, p. 21.

<sup>8</sup> Ibid, p.27.

<sup>9</sup> "Establishing a Plan to Achieve Energy Code Compliance in Cities, 2014, City Energy Project, p. 4.

<sup>10</sup> "The Future of Code Officials: Results and Recommendations from a Demographic Survey," 2014, International Code Council and National Institute of Building Sciences.

<sup>11</sup> A stretch energy code is a voluntary, locally adopted and implemented alternative to a mandatory statewide minimum energy code. It allows local governments and communities to implement a more stringent energy code that is readily adoptable and is easier to enforce.

<p><b>State Energy Plan/Clean Energy Standard Link</b></p>	<ul style="list-style-type: none"> <li>• Generally, the 2015 State Energy Plan identifies buildings as a major source of energy use and greenhouse gas (GHG) emissions in the State. This strategy will reduce energy consumption and GHG emissions associated with buildings, both as a function of how buildings are operated and the efficiency of the installed equipment, contributing to State Energy Plan goals to reduce GHG emissions by 40% and to implement a 600 trillion BTU increase in statewide energy efficiency.</li> <li>• More specifically, the Energy Plan identifies building codes as a critical strategy for improving the energy efficiency of New York’s building stock and calls on NYSERDA to “provide in-person and online training for architects, engineers, contractors, and code officials, as well as other support resources such as technical publications.” This initiative will serve as a mechanism to provide these code supporting resources.</li> <li>• This initiative also supports achievement of the Clean Energy Standard goal for renewable resource electric generation (50% renewable electric generation by 2030 – “50 by 30”) by reducing the overall electric load, and therefore the amount of renewables necessary to meet the 50 by 30 goal.</li> </ul>
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22.1.2 Target Market Characterization

<p><b>Target Market Segment(s)</b></p>	<p>The target market is defined as:</p> <ul style="list-style-type: none"> <li>• Commercial and residential construction<sup>12</sup>, with an initial focus on low-rise residential, high-rise multifamily, commercial offices, stand-alone retail, and hotels.</li> <li>• Jurisdictions with the highest level of forecasted new construction activity, including New York City, Long Island, Western New York, Hudson Valley and Capital District.</li> <li>• State and national energy code policy makers.</li> </ul>
<p><b>Market Participants</b></p>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Architects</li> <li>• Engineers</li> <li>• Code Officials</li> <li>• Builders/Developers</li> <li>• Design Professionals</li> <li>• Construction Trades</li> <li>• Energy Professional firms such as energy efficiency consultants, developers, energy service companies</li> <li>• Other Community Stakeholders (e.g., other municipal officials, utility representatives, etc.)</li> </ul>
<p><b>Market Readiness</b></p>	<ul style="list-style-type: none"> <li>• Code officials, design professionals and construction trades seek out energy code training to stay current with code changes and to identify solutions where complying to code is problematic. More than 7,000 individuals took NYSERDA-sponsored code training over the past 3 years.</li> <li>• Effective training techniques vary based on participants. While classroom training is still necessary, on-line, visual hands-on training, and other training</li> </ul>

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<sup>12</sup> The International Energy Conservation Code defines “residential” construction as one- and two-family dwellings and multiple single-family dwellings (e.g., townhouses), and multifamily buildings that are three stories or less. “Commercial” construction is defined as all other buildings not included in the definition of residential, i.e., assembly, educational, business, institutional, mercantile, factory/industrial, hotels/motels, etc. “2015 International Energy Conservation Code and Commentary,” International Code Council, Inc., 2015, pp. C2-4, C2-13.

	<p>techniques have been used successfully to increase participants’ understanding of methods to achieve code compliance.<sup>13</sup></p> <ul style="list-style-type: none"> <li>• Quality assurance platforms are available or in development that will reduce code complexity, allowing for improved enforcement of the energy code.</li> <li>• Other alternative business structures for enforcement, such as enforcement at the county level,<sup>14</sup> rather than at the local level, or use of third party technical code specialists, have been used successfully to improve code enforcement.</li> <li>• Nationally, several cities, states and provinces have already adopted aggressive stretch codes. These jurisdictions recognize that the national model code may not be able to achieve the level of energy efficiency necessary to achieve net-zero-capable buildings, especially for buildings that are taller and more complex and those located in densely settled urban areas. California and Massachusetts offer proven stretch code strategies with readily adoptable model language and aligned incentives to encourage adoption by local jurisdictions.</li> <li>• There are experts in the market who are available to provide technical and regulatory assistance for code-establishing agencies. Furthermore there are active stakeholder groups who attend and participate in code hearings. Currently the United States Department of Energy (US DOE) makes available modeling protocols for several different building prototypes.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Training, workload assistance, and tools will increase the effectiveness of code enforcement officials at enforcing code.<sup>15</sup> Other training will provide architects, engineers and participants in the construction trades with solutions to comply with code, particularly for challenging applications, reducing their soft costs.</li> <li>• A model stretch code will provide progressive jurisdictions the opportunity to advance climate goals with a code that is cost effective and easy to enforce.</li> <li>• Improved code compliance will provide energy savings and carbon reductions for municipalities, as well as increased building comfort for building occupants.</li> <li>• Streamlining compliance and enforcement activities will save taxpayer money and will improve the permit processing.</li> </ul>

22.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA conducted market research with architects, engineers, code enforcement officials, and other entities involved with code compliance and construction to identify gaps and barriers in compliance and enforcement. Results of this analysis informed the strategies and activities in this investment plan for improving compliance and enforcement.</li> <li>• Stakeholders from various sectors, including but not limited to owner and sector representatives, energy efficiency professionals, and communities will be engaged throughout this initiative to identify needs, barriers and obstacles, to determine market responses to proposed activities, and to identify future adjustments or changes in focus.</li> <li>• NYSERDA will build on these stakeholder relationships and continue to seek input, direction, and feedback on activities.</li> </ul>
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<sup>13</sup> “Advanced Energy Codes Program: Knowledge Survey Process Evaluation,” prepared by Industrial Economics, Incorporated, September 2016, p. 15-16.

<sup>14</sup> Chenango, Jefferson, and Wyoming Counties have implemented this approach.

<sup>15</sup> “New York Gap Analysis,” prepared by the Trust for Conservation Innovation/Building Codes Assistance Project, April 2016.



22.1.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Lack of energy code understanding.</b> Code enforcement officials find the energy code to be complex, especially the commercial energy code, and are unsure when it is triggered in commercial buildings, how it applies to existing buildings, and how it impacts other building codes.<sup>16</sup> NYSERDA will offer training statewide to improve the knowledge of these officials and offer them insights into building processes and systems that are often a challenge relative to energy code compliance and which may impact other building codes.</li> <li>• <b>Lack of energy code training.</b> Code enforcement officials, design professionals, builders, developers and the construction trades lack the training to stay current on changes to energy codes, advanced technologies, and other innovations that would improve code compliance. Other challenges include a lack of educational or training opportunities.<sup>17</sup> NYSERDA will offer audience-specific training statewide to improve the knowledge of these entities and introduce them to advanced technologies and strategies that improve code compliance.</li> <li>• <b>Code enforcement departments are resource constrained.</b> Code enforcement officials report that lack of time or staff is the biggest challenge to code enforcement. Quality assurance applications, county-wide code enforcement, third party plan reviews and other alternative enforcement structures exist that can help jurisdictions improve code enforcement. NYSERDA will work with code enforcement officials to identify opportunities for these support services to be provided to resource-constrained jurisdictions.</li> <li>• <b>Lack of knowledge of value in adoption of stretch codes.</b> Many jurisdictions do not see value in a stretch code. Many municipal officials fear increased code requirements will hamper economic development because of perceived higher first costs. Community pressure to be less stringent is also a concern.<sup>18</sup> A stretch code is perceived to increase the complexity of the energy code. With 1600 jurisdictions deciding whether to adopt a stretch energy code, it creates an issue of scale and a potential patchwork of requirements for the market to respond to. NYSERDA will address these barriers by developing a stretch code format that is cost effective and easy to adopt and enforce, and by piloting stretch code adoption with several progressive jurisdictions to identify opportunities and hurdles that may exist in adopting and exercising a stretch code.</li> <li>• <b>National model codes do not address all aspects of a building's energy use, and the pace of national model code advancement will not support New York State's greenhouse gas reduction goals.</b> The next version of the ECCCNY is dependent upon the national code and US DOE's review of the cost-effectiveness of that code at the state level. NYSERDA will identify advanced technologies and strategies not currently covered by model codes and validate the achievable savings to inform state and national codes. Pilots of approaches to stretch codes will be studied to determine their credibility and applicability to New York State's climate, their cost effectiveness, and barriers and opportunities to their adoption.</li> <li>• <b>Constraints on resources and expertise prevent timely enactment of state and local codes.</b> NYSERDA will provide technical support and modeling services to the Department of State to support enactment of the state energy code and to local jurisdictions who adopt stretch codes.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If NYSERDA provides audience-specific training content and approaches, then more of the target audience will attend these trainings.</li> </ul>

<sup>16</sup> “New York Gap Analysis,” Ibid., p. 21-22.

<sup>17</sup> Ibid., p.21.

<sup>18</sup> “New York Gap Analysis,” bid., p. 25.

	<ul style="list-style-type: none"> <li>• If NYSERDA provides audience-specific training content and approaches, then the application of code by trained participants will improve.</li> <li>• If NYSERDA demonstrates that an alternative enforcement business structure is cost effective and improves enforcement, jurisdictions will adopt it.</li> <li>• If NYSERDA validates the achievable savings from advanced technologies and strategies not currently covered by the ECCCNY and model codes, they will be incorporated into stretch codes and future cycles of the model codes.</li> <li>• If NYSERDA shows that a model stretch code is cost effective, easy to adopt and enforce, and will advance climate goals, jurisdictions will adopt it.</li> <li>• If NYSERDA provides technical support to state or local jurisdictions for enacting an energy code, it will be adopted more quickly.</li> </ul>
<p><b>Activities</b></p>	<p>The activities under this plan seek to improve code compliance and enforcement, assist in the development and advancement of codes, and assist in the enactment of codes, allowing NYSERDA to develop a path to codify a stretch to zero code.</p> <p><b>Support for Code Compliance and Enforcement</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will offer trainings statewide to improve the knowledge of code enforcement officials, design professionals, the construction trades, and energy professionals and introduce them to technologies and strategies that improve code compliance. <ul style="list-style-type: none"> <li>○ Training efforts will include classroom, web-based, in-the-field training, and conferences. The curricula will be tailored to the specific audience and building sector.</li> <li>○ Services will be procured under mechanisms such as mini-bids or solicitations. Mini-bids will use either existing contractor pools available at NYSERDA or a codes-specific pool developed through a request for qualifications process.</li> <li>○ Current training contracts, competitively selected under NYSERDA’s Technology &amp; Market Development (T&amp;MD) portfolio, will be extended with Clean Energy Fund (CEF) funds to provide continuity in the market while a solicitation is developed and issued for audience specific training content and approaches and provision of support services.</li> </ul> </li> <li>• NYSERDA will provide general support services (e.g., training, platforms, etc.) statewide and customized support services (e.g., plan review, inspections, etc.) to assist resource constrained local jurisdictions that pay into the SBC, to supplement existing code enforcement resources.</li> <li>• NYSERDA’s activities will include teaming with Clean Energy Communities outreach efforts to inform community stakeholders on the value of enforcing ECCCNY and any stretch code that is adopted.</li> </ul> <p><b>Code Development and Advancement</b></p> <ul style="list-style-type: none"> <li>• Stakeholder input and public comment informed NYSERDA’s first version of the one-cycle stretch code<sup>19</sup> called “NYStretch-Energy.” Future versions of NYStretch-Energy will be informed by stakeholders including energy efficiency professionals, utility representatives, representatives of market groups (e.g., Real Estate Board of New York, National Association of Home Builders), and staff from New York City’s Department of Buildings and the Mayor’s Office of Sustainability. Their feedback will inform NYSERDA on all aspects of NYStretch-Energy including, but not limited to technologies, efficiency levels, building</li> </ul>

<sup>19</sup> Energy codes are developed on a three year cycle. Typically by the time New York enacts the ECCCNY, the next version of the energy code has been developed. A “one-cycle” stretch code would include elements of the next version of the energy code and therefore, when adopted, would be one code cycle ahead of the ECCCNY.

	<p>types, and ease of adoption, compliance and enforcement. Contractor(s) will be engaged to assist with the stakeholder and public comment process and to draft the code language</p> <ul style="list-style-type: none"> <li>• Market research will be conducted to determine how communities in New York State view one-cycle stretch codes and stretch to zero codes.<sup>20</sup> This effort will help inform Code to Zero activities, including the development of a plan to achieve a stretch to zero code baseline by 2030. Interest, barriers, and opportunities will be identified. This effort will prioritize NYSERDA’s outreach activities and inform messaging.</li> <li>• For new technologies and strategies to be adopted by the market and incorporated into state and national model code, savings must be validated and the technologies demonstrated to be cost-effective. Market research will be conducted to identify case studies of successful incorporation of advanced technologies and of systems typically addressed in renovation, including information on the building types, technologies, location, and renovation scopes involved. In addition, measurement and verification activities identified in NYSERDA’s New Construction Comprehensive Strategy investment plan will complement this effort by providing verified information on the incorporation of more advanced energy technologies and designs in new buildings, thereby providing demonstrated market performance that can be used to help justify adoption of codes with higher performance goals.</li> <li>• Newly constructed buildings in targeted sectors<sup>21</sup> that incorporated advanced technologies or strategies not yet considered in code will be identified so that achievable savings and Energy Use Intensities (EUIs) can be validated. Where similar uses or space types exist in other building sectors (e.g., approaches that work for hotels that would translate well in dormitories), lessons learned will be considered for other market segments. Results from this activity will be used to inform stretch code activities and, where appropriate, suggestions or code language will be submitted to the national code councils for consideration during the development process for future iterations of national model codes.</li> </ul> <p><b>Pilots</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will issue a series of competitive solicitations for pilots to test new approaches to code development, enactment and enforcement. Pilot participants may be from any region of New York State, however only SBC-paying jurisdictions may receive any available incentive funding. Participants will be selected based on criteria such as geographic diversity, replicability, savings potential, and value of the proposed services. Once the participants are selected, NYSERDA will provide technical assistance, track and monitor progress, and collect and share results of the pilots. Where appropriate, results from the pilots will be submitted with requests for revised code language to the national code council for consideration during development of future iterations of national model codes. <ul style="list-style-type: none"> <li>○ <b>Pilot #1: Enforcement.</b> Entities will be invited to demonstrate alternative enforcement business structures, (e.g., county level code enforcement, quality assurance platforms for plan reviews and inspections, third party services, etc.) that can improve code enforcement.</li> <li>○ <b>Pilot #2: One-cycle Stretch Code.</b> Communities will be invited to demonstrate a one-cycle stretch code to identify barriers, opportunities,</li> </ul> </li> </ul>
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<sup>20</sup> A “stretch to zero” code refers to an energy code that would go beyond a one-cycle stretch code such that a building’s energy use would be near or the same as the energy it generates. It may also address unregulated systems (e.g., plug load, data centers, etc.), renewable technologies, district (vs building) energy systems, and zoning requirements.

<sup>21</sup> See Target Market Segments section.

	<p>and lessons learned regarding the adoption, implementation and enforcement of stretch codes. Communities will respond to a list of suggested areas of assistance, or propose other needs, and demonstrate why the assistance is necessary to adopt a one-cycle stretch code. Pilot activities will be based on communities’ needs and may include funds for training assistance, toolkits, or implementation support. NYSERDA will work with the utilities to align them with NYSERDA on offering incentives for projects in communities that adopt a stretch code.</p> <ul style="list-style-type: none"> <li>○ <b>Pilot #3: Stretch to Zero Code.</b> Other cities and states have adopted a variety of approaches to establish a stretch to zero energy code. Jurisdictions will be invited to demonstrate suggested approaches, or propose an approach, to implementing zero energy codes. The pilots will help to determine how well the approaches will work in New York’s climate, their credibility and cost effectiveness, and the barriers and opportunities for them to be incorporated into a stretch to zero code. Pilots may include funding for implementation support to communities that test a zero stretch code approach. NYSERDA will work with the utilities to align them with NYSERDA on offering incentives for projects in communities that adopt a stretch code.</li> </ul> <p><b>Code Enactment</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will provide services (e.g., technical support, modeling services, etc.) to support enactment of the ECCCNY and stretch codes. NYSERDA will contract with technical consultant(s) and provide direct staff time.</li> <li>• Utilities will be invited to participate in stretch code development and will be informed of jurisdictions that adopt a stretch code in conjunction with NYSERDA’s support.</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2017)</u></p> <ul style="list-style-type: none"> <li>• Extend training and third-party plan review contracts.</li> </ul> <p><u>Milestone 2 (2017)</u></p> <ul style="list-style-type: none"> <li>• Issue a procurement to provide third-party services through 2018.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue NY Stretch-Energy stretching off of IECC<sup>22</sup> 2018.</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue Pilot #1 solicitation to pilot alternative enforcement structures.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue Pilot #2 solicitation for pilot communities to adopt NY Stretch-Energy (IECC2018).</li> </ul> <p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue solicitation for audience-specific training content and approaches.</li> </ul> <p><u>Milestone 7 (2018)</u></p> <ul style="list-style-type: none"> <li>• Finalize plan to codify stretch-to-zero as baseline by 2030.</li> </ul> <p><u>Milestone 8 (2019)</u></p> <ul style="list-style-type: none"> <li>• Contract Pilot(s) #1 for alternative enforcement business structures.</li> </ul>

<sup>22</sup> IECC = International Energy Conservation Code created by the International Code Council through a consensus-based process.

	<p><u>Milestone 9 (2019)</u></p> <ul style="list-style-type: none"> <li>Contract Pilot(s) #2 for adoption of NY Stretch-Energy (IECC2018).</li> </ul> <p><u>Milestone 10 (2019)</u></p> <ul style="list-style-type: none"> <li>Contracts for audience-specific training content and approaches.</li> </ul> <p><u>Milestone 11 (2019)</u></p> <ul style="list-style-type: none"> <li>Issue Solicitation to develop NY Stretch-Energy stretching off of IECC2021.</li> </ul> <p><u>Milestone 12 (2019)</u></p> <ul style="list-style-type: none"> <li>Issue Pilot #3 solicitation for pilot communities to test Stretch to Zero code approaches.</li> </ul> <p><u>Milestone 13 (2020)</u></p> <ul style="list-style-type: none"> <li>Contract for development of NY Stretch-Energy (IECC2021).</li> </ul> <p><u>Milestone 14 (2020)</u></p> <ul style="list-style-type: none"> <li>Contract Pilot(s) #3 to test Stretch to Zero code approaches.</li> </ul> <p><u>Milestone 15 (2021)</u></p> <ul style="list-style-type: none"> <li>Issue NY Stretch-Energy stretching off of IECC 2021.</li> </ul> <p><u>Milestone 16 (2021)</u></p> <ul style="list-style-type: none"> <li>Disseminate results of pilots for alternative enforcement business structures.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>Code compliance reaches a level of 90% across the State.</li> <li>20% of the jurisdictions in the State adopt a stretch code.</li> <li>Jurisdictions who have adopted alternative code enforcement structures or to whom training and supplemental services have been provided report improved enforcement of the energy code.</li> </ul>

22.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>NYSERDA will share both the details of the stretch code development process and the final product with utilities. Utility representatives will be invited to participate in stretch code development and to provide comments during the public comment period.</li> <li>A coordinated effort between NYSERDA and the utilities, and DPS if necessary, is needed to establish a single baseline for code that would apply to incentives statewide and reward projects within communities that adopt stretch codes. NYSERDA will establish a meeting with the utilities upon approval of the investment plan by DPS and will hold periodic meetings until there is alignment on an approach for this subject.</li> </ul>
<b>Utility Interventions in Target Market</b>	The New York utilities do not currently have any similar offering to this market.

22.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and

Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

Budget	2017	2018	2019	2020	2021	2022	Total
Direct Incentives and Services	\$ -	\$ -	\$ 2,000,000	\$ 3,650,000	\$ -	\$ -	\$ 5,650,000
Tools, Training, and Replication	\$ -	\$ 1,700,000	\$ 7,850,000	\$ -	\$ 800,000	\$ 500,000	\$ 10,850,000
Implementation Support	\$ 160,000	\$ 1,620,000	\$ 1,690,000	\$ 330,000	\$ 500,000	\$ 200,000	\$ 4,500,000
Total	\$ 160,000	\$ 3,320,000	\$11,540,000	\$ 3,980,000	\$ 1,300,000	\$ 700,000	\$ 21,000,000

**Table 2: Annual Expenditures Projection**

Expenditures	2017	2018	2019	2020	2021	2022	2023	2024	Total
Total	0%	10%	23%	22%	23%	16%	5%	0.5%	100%

### 22.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

Indicators <sup>23</sup>		Baseline (Before/Current)	2021 (Cumulative)
Activity/ Outputs	# of individuals receiving NYSERDA-supported code training by market segment and building type	7,000	13,250
	# of Pilots	0	6
	# of entities NYSERDA supports in the enactment of energy codes	0	5
Outcomes	Percentage of market complying with the energy code.	TBD	%Δ = 10% <sup>24</sup>
	# of jurisdictions (outside of the pilots) adopting alternative enforcement business structures	0	8
	# of jurisdictions (outside of the pilots) adopting stretch code	0	10

<sup>23</sup> TBD denotes that NYSERDA requires more data in order to quantify baseline/market metrics to the degree needed to measure against in the future. Baseline measurements of key market indicators are anticipated to occur soon following initiative approval and NYSERDA will update the information in this table as the information becomes available, which is anticipated within 9-12 months of initiative approval. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>24</sup> A study by Pacific Northwest National Laboratory indicates that for commercial codes, compliance in the first year when a new code is adopted is estimated at 50%. This rate increases asymptotically every year to near 80% after 10 years. For residential codes, compliance in the first year is estimated at 80%, going to 100% (asymptotically) after 10 years. “Impacts of Model Building Energy Codes,” p. iv and 9, PNNL-25611 Rev. 1, October 2016, Pacific Northwest National Laboratory.

Other outcomes that will NYSEDA will be monitoring include:

- Integration of stretch code concept into ECCCNY by NYS DOS.
- Development of a more comprehensive national model code that addresses all aspects of a building's energy use and energy production.

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. The direct benefits in Tables 4 and 5 align with the direct incentives and services funding in Table 2. The funding in 2017-2018 and 2021-2022 will be used for code training, enforcement and enactment activities, which are reflected in the indirect benefits.

**Table 4. Direct Impacts<sup>25</sup>**

Primary Metrics <sup>26</sup>		2017	2018	2019	2020	2021	2022	TOTAL
Energy Efficiency	MWh Annual	-	-	66,300	99,400	-	-	165,700
	MWh Lifetime	-	-	1,660,000	2,490,000	-	-	4,142,000
	MMBTu Annual	-	-	52,900	79,300	-	-	132,200
	MMBTU Lifetime	-	-	1,320,000	1,980,000	-	-	3,306,000
	MW	-	-	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-	-
	MW	-	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	-	37,900	56,900	-	-	94,830
CO2e Emission Reduction (metric tons) Lifetime		-	-	949,000	1,420,000	-	-	2,371,000
Customer Bill Savings Annual (\$ million)		-	-	\$9.35	\$14.0	-	-	\$23.37
Customer Bill Savings Lifetime (\$ million)		-	-	\$234.0	\$351.0	-	-	\$584.3
Private Investment (\$ million)		-	-	\$220.0	\$293.0	-	-	\$513.5

**Table 5. Annual Projected Initiative Participation**

Participants <sup>27</sup>	2017	2018	2019	2020	2021	2022	Total
Training	250	1500	1500	1500	1500	1500	7750
Pilots	-	-	3	3	-	-	6
Total	250	1500	1503	1503	1500	1500	7756

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one

<sup>25</sup> These direct impacts are based only on new construction activity. There is no data available currently to calculate the impact of this initiative on reconstruction activity that must adhere to energy codes. When the impacts from that activity is included, it is expected that direct benefits will be higher.

<sup>26</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 25-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSEDA's programs.

<sup>27</sup> Training participants are architects, engineers, design professionals, builders/developers, members of the construction trades, code enforcement officials, elected officials, and communities. Pilots reflect the number of communities where one-cycle stretch codes and stretch codes to zero will be tested.

year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 6. Estimated Indirect Market Impact**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	88,600	184,000	243,000
	MMBtu Cumulative Annual	271,000	401,000	474,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		62,400	120,000	155,000

### 22.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• This initiative will be offered as a fuel neutral program as building energy codes cover total building energy, including electricity and all fuels.</li> <li>• Offering the Code to Zero initiative on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$221 per ton of carbon, compared to a cost of \$241 per ton of carbon in an electric only scenario.</li> </ul>
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### 22.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>• Collect, analyze and report on progress of the initiative by comparing progress against identified goals on a regular basis (i.e., quarterly, bi-annually).</li> <li>• The strategy design will be tested to gauge the target population’s reaction to the strategy. This information will be used to help inform decisions about how to allocate time and resources within the initiative and to confirm market interest and preparedness for full scale implementation.</li> <li>• Insights as to how the initiative can be optimized will be gathered and applied to future initiative design to ensure greatest market impacts within the identified market sectors.</li> <li>• Activity specific test-measure-adjust work will include: <ul style="list-style-type: none"> <li>○ Compliance: Assess the impact of NYSERDA’s training to improve compliance. Receive input from stakeholders on training components and approaches. Review and adjust as necessary.</li> <li>○ Alternative Enforcement Business Structures: For each structure used, assess its impact on the enforcement process (e.g., how effective was it? How easy was it to use? Cost compared to value? Etc.). Identify market potential to offer tool or service without NYSERDA assistance. Solicit input from users and stakeholders. Review and adjust as necessary.</li> <li>○ Stretch Code Pilots: Assess ease of adopting stretch code, compliance to stretch, barriers to and opportunities from adoption, success of alternative approaches, energy savings. Receive input from stakeholders. Review and adjust as necessary.</li> </ul> </li> </ul>
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- Enactment: Assess the impact of NYSERDA's services to support code enactment on state and local level. Review services offered to determine need and effectiveness. Receive input from stakeholders. Review and adjust as necessary.

Market Evaluation

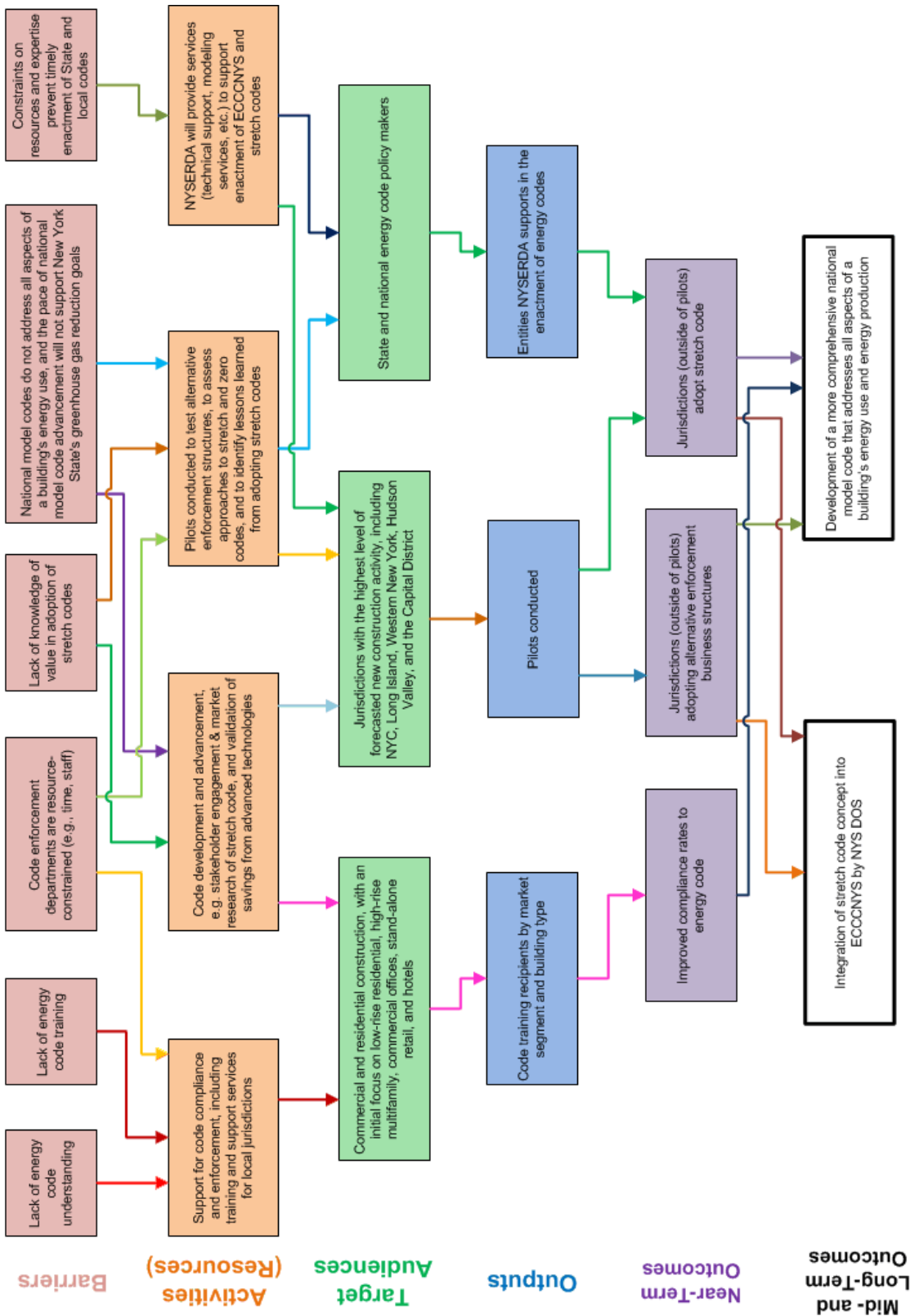
- Market evaluation will draw on the logic model and will include baseline measurements of key market indicators. Regular longitudinal measurements (e.g., annual or biennial) will include updates of the baseline metrics as well as additional measurements to assess market change resulting from the initiative.
  - Due to the historically demonstrated difficulty of obtaining samples for studying code compliance, Delphi panels will be utilized in order to track key indicators in the initiative that would traditionally require widespread data collection to measure, such as the number of jurisdictions adopting alternative enforcement business structures and stretch codes. This will allow NYSERDA to trade expensive, widespread sampling for focused, expert consensus where appropriate. In order to supplement the panels, a targeted longitudinal study may be conducted for a limited number of representative jurisdictions. This longitudinal study would not be used to draw conclusions about the population of new construction or renovation projects, but rather as a comparison to the Delphi panel responses to validate findings or raise questions in need of additional research.
  - Baseline measurements of key market indicators will occur within one year following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These include but are not limited to: number of recipients receiving training and improvement in code compliance levels.
- Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: number of jurisdictions adopting alternative enforcement business structures, pilots conducted to inform code compliance issues and opportunities, and increases in energy efficiency as a result of new and substantially renovated buildings.
- The evaluation will also:
  - Assess impact of audience-specific training content and approaches. Review training effectiveness using an established framework such as the Kirkpatrick model. Receive input from attendees and stakeholders and adjust training content and approaches as necessary.
  - Interview architects and engineers to discuss project plans that met energy code. Determine if projects were built as planned or if variances to the energy code were filed.
  - Survey code departments to identify building applications with and without variances, and identify whether there are any variances to the energy code.
- Market evaluation will build a longitudinal model to measure non-compliance over time by interviewing builders, code officials, and other key municipal officials 6 months prior to and 6 months after a change in the ECCCNY. This will enable NYSERDA to collect the data necessary to determine level of compliance and impact of training across different iterations of the Energy Code.
- As appropriate, the market evaluation will leverage sector-level market studies as well as publicly and commercially available data to inform the tracking of key market indicators.

Impact Evaluation/Field Verification

- Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users. Impact Evaluation will have access to code compliance evaluation and other data necessary to validate direct impacts per International Performance Measurement and Verification Protocol (IPMVP) standards.

# Appendix A – Logic Models

## LOGIC MODEL: Code to Zero



## Appendix B –Investment Plan Review Supplement<sup>1</sup>

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<sup>1</sup> As this report includes performance through Q2 2017 and the Code to Zero Initiative was filed in Q4 2017, that initiative is not included herein.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: On-Site Power Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

November 1, 2017

Clean Energy Fund Investment Plan:  
On-Site Power Chapter

<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
November 1, 2017	Original Issue	Original Issue

## 23 On-Site Power

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On-site power production, also known as Distributed Generation (DG), involves the self-production of electricity at or near its point of use. New York State is experiencing great adoption of on-site power by building owners who value the economic savings, enhanced energy resiliency, and reduction in carbon emissions. NYSERDA will continue to support greater adoption of a wide variety of DG technologies, however several emerging on-site power technologies continue to have very low penetration in the marketplace and relatively high costs. More-effective approaches are needed to help these markets improve their value propositions, with the ultimate goal of discovering adequate revenues from marketplace sources.

The first initiative described in this chapter is Fuel Cells initiative. Fuel cells are a class of emerging technology which has struggled to reduce costs and monetize the values which differentiate it from other on-site power options available to customers, and as such, has been challenged to demonstrate a compelling value proposition which can grow the market to scale in New York in near term. As the New York State energy market transforms, it will be important for fuel cell stakeholders to understand how the capabilities of their projects could appeal to high-value customers, and how projects could be sited and configured so as to capitalize on the various components of market-based compensation that may be available, in order to develop successful business models.

Through the Fuel Cell initiative, NYSERDA will encourage the fuel cell stakeholders to re-engage in the New York marketplace, including pursuit of projects at high-value customers (such as those who value resiliency), and becoming/staying engaged in applicable policy working groups that are informing the design of market-based compensation mechanisms.

Program investments and activities will continue to be informed through ongoing research, technical analysis, and engagement with stakeholders and subject matter experts.

## 23.1 Fuel Cells

### 23.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• As of the end of 2016, there were 20 continuous-duty stationary power fuel cell systems operational in NYS, representing 10.5 MW.<sup>1</sup> NYSERDA is also supporting 29 continuous-duty stationary power fuel cell projects that are either currently under development or have more-recently begun operation, collectively representing 6.3 MW.</li> <li>• Since the expiration of the Renewable Portfolio Standard Customer-Sited Tier (RPS CST) Fuel Cell program in early 2016, engagement in the New York State marketplace by the fuel cell Original Equipment Manufacturers (OEMs) has dwindled.</li> <li>• To compete effectively with other on-site power options, the fuel cell market will need to improve the value proposition by reducing costs and configuring projects to capture various types of market-based compensation revenues (such as enrolling in demand response programs, siting projects at high-value customer sites or grid-constrained locations, etc.).</li> <li>• The market has indicated that ongoing work in New York State surrounding changes under Reforming the Energy Vision (REV) that are likely to provide new cash flow streams (often referred to as the value stack) could improve the value proposition for fuel cells when combined with a focus on high-value applications. The market has indicated that a concurrent fuel cell incentive program is crucial to encouraging the fuel cell stakeholders to engage in REV and associated working groups so as to drive value stack outcomes that include features which can be leveraged by fuel cells, and to focus on high-value applications within the New York marketplace.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA's offering will provide financial support to assist facilities with projects to install on-site, stationary power, continuous-duty fuel cells to help reduce their energy expenses and greenhouse gas emissions, to relieve strain on the electric utility grid, and where applicable to enhance the resiliency of the host site.</li> <li>• This program will be an evolution of the previous RPS CST Fuel Cell program and will support continuous-duty stationary power fuel cells larger than 25 kW.</li> <li>• For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Fuel Cell Program," which can be found in Appendix A.</li> </ul>
<p><b>Goals</b></p>	<ul style="list-style-type: none"> <li>• Reduce the upfront costs to install and operate fuel cells</li> <li>• Attract fuel cell stakeholders to engage in REV and associated working groups</li> <li>• Drive fuel cell uptake configured for high-value applications.</li> </ul>
<p><b>State Energy Plan/Clean Energy Standard Link</b></p>	<ul style="list-style-type: none"> <li>• This initiative will contribute to the 2015 State Energy Plan goal to reduce greenhouse gas (GHG) emissions by 40% by providing on-site electric generation utilizing equipment that generates less emissions than standard technologies.</li> <li>• The 2015 State Energy Plan states that "REV will complement and further other resiliency efforts by promoting the development of clean, local energy resources that strengthen and improve the reliability of the grid." Continuous-duty stationary power fuel cells operate as a distributed generation resources, which can relieve stress on the grid and improve reliability.</li> </ul>

<sup>1</sup> US Department of Energy data at <https://doe.icfwebservices.com/chpdb/> as of 12/31/2016

### 23.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market segment is fuel cell project developers seeking installation of systems in a grid-connected manner and operated continuous-duty. <sup>2</sup>
<b>Market Participants</b>	Market participants include: <ul style="list-style-type: none"> <li>• End use customers who will host fuel cell installations</li> <li>• Fuel cell project developers, including three OEMs of large stationary power fuel cell systems that have been active in the New York marketplace.</li> <li>• Franchisees who sell, install, and maintain an OEM’s fuel cell product.</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• All three of the active fuel cell OEMs have sales, installation and service channels and offer commercial products with commercial contracts.</li> <li>• Customers who choose to be early adopters of emerging technologies in order to get early exposure and with high-value needs have expressed an interest in assessing the applicability of fuel cells to their needs.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Fuel cells allow end use customers to reduce their GHG emissions and energy costs, and where applicable to enhance the resiliency of the host site.</li> <li>• OEMs (and franchisee, as applicable) benefit in the form of increased sales revenues.</li> </ul>

### 23.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA has engaged in discussions with the three OEMs of large stationary power fuel cell systems that have been active in the New York marketplace. These discussions indicate that an incentive program would assist in creating sales opportunities, which would attract fuel cell OEMs to focus their attention on the New York marketplace, including engaging in REV and associated working groups.</li> <li>• NYSERDA also leveraged experiences gained through nearly a decade of running a fuel cell incentive program under the RPS CST which sunset in February 2016, acquiring on average slightly more than one megawatt-per-year throughout this decade duration. Although NYSERDA had previously invited RPS CST program participation of small continuous-duty stationary power fuel cells (modules size 25 kW and smaller), none materialized, therefore, NYSERDA believes it would be unnecessary to include small fuel cells in this initiative.</li> </ul>
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### 23.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• <b>OEM lack of focus on the NYS market.</b> OEMs focus on markets in other states, such as Connecticut and California, which they view as providing more sales opportunities. Additional financial support for projects can improve the value proposition and attract more participation in the NYS market, and especially can focus pursuit on high-value applications.</li> <li>• <b>Lack of compelling value proposition for fuel cells.</b> Energy cost savings provided by fuel cells frequently do not justify the high project costs for fuel cells. Market structure changes being pursued under REV may increase the</li> </ul>
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<sup>2</sup> The Fuel Cell incentive program is eligible to all sectors, including but not limited to residential, commercial, industrial, agricultural, institutional, educational, not-for-profit, and government-owned facilities.



	<p>revenues that a fuel cell project can accrue, such as when emphasizing locational value, and economics may improve when combined with a focus on high-value applications (such as data center customers who place a high value on reliability, or premium matching of a fuel cell to the load attributes of a prototypical customer).</p>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If fuel cell OEMs are provided with incentive funding, then they will continue to carry out sufficient marketplace activity in NYS long enough to allow for them to familiarize themselves with the new market compensation mechanisms that are emerging, and pivot to business models that improve the monetization of the benefits that fuel cells provide .</li> <li>• If marketplace activity continues, then business models that monetize the various benefits that fuel cells provide will emerge, and use-cases with high-value customers will be demonstrated.</li> </ul>
<b>Activities</b>	<p><b>Offer Open Enrollment Incentives</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will provide an open enrollment incentive program for fuel cell projects. Incentives will be computed based on system nameplate capacity up to a maximum per eligible site where the fuel cell system will be installed.</li> </ul> <p><b>Maintain List of Eligible Equipment</b></p> <ul style="list-style-type: none"> <li>• A list of Eligible Equipment is maintained by NYSERDA on its website. Applicants will submit required documentation to be reviewed by NYSERDA to determine eligibility of the project.</li> </ul> <p><b>Provide Technical Review</b></p> <ul style="list-style-type: none"> <li>• Technical Review is conducted by NYSERDA staff. Installation is completed by firms and vendors that the customer retains on their own. Cost-sharing or incentives will be administered by NYSERDA after proof of successful completion of project milestones (installation milestones, and first annual operating performance milestone).</li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue open enrollment solicitation.</li> </ul> <p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with accepted open enrollment solicitation applicants as they apply through 2019.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Confirm installation of equipment at site. This will start in 2018 and continue in 2019 based on timing of applications.</li> </ul> <p><u>Milestone 4 (2019)</u></p> <ul style="list-style-type: none"> <li>• Confirm first annual performance of fuel cell operation. This will start in 2019 and continue in 2020 based on timing of applications.</li> </ul>
<b>Goals Prior to Exit</b>	<ul style="list-style-type: none"> <li>• OEMs re-engaged in NYS fuel cell market.</li> <li>• Fuel cell project developers gain familiarity with market based compensation mechanisms.</li> </ul>

23.1.5 Relationship to Utility/REV

<b>Utility Role/ Coordination Points</b>	<ul style="list-style-type: none"> <li>• Fuel cells require coordination with electric utilities for electrical interconnection in accordance with the state’s Standardized Interconnection Requirements (NY-SIR), and where applicable coordination with the natural gas utility for acquiring a supply of fuel.</li> </ul>
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<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>Utilities do not administer programs to incentivize installation of fuel cells. Utilities have offered market-based compensation for “non-wires solutions” (i.e., projects implemented by customers on the customer-side of the meter which, through the reduced load on the utility grid, deliver operational savings to the grid operator -- such projects may receive a payment from the utility pro-rated to the explicit benefit accruing to the utility) which may include fuel cells as eligible technologies, and it is foreseeable that this will continue.</li> </ul>
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23.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
Direct Incentives and Services	\$7,500,000	\$7,500,000	\$15,000,000
Total	\$7,500,000	\$7,500,000	\$15,000,000

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
<b>Total</b>	10%	30%	50%	10%	100%

23.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

<b>Indicators</b>		<b>Baseline (Before/Current)</b>	<b>2019 (Cumulative)</b>
Activity/Outputs	Number of fuel cell project incentives provided through program	0	27
Outcomes	Number of OEMs active in NYS	3	3

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes:

- Progress toward monetization of the various benefits of fuel cells and the increase in familiarity with market compensation mechanisms.
- Demonstration of use-cases with high-value customers, such as those who place a premium on resiliency.

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Due to the nature of the activities, estimating energy savings impacts at this stage is difficult because the specific technologies that will be supported are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

**Table 4. Direct Impacts**

Primary Metrics <sup>3</sup>		2018	2019	TOTAL
Energy Efficiency	MWh Annual	33,300	33,300	66,580
	MWh Lifetime	666,000	666,000	1,332,000
	MMBtu Annual			
	MMBtu Lifetime	-	-	-
	MW	4	4	8
Renewable Energy	MWh Annual	-	-	-
	MWh Lifetime	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Annual		3,750	3,750	7,502
CO2e Emission Reduction (metric tons) Lifetime		75,000	75,000	150,000
Customer Bill Savings Annual (\$ million)		\$3.00	\$3.00	\$5.99
Customer Bill Savings Lifetime (\$ million)		\$59.9	\$59.9	\$119.80
Private Investment (\$ million)		\$20.5	\$20.5	\$41

**Table 5. Annual Projected Initiative Participation**

	2018	2019	Total
Participants <sup>4</sup>	14	13	27

<sup>3</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 20-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA’s programs. Energy Efficiency values represent electricity savings from use of the fuel cell; natural gas required to run the fuel cell (518,700 MMBTU cumulative annual and 10,370,000 MMBTU lifetime in Total) is netted out of the emission reduction and bill savings values shown in this table. Emission reductions are net, including both electricity savings which add to the emission benefits and additional MMBTU required to use the fuel cell which subtract from the benefits.

<sup>4</sup> Participants are end-use sites where fuel cells are installed.

NYSERDA does not anticipate achievement of indirect market effects associated with this initiative as it will not induce enough projects to scale-up the market sufficiently such that meaningful economy-of-scale manufacturing cost savings would materialize.

### 23.1.8 Fuel Neutrality

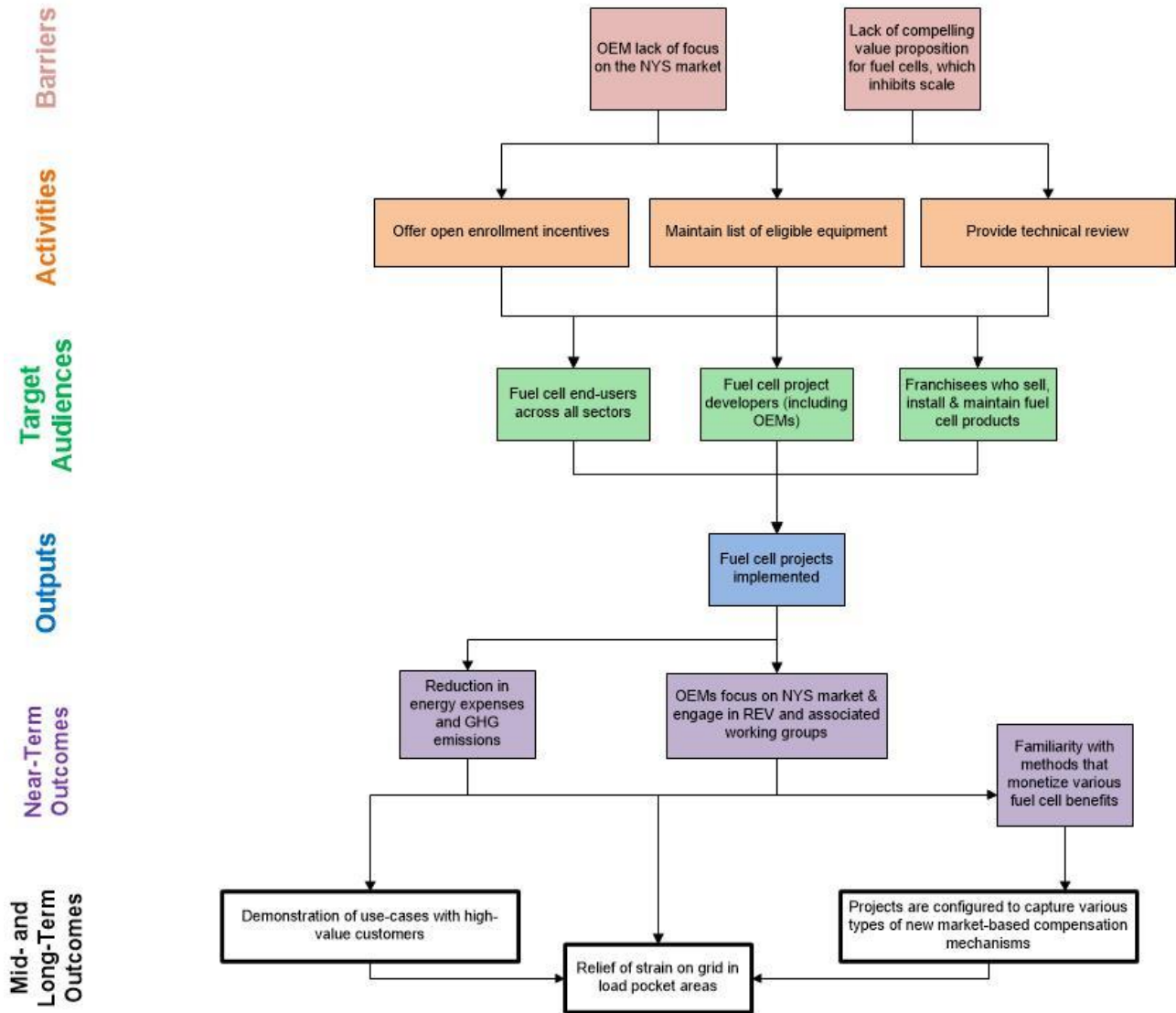
<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>This initiative is not being offered on a fuel neutral basis.</li> </ul>
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### 23.1.9 Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>Collect and analyze fuel cell project data and report on progress of the initiative by comparing progress against identified goals on a regular basis (i.e., quarterly, bi-annually).</li> <li>The design of the fuel cell initiative will be tested to gauge the target population’s reaction to the strategy. This information will be used to help inform decisions about how to allocate time and resources within the initiative and to confirm market interest.</li> </ul> <p><b><u>Fuel Cell Strategy M&amp;V</u></b></p> <ul style="list-style-type: none"> <li>Site inspections will be conducted for each project supported by the initiative to confirm reported system characteristics (e.g., nameplate capacity) and ensure proper system installation.</li> <li>Each system will be enabled to provide generation data to NYSERDA, which will be posted on NYSERDA’s DG Integrated Data System website.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>Market evaluation will draw on the logic model and will address key indicators such as sales of fuel cell systems; changes in familiarity regarding methods that monetize fuel cell benefits; and the demonstration of high-value use cases.</li> <li>As appropriate, the market evaluation will leverage sector-level market studies as well as publicly and commercially available data to inform the tracking of key market indicators.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>Evaluation M&amp;V (EM&amp;V) of direct savings will be carried out in a phased approach that begins with desk review of project-level data collected during site visits and posted on NYSERDA’s DG Integrated Data System website. The initial focus will be on larger projects and consideration will be given to the analysis of small projects as well, if deemed appropriate.</li> <li>If additional EM&amp;V activity is warranted, it will be conducted according to the International Performance Measurement &amp; Verification Protocol (IPMVP) method(s) most appropriate given the systems promoted by this initiative. Additional activity will likely occur for projects with EM&amp;V results that differ significantly from anticipated impacts, or upon request from program staff to maximize learning.</li> <li>Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</li> </ul>
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# Appendix A – Logic Models

## LOGIC MODEL: Fuel Cell Program



## Appendix B –Investment Plan Review Supplement<sup>1</sup>

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<sup>1</sup> As this report includes performance through Q2 2017 and the Fuel Cell Initiative was filed in Q4 2017, that initiative is not included herein.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: New Construction Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

November 1, 2017

Clean Energy Fund Investment Plan: New Construction		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
November 1, 2017	Original Issue	Original Issue



## 24 New Construction

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NYSERDA aims to influence design and construction of new buildings and substantial renovations to increase efficiency in commercial, multifamily and single family new construction, moving the market to ultimately pursue Net Zero Energy Performance. Through the initiatives in this chapter, NYSERDA will facilitate a new construction market in New York State where residential and commercial building owners, occupants, and developers routinely demand and the construction community routinely delivers successful deep energy saving and net zero energy performance buildings.

The first initiative in the chapter is made up of five activities that will increase the awareness of and confidence in the performance of advanced clean energy buildings. NYSERDA will maintain the current standard offer base incentives to maintain a consistent presence in the market to help overcome initial costs and risk barriers related to building advanced clean energy buildings. In addition to reinforcing and extending this support from the initial filing in the Resource Acquisition Transition Chapter, this initiative will seek out opportunities to engage with more innovative market segments, reduce administrative burdens, and shorten project engagement times through a Commercial Pilot program, which will then be used to inform future base incentive offerings.

NYSERDA will also host a Buildings of Excellence Competition for multifamily buildings. The competition will promote advanced clean energy buildings that are highly replicable, achieve superior energy performance, and demonstrate cost effectiveness. Additionally, NYSERDA will conduct a Performance Analysis to assess actual building and equipment performance, which will be used to provide feedback to modeling software tools to increase accuracy, create a Data Library on measure performance, and develop case studies on successful projects to provide building performance validation and increase market demand for advanced clean energy buildings.

Further Activities conducted under this Chapter include Simplified Design and Tools, and Third-Party Standards Development. These activities will promote market-based solutions by increasing the capacity of design and construction teams through training, creating model measure packages for common building types, utilizing technology solutions to improve design development, and validating third-party organizations to provide quality assurance over performance standards.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 24.1 New Construction

### 24.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Approximately 100 million square feet of new construction is built per year in New York State. Once a building is constructed, it is in operation for 50-100 years, and it becomes much more expensive to execute significant energy saving measures. This makes it essential to build as energy efficiently as possible at the time of construction.</li> <li>• However, a significant portion of construction does not meet current New York State Energy Conservation Construction Code (NYS ECCC), let alone more advanced efficiency standards,<sup>1</sup> creating a significant opportunity once addressed to achieve energy savings that will last for several decades.</li> <li>• NYSERDA's Code to Zero initiative is focused on strengthening compliance and advancing adoption of codes with higher performance goals, yet to achieve net zero energy code in the next 15-25 years, the new construction market will need to build and demonstrate cost-effective construction techniques that can be used to help justify the adoption of codes with higher performance goals.</li> <li>• While over 100 Net Zero Capable and Net Zero Energy buildings have been built in New York<sup>2</sup>, analysis of NYSERDA program data to date has shown these highly efficient buildings cost 5-10% more than standard design and construction, limiting their market penetration.</li> <li>• The success of advanced clean energy buildings relies on setting energy goals early-on in the design process. Generally, architects are reluctant to commit to such energy goals at the beginning of a project because they have little information on how their designs will be implemented. Energy simulation modeling can improve this information, but is not being utilized in many cases due to high costs and inconsistent accuracy.</li> <li>• Many developers and building owners do not understand the costs and benefits of various construction decisions, making their decisions based on incomplete or inaccurate information.</li> <li>• Developers in the Low-to Moderate-Income (LMI) market rely on funding awarded from public housing agencies such as New York State Housing and Community Renewal for the construction of LMI housing. Public housing agencies provide these funding opportunities through standard offer programs or competitive solicitations, which have historically required a minimum energy efficiency above code, for new construction projects.</li> <li>• Historically, NYSERDA has provided targeted incentives to owners, developers, and builders to offset a portion of the initial cost and risk for design and construction related to building advanced clean energy buildings and Net Zero Energy performance buildings, across all sectors. This support has enabled participation in key conversations with decision-makers early enough in the design and construction process to influence the results, and support more</li> </ul>
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<sup>1</sup> There are a number of advance performance standards that categorize building performance, including, ENERGY STAR, ASHRAE, LEED, Passive House Institute, Passive House Institute-US, Net Zero Energy, and Net Zero Energy-capable. The New Construction initiative aims to be agnostic in the path to performance, therefore all activities that aim for above-code energy performance refer to advanced clean energy building performance, rather than referencing specific performance standards.

<sup>2</sup> To date, Net Zero Energy activity in New York includes: 60 Net Zero Energy single family homes, plus approximately 80 that are Net Zero Capable; 3 Net Zero Energy low-rise multifamily residential projects, and 8 multifamily projects that are Net Zero Capable; and approximately 60 Commercial projects seeking Net Zero Energy standards, but only a few are built.

	advanced technologies, designs, or deep energy-saving performance-based outcomes.
<b>Intervention Strategy</b>	<ul style="list-style-type: none"> <li>• NYSERDA will build on its past efforts to influence energy decision-making in the design and construction of new buildings, working to make the construction of advanced clean energy buildings the norm across all sectors. To that end, NYSERDA will: <ul style="list-style-type: none"> <li>○ Continue to provide its standard offer new construction incentive program through the Resource Acquisition Transition Chapter for Commercial, Low-rise Residential and Multifamily New Construction in 2018 and through this initiative in 2019 and 2020, in order to serve the needs of most new construction projects while simultaneously testing alternative incentive structures in the Commercial market sector to drive increased impact.</li> <li>○ Issue a Buildings of Excellence Competition to drive innovative design and construction approaches in the Multifamily market, and create highly replicable use cases to spur public interest and demand for advanced clean energy buildings.</li> <li>○ Provide direct support to the design community to enhance the capabilities of architects, engineers, and construction managers to facilitate more advanced building designs and execution, in support of the Buildings of Excellence Competition.</li> <li>○ Develop and issue integrated design and construction protocols, provide guidance on effective project delivery, and support the creation and expansion of online platforms that will help streamline the design process of advanced clean energy buildings.</li> <li>○ Develop data and information resources to document success stories and lessons learned that can be used to provide a cost benefit justification for more advanced technologies, as well as to improve modeling tools.</li> </ul> </li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: New Construction” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Develop tools to make building designs more consistent and reliable, and expedite the review and approval process of buildings.</li> <li>• Increase the confidence in advanced clean energy building practices and technologies.</li> <li>• Reduce the overall costs of advanced clean energy buildings and Net Zero Energy performance construction.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• Generally, the 2015 State Energy Plan identifies buildings as a major source of energy use and greenhouse gas (GHG) emissions in the State. This strategy will reduce energy consumption and GHG emissions associated with buildings, both as a function of how buildings are operated and the efficiency of the installed equipment, contributing to State Energy Plan goals to reduce GHG emissions by 40% and to implement a 600 trillion BTU increase in statewide energy efficiency.</li> <li>• The 2015 New York State Energy Plan states that “NYSERDA will seek to address the diverse set of remaining barriers with new programs and strategies that unlock the potential of energy efficiency to reduce operating costs, spur investment, and create jobs throughout the State.” Driving “commercial interest toward Zero Net Energy in new construction and renovated buildings” is listed as a potential strategy to tap into this energy efficiency potential. This initiative lays out a strategy to achieve this goal.</li> <li>• This initiative also supports achievement of the Clean Energy Standard goal for renewable resource electric generation (50% renewable electric generation by 2030 – “50 by 30”) by reducing the overall electric load, and therefore the amount of renewables necessary to meet the 50 by 30 goal.</li> </ul>

### 24.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	The target market segment includes owners, developers, architects, engineers, energy modelers, and construction entities for new buildings and substantial renovations in single family and multifamily homes, offices, hotels, retail, education, healthcare, and warehouses.
<b>Market Participants</b>	Market Participants include: <ul style="list-style-type: none"> <li>• Code Inspectors</li> <li>• Green Building Verifiers</li> <li>• Tenants and Residents</li> <li>• Manufacturers</li> <li>• Distributors and Suppliers</li> <li>• Finance Community</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• Architects and engineers report that if the market asks for advanced clean energy buildings, they can deliver them. Based on a review of NYSERDA program data of projects to date, analysis has shown Net Zero Energy performance buildings cost 5-10% more to design and build than standard construction. This cost premium is likely causing slower market uptake, in addition to a market perception that the cost is more than 5-10%, and the technology is not ready to reliably meet Net Zero Energy goals.</li> <li>• Builders and Developers are often unwilling to guarantee Net Zero Energy performance as a selling-point due to occupant behavior and unregulated plug-loads. However, they have expressed a willingness and interest in building more advanced clean energy buildings. The success of early adopters must be shared with the rest of the market to move them to action.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Occupants of advanced clean energy buildings benefit from energy bill savings, insulation from energy price shocks, improved occupant comfort, a healthier indoor environment, and resiliency and sustained occupancy during extreme weather events.</li> <li>• Consumers will experience an easier, more streamlined decision-making process for assessing advanced clean energy building options early in the design process.</li> <li>• Building owners and developers will benefit from construction processes that are consistent and reliable, and improved communication among the design, construction and trades, and inspections silos.</li> <li>• Building owners and operators will have increased confidence that the predicted energy savings will be achieved and that their profit streams are accurate.</li> </ul>

### 24.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA has met with members of the design community, who have indicated that they are prepared to build Net Zero Energy buildings if consumer demand grows. They also expressed support for streamlined tools and programs.</li> <li>• NYSERDA has held meetings with industry and government market actors, who have expressed support for an advanced buildings competition.</li> <li>• End use customers have expressed a desire for more predictable energy savings, including Net Zero Energy performance. Some consumers also have requested information about the full costs of incorporating energy efficient or renewable energy technologies.</li> <li>• NYSERDA will continue to engage in outreach to market actors, through one-on-one meetings, as activities are launched in the market to determine if any changes are needed to reach wider market adoption.</li> </ul>
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24.1.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<ul style="list-style-type: none"> <li>• <b>Difficulty predicting energy savings.</b> Predicting energy savings can be expensive and inaccurate, and there is often a lack of market feedback that links actual performance to predicted. Simplified tools and resources will improve the speed and accuracy of predicting energy savings, and provide verified building performance information to improve feedback and accuracy.</li> <li>• <b>Lack of awareness of integrated design practices.</b> There is a lack of market understanding of and confidence in integrated design and construction protocols, including regarding appropriate costs. Addressing information gaps surrounding this process will increase confidence in the process and reduce perceived risks.</li> <li>• <b>Lack of confidence in energy performance ratings and standards.</b> There is a lack of confidence in organizations and mechanisms capable of setting and enforcing energy performance ratings and standards. NYSERDA’s validation and backing of third-party quality assurance and quality control (QA/QC) organizations will enable regulatory agencies, code enforcement officials, financial institutions and the market to rely on those standards and the certified professionals who enforce them to perform these oversight roles without NYSERDA support.</li> <li>• <b>Lack of verified performance.</b> There are not enough advanced clean energy buildings in operation today to provide a large enough body of evidence about the ever changing economics and functionality of these buildings in an environment of continuously increasing energy code requirements. Financial support for highly reliable advanced clean energy buildings will enable the development of a broader data set, further proving the technology.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If building owners and developers are provided more complete and accurate information about predicted building performance, they will seek to include more energy efficient and renewable energy technologies in building design and construction, increasing the market penetration of advanced clean energy buildings.</li> <li>• If NYSERDA delivers a high-profile multifamily building competition, then Developers will respond by commissioning the design and construction of advanced clean energy buildings utilizing new and innovative technologies and buildings practices at a faster pace than would otherwise be achieved.</li> <li>• If the market has better information about integrated design and construction protocols, then the process will be utilized more, reducing the cost of construction of advanced clean energy buildings.</li> <li>• If building performance resulting from integrated design, Net Zero Energy building practices, and advanced technologies can be verified and the data incorporated into energy simulation modeling tools, then modeling software discrepancies between predicted performance and actual performance will decrease and models will become more comprehensive and more accurate.</li> <li>• If NYSERDA supports and validates third-party standards and mechanisms to certify building performance, then the market-delivered certification of building performance will be more broadly utilized by LMI regulatory agencies for public housing solicitations.</li> <li>• If there is a comprehensive effort to quantify actual building performance associated with specific measures or packages of measures, the design community and building owners will have confidence to routinely include those measures for advanced clean energy equipment and construction techniques in projects and standards.</li> </ul>
<p><b>Activities</b></p>	<p><b>Incentives</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will continue to provide the current Standard Offer base incentives as indicated in the Resource Acquisition Transition Chapter, providing support via this initiative starting in 2019 (the offering as presented in the Resource Acquisition Transition Chapter provides support through 2018). The incentive program</li> </ul>

presented as the Standard Offer serves the needs for most new construction projects and will remain intact to maintain a consistent and predictable incentive offer.

- Additional support will be made available through this initiative for multifamily buildings in 2018, in anticipation that the Buildings of Excellence Competition participants will drive increased participation to the Standard Offer incentive program than was originally allocated for in the Resource Acquisition Transition Chapter.
- NYSERDA will also test alternative incentive program approaches for advanced clean energy commercial buildings through a pilot program. Potential approaches that will be tested in the market include, but are not limited to additional paths to participation for commercial buildings (i.e., through certification via third party Standards such as Passive House), greater program flexibility, reduced administrative burdens, and shortened project engagement time.
- The commercial pilot will be delivered through a competitive solicitation, and will drive increased impact by supporting alternative incentive structures. The alternative approaches will be targeted to more innovative market segments that do not respond to traditional program offerings, and will allow a more flexible approach to achieve carbon savings in the most cost-effective manner for their project.
- Based on the results of the commercial pilot, NYSERDA will modify its standard offer solicitation as appropriate to provide incentives to commercial buildings to reduce the cost premium associated with advanced clean energy buildings, incorporating proven successful approaches from the pilot program.

#### **Buildings of Excellence Competition**

- NYSERDA will issue a competitive solicitation to seek proposals on advanced clean energy building designs. The competition will focus on the multifamily sector, for a total of 4 rounds.
- 5 or more winners will be selected for each round of the competition, and awards of up to \$1,000,000 will be granted.
- Proposals will be evaluated based on:
  - Energy Efficiency (measured as the percent improvement over current energy code)
  - Use of onsite or community renewable or distributed energy generation
  - Demonstration of building economic performance, cost effectiveness, and replicability
  - Innovation, resiliency and contributions to architectural aesthetics, sustainability, occupant health and comfort
  - Additional clean energy building criteria (e.g., on-site electric vehicle charging, advanced controls, battery storage, etc.)
- The proposals must include a plan for market outreach and how the project will impact future construction. NYSERDA will provide market recognition through case studies and press releases on the winning projects.
- NYSERDA will promote the Buildings of Excellence Competition winners as replicable advanced building designs to increase awareness of and demand for advanced clean energy buildings and integrated design and construction protocols.
- NYSERDA will support the design community, through trainings, tools, and promotion, to increase the capabilities and capacity of architects, engineers, and design-build firms to deliver competitive building designs.

#### **Performance Analysis**

- NYSERDA will assess actual building and equipment performance to provide confidence in design and construction decisions and validate market models and performance. Data collected will be used to create a Data Library on measure performance.

	<ul style="list-style-type: none"> <li>• Case studies and reports on successful projects will be developed, including what made them successful, lessons learned, and building performance validation reports to increase confidence and consumer demand for advanced clean energy buildings.</li> <li>• At least 12 current and future advanced clean energy buildings will be assessed per year, inclusive of commercial and multifamily buildings.</li> </ul> <p><b>Simplified Design and Tools</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will provide project guidance and information resources, developed, using project data and stakeholder input, to support builders and developers, including: <ul style="list-style-type: none"> <li>○ Integrated design and construction protocols to help the market understand and properly implement integrated projects, including model solicitations (e.g., on selecting an integrated design team)</li> <li>○ Specifications that can be used in public housing award processes, to influence bidding from Public Housing Authorities to include advanced clean energy building practices in bid processes.</li> <li>○ Model measure packages that optimize energy performance for common building types</li> <li>○ An advisor or coach for first time builders and developers that can provide guidance in understanding integrated design and construction processes, review specifications for competitive construction solicitations and contracts, and review building model and design options.</li> </ul> </li> <li>• NYSERDA will also support the development and expansion of online platforms (such as Open Studio, Google, etc.) that facilitate improved design and can potentially help speed and improve code compliance reviews. The online platform will provide architects and engineers a way to submit complete and proper documents for code review, as well as allow Code Enforcement Officials to more simply run quality assurance checks on designs, through the software. Relevant findings from this effort will be shared with and incorporated into NYSERDA’s Code to Zero efforts.</li> </ul> <p><b>Third-Party Standards Development</b></p> <ul style="list-style-type: none"> <li>• NYSERDA will provide guidance and feedback to organizations to inform the development of third-party QA/QC standards.</li> <li>• Once developed, NYSERDA will validate the third-party QA/QC protocols, which will enable the use of those standards as alternative compliance paths for NYSERDA’s new construction standard offer incentive programs.</li> <li>• NYSERDA’s validation of third-party QA/QC protocols, will also be used in outreach to LMI funding agencies, as reliable market-based standards for energy performance.</li> </ul>
<p><b>Key Milestones</b></p>	<p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue first competitive solicitation for Buildings of Excellence Competition.</li> </ul> <p><u>Milestone 2(2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees for Buildings of Excellence Competition.</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue solicitation to launch Simplified Design and Tools: Model Measure Packages activity.</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees for Simplified Design and Tools: Model Measure Packages activity.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue solicitation for Commercial Pilot Incentive Program.</li> </ul>

	<p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees for Commercial Pilot Incentive Program.</li> </ul> <p><u>Milestone 7 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue competitive RFP for Simplified Design and Tools: Online Platform development.</li> </ul> <p><u>Milestone 8 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees for Simplified Design and Tools: Online Platform development.</li> </ul> <p><u>Milestone 9 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue mini-bid for technical reviewers through existing NYSERDA umbrella contracts to begin Performance Analysis to assess project performance.</li> </ul> <p><u>Milestone 10 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with technical reviewers for Performance Analysis to assess project performance.</li> </ul> <p><u>Milestone 11 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue solicitation for Simplified Design and Tools: Integrated Design Practices Advisor for first-time Developers.</li> </ul> <p><u>Milestone 12 (2018)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees for Simplified Design and Tools: Integrated Design Practices Advisor for first-time Developers.</li> </ul> <p><u>Milestone 13 (2018)</u></p> <ul style="list-style-type: none"> <li>• Issue second competitive solicitation for Buildings of Excellence Competition.</li> </ul> <p><u>Milestone 14 (2019)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees for second round of Buildings of Excellence Competition.</li> </ul> <p><u>Milestone 15 (2019)</u></p> <ul style="list-style-type: none"> <li>• Issue third competitive solicitation for Buildings of Excellence Competition.</li> </ul> <p><u>Milestone 16 (2019)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees for third round of Buildings of Excellence Competition.</li> </ul> <p><u>Milestone 17 (2020)</u></p> <ul style="list-style-type: none"> <li>• Issue fourth competitive solicitation for Buildings of Excellence Competition.</li> </ul> <p><u>Milestone 18 (2020)</u></p> <ul style="list-style-type: none"> <li>• Contract with awardees for fourth round of Buildings of Excellence Competition.</li> </ul>
<b>Goals Prior to Exit</b>	<p>NYSERDA intends to remain engaged in the New Construction market throughout the Clean Energy Fund although this initiative and budget only focuses on three years due to the comprehensive nature of the strategy, thus the goals prior to exit are reflective of that extended engagement.</p> <ul style="list-style-type: none"> <li>• Reduce incremental cost of building a Net Zero Energy building from the current level of 5-10% to less than 1% by 2030. By 2020, the goal is to reduce the incremental cost of building to Net Zero Energy standards to 3-8%.</li> <li>• Improve accuracy of predicted energy consumption and cost to be within 10% accuracy of actual verified building performance for more than 50% of new</li> </ul>



	<p>construction by the end of the Clean Energy Fund, and within 18% accuracy at the end of 2020.</p> <ul style="list-style-type: none"> <li>• Increase space built per year with advanced clean energy building characteristics by 10% by the end of the Clean Energy Fund, and to 4% of space built with advanced clean energy building characteristics at the end of this initiative by 2020.</li> </ul>
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#### 24.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	Several utilities have indicated some level of interest in exploring the market potential to operate a standard incentive program. NYSERDA will continue to work with utilities who are exploring this opportunity and ensure complementary rather than duplicative approaches.
<b>Utility Interventions in Target Market</b>	Currently, no utilities offer incentive programs for new construction projects, however, all utilities offer some incentives for existing buildings that could support gut rehabilitation projects.

#### 24.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

<b>Budget</b>		<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Market Rate	Direct Incentives and Services	\$922,000	\$9,908,100	\$18,637,100	\$18,637,100	\$48,104,300
	Tools, Training, and Replication	\$174,700	\$3,885,917	\$2,612,383	\$2,612,383	\$9,285,383
	Implementation Support	\$429,900	\$3,203,683	\$4,294,183	\$4,294,183	\$12,221,949
	<i>Sub-Total</i>	<i>\$1,526,600</i>	<i>\$16,997,700</i>	<i>\$25,543,666</i>	<i>\$25,543,666</i>	<i>\$69,611,632</i>
LMI	Direct Incentives and Services	\$1,545,000	\$3,194,000	\$6,482,500	\$6,482,500	\$17,704,000
	Tools, Training, and Replication	\$179,800	\$1,763,633	\$1,040,133	\$1,040,133	\$4,023,699
	Implementation Support	\$610,000	\$1,328,367	\$1,681,867	\$1,681,867	\$5,302,101
	<i>Sub-Total</i>	<i>\$2,334,800</i>	<i>\$6,286,000</i>	<i>\$9,204,500</i>	<i>\$9,204,500</i>	<i>\$27,029,800</i>
<b>Total</b>		<b>\$3,861,400</b>	<b>\$23,283,700</b>	<b>\$34,748,166</b>	<b>\$34,748,166</b>	<b>\$96,641,432</b>

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
<b>Total</b>	1%	6%	19%	28%	26%	18%	3%	100%

### 24.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

<b>Indicators<sup>3</sup></b>		<b>Baseline (Before/Curr ent)</b>	<b>2019 (Cumulative)</b>
<b>Activity/ Outputs</b>	Number of advanced clean energy housing units in NYS	6,139	15,139
	Number of advanced clean energy commercial buildings in NYS	9	69
	Number of housing units recognized through Buildings of Excellence competition	0	4,350
	Number of participants attending workshops and trainings	0	872
	Number of case studies developed and distributed	0	13
	Number of model measure packages available	0	9
	Number of Projects that utilize coach/advisor	0	280
	Number of projects that complete a Performance Analysis through the program	0	24
	Incremental cost of building a Net Zero Energy building over standard construction practices	5-10% cost above standard construction	3-8% cost above standard construction
<b>Outcomes</b>	Percent market penetration of projects utilizing integrated design and construction practices to achieve Net Zero Energy and Net Zero Energy-capable performance	TBD	4%
	Number of LMI Public Housing solicitations that specify use of integrated design and construction practices, and third-party QA/QC standards	0	2
	Projects that utilize model measure packages outside of the program	0	32
	Discrepancies between predicted and actual savings	TBD	Within 18% accuracy for more than 50% of projects

<sup>3</sup> TBD denotes that NYSERDA requires more data in order to quantify baseline/market metrics to the degree needed to measure against in the future. Baseline measurements of key market indicators are anticipated to occur soon following initiative approval and NYSERDA will update the information in this table as the information becomes available, which is anticipated within 9-12 months of initiative approval. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 4. Direct Impacts: Market Rate**

Primary Metrics <sup>4</sup>		2018	2019	2020	TOTAL
Energy Efficiency	MWh Annual	31,900	57,600	57,600	147,100
	MWh Lifetime	706,000	1,330,000	1,330,000	3,374,000
	MMBtu Annual	67,100	151,000	151,000	368,500
	MMBtu Lifetime	1,500,000	3,470,000	3,470,000	8,440,000
Renewable Energy <sup>5</sup>	MW	-	-	-	-
	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		20,300	39,400	39,400	99,060
CO2e Emission Reduction (metric tons) Lifetime		452,000	888,000	888,000	2,227,000
Customer Bill Savings Annual (\$ million)		\$4.7	\$9.04	\$9.04	\$22.77
Customer Bill Savings Lifetime (\$ million)		\$105	\$204	\$204	\$513
Private Investment (\$ million)		\$12.1	\$41.1	\$41.1	\$94.33

**Table 5. Direct Impacts: LMI**

Primary Metrics <sup>6</sup>		2018	2019	2020	Total
Energy Efficiency	MWh Annual	2,100	8,580	8,580	19,260
	MWh Lifetime	52,600	215,000	215,000	482,800
	MMBTu Annual	8,820	47,400	47,400	103,600
	MMBTU Lifetime	220,000	1,190,000	1,190,000	2,592,000
Renewable Energy <sup>7</sup>	MW	-	-	-	-
	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		1,580	7,080	7,080	15,740
CO2e Emission Reduction (metric tons) Lifetime		39,600	178,000	178,000	394,600
Customer Bill Savings Annual (\$ million)		\$3.77	\$1.61	\$1.61	\$3.599
Customer Bill Savings Lifetime (\$ million)		\$9.41	\$40.3	\$40.3	\$90.01
Private Investment (\$ million)		\$3.45	\$25.8	\$25.8	\$54.95

<sup>4</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 22-year measure life for Commercial New Construction Projects, and a 25-year measure life for Residential New Construction Projects. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<sup>5</sup> Projects will likely include renewables to meet Net-Zero Energy standards. However, the renewables will be supported through other NYSERDA programs (e.g. NY-Sun) and therefore are not claimed here to avoid double counting.

<sup>6</sup> Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 25-year measure life for Residential New Construction Projects. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<sup>7</sup> Projects will likely include renewables to meet Net-Zero Energy standards. However, the renewables will be supported through other NYSERDA programs (e.g. NY-Sun) and therefore are not claimed here to avoid double counting.

**Table 6. Annual Projected Initiative Participation**

	2018	2019	2020	Total
Market Rate Housing-Unit Participants	500	3,900	3,900	8,300
Market Rate Commercial Buildings	38	73	73	184
Market Rate Training Participants	242	242	242	726
LMI Housing Unit Participants	500	4,100	4,100	9,282
LMI Training Participants	194	194	194	582
Total	1,474	8,509	8,509	18,492

Benefits shown in Tables 7 and 8 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 7. Estimated Indirect Market Impact Market Rate**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	31,400	84,000	136,000
	MMBtu Cumulative Annual	79,000	211,000	342,000
Renewable Energy	MWh Cumulative Annual	726	1,940	3,150
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		21,200	56,600	92,000

**Table 8. Estimated Indirect Market Impact LMI**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	4,380	11,700	19,000
	MMBtu Cumulative Annual	27,600	73,400	119,000
Renewable Energy	MWh Cumulative Annual	609	1,620	2,640
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		4,110	11,000	17,800

### 24.1.8 Fuel Neutrality

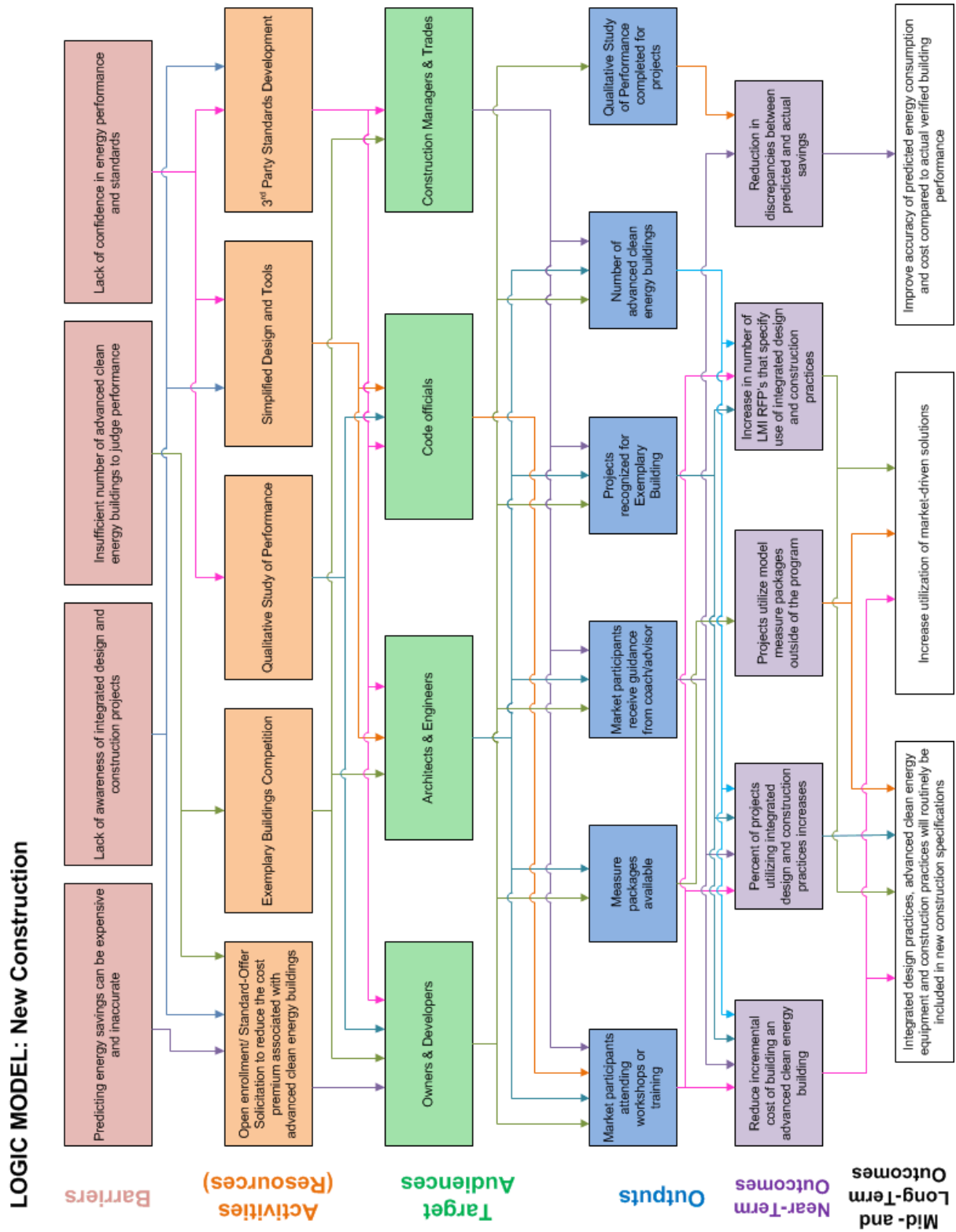
<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>Offering this initiative on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$704 Market Rate<sup>8</sup>, and \$1,717 LMI per ton of carbon, compared to a cost of \$881 Market Rate and \$2,664 LMI per ton of carbon in an electric only scenario.</li> </ul>
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<sup>8</sup> Market rate values includes both commercial and housing.

## 24.1.9 Performance Monitoring and Evaluation Plans

<p><b>Performance Monitoring &amp; Evaluation Plan</b></p>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><b><u>Test-Measure-Adjust Strategy</u></b></p> <ul style="list-style-type: none"> <li>• The Commercial Pilot program for advanced clean energy buildings will provide market feedback based on uptake of alternative pathways to participation, and new project delivery.</li> <li>• Voice of Customer will be utilized for feedback throughout the initiative, especially during the early development and delivery of new activities such as simplified tools and trainings.</li> </ul> <p><b><u>Market Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of programmatic and broader market success.</li> <li>• Baseline measurements of key market indicators will occur within one year following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These key indicators include but are not limited to: the number of advanced buildings and units built in NYS, participants attending workshops/trainings and projects utilizing model measure packages.</li> <li>• Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: more projects utilizing integrated design and construction practices, increased use of advanced building practices, and reductions in discrepancies between predicted and actual savings.</li> <li>• Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors.</li> </ul> <p><b><u>Impact Evaluation/Field Verification</u></b></p> <ul style="list-style-type: none"> <li>• Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.</li> <li>• Impact Evaluation will have access to program and other data necessary to validate direct impacts per International Performance Measurement and Verification Protocol (IPMVP) standards.</li> <li>• For projects that include renewables supported through other NYSERDA programs, NYSERDA will develop an approach to identify these projects in the other programs and to represent them in the evaluation for the appropriate program (e.g. NY-Sun).</li> </ul>
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# Appendix A – Logic Models



## Appendix B –Investment Plan Review Supplement<sup>1</sup>

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<sup>1</sup> As this report includes performance through Q2 2017 and the New Construction Initiative was filed in Q4 2017, that initiative is not included herein.

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Residential Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

November 1, 2017



Clean Energy Fund Investment Plan: Residential Chapter		
<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
November 1, 2017	Original Issue.	Original Issue.

## 25 Residential

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The one-to-four family residential market consists of more than five million low-rise (three stories or less) residential buildings with up to four living units. Approximately 75% of homes were built prior to 1979, when the Energy Conservation Construction Code became effective in New York State. To date, energy efficiency programs have only marginally tapped the potential energy savings of this sector. NYSERDA seeks to scale the rate at which residential building owners undertake energy efficiency improvements. To achieve this goal, NYSERDA will seek to increase consumer awareness and understanding of homes energy performance, and the means to obtain quality installation of energy efficiency improvements, as well as increase the number of contractors providing such services.

To address the wide variety of home types in New York, and the wide array of motivators for consumers, a multi-faceted approach will be used to encourage homeowners to undertake energy efficiency improvements. The first initiative described in this chapter, Engaging New Markets, will engage new markets in energy efficiency by leveraging home investment decisions already taking place, and encouraging the addition of energy efficiency improvements into those investments. The activities under this initiative will pilot various strategies, make adjustments to improve the impact of the strategies as needed, and at the conclusion of the pilots, deploy tools and other means to expand successful activities statewide.

This initiative will be anchored by investments in mid-stream and up-stream market actor training and consumer education. The investments made in these areas will not only support market transformation related directly to the Engaging New Markets work, but also transfer to additional strategies to be added to this chapter in the coming years, and improve the cost effectiveness of those later investments. Such additions may include the following:

- Working within the home seller market to leverage the increasing value of energy efficient homes, to encourage home sellers to invest in the most cost-effective energy efficient improvements prior to placing the home on the market.
- Working with home insurers and mortgage lenders on means to recognize the value, including non-energy benefits, of an energy efficient home in their rates or underwriting practices.
- Using data to identify successful standard approaches to cost-effective energy efficiency improvements in common building types, thereby streamlining the customer acquisition and energy efficiency project implementation process.
- Demonstrating the use of contractor performance data, such as typical savings achieved and quality installation performance, to improve consumer confidence in energy efficiency projects and increase contractor sales rates.
- Supporting the emergence of new business models that leverage energy savings data to increase third-party investment in project financing, or in business expansions, by increasing confidence of investors.
- Demonstrating the use of publicly available data to better target specific energy efficiency services to homes that can benefit most from those services, which will lower customer acquisition costs.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

## 25.1 Engaging New Markets

### 25.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• The residential sector has unique challenges to energy efficiency due to wide variations in homes, many market actors, and the way homeowners make decisions about investments in their home.</li> <li>• New York State homeowners currently spend an estimated \$26 billion annually on home improvements, with 20% of those improvements being energy-related,<sup>1</sup> and 60% of home owners<sup>2</sup> have invested in home improvements in the past two years. However, these energy-related improvements frequently don't include beyond-code energy efficiency improvements, or equipment that exceeds the minimum federal standards, even when it would make sense to include them from a purely economic perspective.</li> <li>• Homeowners invest in their homes to meet their family and lifestyle needs, and to maintain or improve the value of their home. However, homeowners don't understand the full value of energy efficiency, and don't see it as a tool to address their needs. They are hesitant to invest without knowing there is adequate return on the investment, particularly when there are many competing priorities. Additionally, homeowners tend to be more reactive to home energy system failures, rather than proactive regarding energy improvements.</li> <li>• However, concern over global climate change is growing, as is concern that the federal government will not address it, and homeowners are currently open to learning what they can do to make a difference. This provides an opportunity for a focused consumer education and awareness initiative to provide consumers with a path to action regarding their own homes.</li> <li>• The home improvement services market, which also greatly impacts the residential sector, includes many small contractors. These contractors are routinely in customers' homes every year, but many are not currently selling energy efficiency upgrades or upselling to high efficiency equipment.</li> <li>• Home Performance with ENERGY STAR® (HPwES) established a competent, but small, network of residential energy efficiency services providers, reaching a small number of homeowners, who tended to be early adopters of energy efficiency. Activities being undertaken in this initiative will support the continued growth of the home performance industry through greater consumer understanding of the value of home performance services, and continued development of the home performance network, even as incentives provided by NYSERDA's market rate transition program are phased out,</li> <li>• Comprehensive home performance services will likely still represent a piece of the overall home improvement services market, providing an opportunity to also influence the business practices of many other home improvement contractors, such as remodelers, HVAC, insulation, and siding contractors.</li> <li>• Numerous tools currently exist in marketplace to support sales of energy efficiency improvements, but are underutilized. By introducing and helping market actors leverage these existing tools, it is expected consumers will better understand the benefits and value of energy efficiency, and that contractors will be more likely to include it in their business models.</li> </ul>
<p><b>Intervention Strategy</b></p>	<ul style="list-style-type: none"> <li>• To overcome market barriers in the residential sector, NYSERDA will pursue a multi-faceted approach that addresses both the supply and demand side.</li> </ul>

<sup>1</sup> InfoGroup USA, December 2016 data

<sup>2</sup> NYSERDA. 2015. *2012-2013 Home Performance with ENERGY STAR Process Evaluation/Market Characterization Assessment*. Albany: NYSERDA.

	<ul style="list-style-type: none"> <li>• To increase consumer demand, NYSERDA will pilot different means of providing clear, relevant and actionable information on energy efficiency to assess if the information, the presentation of the information, or the market actor presenting the information impacts decision-making regarding energy efficiency projects. Some pilots will build on purchasing decisions already taking place in the residential market, and will include: <ul style="list-style-type: none"> <li>○ Home inspectors providing home energy ratings at the time of a home purchase, and identifying opportunities for improvement, to determine whether the rating encourages home energy improvements by the buyer.</li> <li>○ Testing up to two home energy rating systems that have been developed for existing homes, evaluating their effectiveness in closing a project sale when delivered by contractors.</li> <li>○ Home improvement retailers and their service network providing home energy performance information and options.</li> <li>○ Marketing and outreach to the broader residential consumer market to educate and increase awareness of the benefits of home energy improvements, pilot activities, strategies and outcomes.</li> </ul> </li> <li>• To expand energy efficiency service delivery, NYSERDA will pilot means to increase the number of contractors providing energy efficiency services, leveraging trusted relationships in the products and services industry to: <ul style="list-style-type: none"> <li>○ Train contractors on the benefits and opportunities associated with including energy efficiency offerings as a business model.</li> <li>○ Facilitate energy efficiency skills training to a greater number of contractors and service providers</li> <li>○ Use home energy ratings as a sales tool.</li> </ul> </li> <li>• For a visual representation of this strategy, please reference the flow chart entitled “Logic Model: Residential - Engaging New Markets,” which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Increase the number of businesses selling or providing energy efficiency services.</li> <li>• Increase consumer awareness of and demand for energy efficiency services.</li> <li>• Increase interaction between residential market actors, enabling cross-selling and referrals to drive more energy efficiency projects.</li> <li>• Increase the demand for efficient homes in the real estate market, and quantify any increase in the value of those homes.</li> <li>• Increase the number of one-to-four family home energy efficiency projects being completed.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The 2015 State Energy Plan identifies buildings as a major source of energy use and greenhouse gas (GHG) emissions in the State. This strategy will reduce energy consumption and GHG emissions associated with one-to-four family homes, contributing to State Energy Plan goals to reduce GHG emissions by 40% and to implement a 600 trillion BTU increase in statewide energy efficiency.</li> <li>• The State Energy Plan also highlights the importance of energy efficiency and calls on NYSERDA to “seek to address the diverse set of remaining barriers with new programs and strategies that unlock the potential of energy efficiency to reduce operating costs, spur investment, and create jobs throughout the State.” Facilitating measurement and disclosure of building energy performance and serving as a credible information source – both of which are included in this initiative – are identified as a potential strategies to tap into this energy efficiency potential. This initiative lays out a strategy to achieve this goal.</li> <li>• This initiative also supports achievement of the Clean Energy Standard goal for renewable resource electric generation (50% renewable electric generation by 2030 – “50 by 30”) by reducing the overall electric load, and therefore the amount of renewables necessary to meet the 50 by 30 goal.</li> </ul>

## 25.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	This intervention will target the one-to-four family residential market segment; in particular, owners of existing homes undergoing general home improvements or equipment replacements, buyers of existing homes, and contractors performing home improvements and equipment replacements
<b>Market Participants</b>	<p>Market participants include:</p> <ul style="list-style-type: none"> <li>• Homeowners, renters, and buyers</li> <li>• Manufacturers, professional, and trade organizations who have relationships with residential contractors</li> <li>• Retailers who provide home improvement services and have an existing network of contractors</li> <li>• Home improvement contractors and system installers</li> <li>• Real estate sector professionals</li> <li>• Community leaders, local government, Chambers of Commerce and other local influencers</li> </ul>
<b>Market Readiness</b>	<ul style="list-style-type: none"> <li>• Many tools to educate homeowners, contractors and other market actors, and drive energy efficiency sales, already exist but are underutilized (e.g. home energy performance ratings, home energy audits, green mortgages, green addendum for appraisals etc.). Homeowners have indicated an interest in receiving "energy facts" reports on their homes, including clear information about home energy opportunities, and have indicated that such information can have an impact on purchase decisions, supporting the theory that there may be market support for increased use of such tools.<sup>3</sup></li> <li>• NYSERDA has years of relationships with retailers, professional, and trade associations, laying the groundwork for expanding energy efficiency services infrastructure and achieving scale.</li> <li>• NYS has approximately 9,000 residential contractors, with large potential to increase the share of contractors working in energy efficiency. Market research of upstream partners shows an interest and demand from residential contractors for information about business opportunities for energy efficiency services provided through a trusted, third party source.<sup>4</sup> Additionally, contractors require training and business development resources to make informed decisions about business model changes. There is increased consumer awareness of climate change and the environmental impact of energy use; and perhaps now an even greater willingness for community leaders to work with businesses and residents at the local level to make positive impacts.</li> </ul>
<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• End-user customers value a more comfortable home with a healthier indoor environment and lower operating costs.</li> <li>• As homeowners begin to understand the value of an energy efficient home, they will also value an increased selling price due to energy efficiency improvements.</li> <li>• Service providers will see value in the form of: <ul style="list-style-type: none"> <li>○ Increased opportunities for acquiring customers at a lower cost</li> <li>○ Improved conversion from sales pitch to project</li> <li>○ Larger work scopes with higher profits</li> <li>○ New tools and resources to improve performance, reputation, and marketability</li> </ul> </li> </ul>

<sup>3</sup> NYSERDA Corporate Strategy Assessment, Residential Chapter, 2014

<sup>4</sup> Market participant interviews conducted by NYSERDA staff, 2017

### 25.1.3 Stakeholder/Market Engagement

<p><b>Stakeholder/Market Engagement</b></p>	<ul style="list-style-type: none"> <li>• NYSERDA has met with a number of market actors, including realtors, appraisers, home inspectors, large retailers, distributors, manufacturers, residential contractors, municipal staff, and program administrators associated with similar projects.</li> <li>• The stakeholders provided information on what specific consumer market segments to target for pilots, including:             <ul style="list-style-type: none"> <li>○ Consumers already engaged in home improvements, but not yet energy improvements</li> <li>○ Homeowners who need data or evidence to support decision-making</li> <li>○ Home buyers who may invest in improvements when they purchase their home</li> </ul> </li> <li>• They also identified business sector actors who can make a difference in the outcome, such as:             <ul style="list-style-type: none"> <li>○ Home improvement retailers who have a network of contractors for installations</li> <li>○ Manufacturers and distributors</li> <li>○ Professional and trade associations</li> <li>○ Home inspectors</li> <li>○ Home improvement contractors</li> </ul> </li> <li>• Other feedback was incorporated into the initiative specific activities, including the need for consumer awareness and education on the benefits of energy improvements and the value of a whole-house approach to improvements (meaning whole house audit, proper sizing of systems, comprehensive view of needs even if all are not undertaken at once). The feedback indicated that service providers could also benefit from education, particularly on potential customers and new business models. They indicated that demonstration projects, case studies, and tools to help make the business case would help mitigate risks of new business models.</li> <li>• During pre-pilot development work, NYSERDA will met with local governments, including New York City, to better understand the opportunities related to the tools and resources presented in this investment plan; with local leadership and businesses within Clean Energy Communities to gain insight on approaches and opportunities for consumer and contractor outreach and education; with retail establishments to better understand business model opportunities and constraints; and with real estate sector market actors to better understand the strengths and weaknesses of various home energy rating systems and their delivery to homeowners and home buyers.</li> </ul>
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### 25.1.4 Theory of Change

<p><b>Market Barriers Addressed</b></p>	<p><u>Barriers Impacting Consumer Demand</u></p> <ul style="list-style-type: none"> <li>• <b>Lack of consumer awareness and understanding of energy needs and savings opportunities.</b> Many consumers do not understand that properly done energy efficiency improvements can address comfort, durability, and health and safety problems in their home. This initiative will provide consumer education and awareness regarding the needs and opportunities within their homes, and the benefits of the energy improvements.</li> <li>• <b>Concern about value and payback of EE improvements.</b> Homeowners are concerned that they will not be able to recoup their energy investment before they leave their home. This initiative will educate consumers on the ability of</li> </ul>
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	<p>energy efficiency to meet comfort, indoor air quality, structural durability, operational costs and other related needs of the residents of the home, making an efficient home a more attractive option in a real estate transaction. The initiative will also work with the appraisal industry and others to provide guidance on valuing energy improvements..</p> <ul style="list-style-type: none"> <li>• <b>Lack of credible home energy performance data.</b> Some homeowners have expressed a lack of trust in residential contractors, and may question audit results because contractors who are providing the audit stand to benefit from the sale of recommended improvements. A home energy performance rating that is delivered through a third-party rating system may provide improved confidence to homeowners trying to understand the energy needs of their home.</li> <li>• <b>Competing consumer home improvement priorities.</b> Energy efficiency improvements must compete for home improvement dollars with other projects. This initiative will leverage home improvements already taking place, introducing energy efficiency into the existing option.</li> </ul> <p><u>Barriers Impacting Delivery of Energy Efficiency Services</u></p> <ul style="list-style-type: none"> <li>• <b>Customer acquisition challenges and related cost.</b> Contractors report that customer acquisition is one of the highest costs of doing business in the energy efficiency sector. Contractors cite customer education as one of the greatest challenges they face, consuming significant time during the sales process. This initiative will provide new educational resources for consumers that are expected to open new markets for contractors, by engaging consumers who may not have previously understood the benefits of energy efficiency projects, and reduce soft costs for the contractors.</li> <li>• <b>Lack of home energy performance data.</b> Some contractors have declined to participate in NYSERDA’s energy efficiency programs, in part, due to the need to estimate energy savings using complicated energy modeling software. Some homeowners also question the validity of the audit results. A home energy performance rating that is delivered through a third-party rating system , can be leveraged by contractors to inform homeowners of the opportunities to improve the energy performance of their home.</li> <li>• <b>Lack of interest and training among home services market actors.</b> The number of contractors providing energy efficiency services is limited compared to the number of home services contractors operating in the state. This initiative will work through upstream market actors, such as manufacturers, distributors, trade associations, and through home improvement retailers, to introduce opportunities in the energy efficiency services market to home services contractors, as well as training them to ensure they can properly deliver the service.</li> </ul>
<p><b>Testable Hypotheses</b></p>	<ul style="list-style-type: none"> <li>• If homeowners are provided with clear, relevant, and actionable third party information regarding their home’s efficiency performance and the value of energy efficiency they will more readily undertake energy efficiency improvements during other home investments.</li> <li>• If residential market actors are provided with information from trusted market partners or effective demonstrations regarding the business case for undertaking energy efficiency work, they will add it to their business model.</li> </ul>
<p><b>Activities</b></p>	<p>NYSERDA will engage residential markets through multiple pilots to prove the value proposition and effectiveness of new approaches. The pilots will be focused on two main areas: increasing consumer demand for services by providing customers with clear, relevant and actionable information; and increasing the delivery of services by expanding the pool of contractors working in the energy efficiency space. If proven successful, NYSERDA will expand the activity statewide. Where appropriate, after the installation of energy efficiency measures, NYSERDA will utilize advanced</p>



measurement & verification (M&V) approaches<sup>5</sup> to measure results and gather data to inform the business case of the technologies installed for future projects, as well as to provide contractors information about their performance.

**Increasing Consumer Demand for Services by Providing Clear, Relevant and Actionable Information**

NYSERDA will enable market actors to provide customers with clear, relevant and actionable energy performance information about their home, which will allow customers to make informed decisions about energy improvements. NYSERDA will test different means of providing this energy information to assess if the type of information provided, the presentation of the information, and the market actor presenting the information has an impact on its effectiveness. Tactics NYSERDA will assess include:

- Embedding home energy ratings in real estate transactions
  - NYSERDA will pilot providing home buyers an energy performance rating<sup>6</sup> at the time of home purchase to determine whether this leads to an increase in energy efficiency improvements. The information will be provided through the home inspectors, who will also provide the home buyer information on how to locate qualified contractors in their area to increase the likelihood the homeowner will act to improve their home energy rating. NYSERDA will work with utilities to further reinforce the pilot through utility interventions with new homeowners.
  - The pilots, which will test up to two home energy rating systems, will be implemented in specific communities.<sup>7</sup> To avoid market confusion, NYSERDA will only pilot one type of home energy rating per community.
  - Home inspectors will be trained to offer home energy performance ratings to their customers as part of the home inspection associated with a home purchase. Other related market actors within the community, such as realtors, appraisers and lenders will also be trained so they can explain the information provided by a home energy rating if needed, and so they can understand the potential value a home energy rating brings to a real estate transaction. The hosting community leaders (such as government officials, chambers of commerce, relevant not-for-profits, employers, etc) will help identify and engage the local real estate market actors and facilitate homeowner education and awareness.
  - NYSERDA will subsidize the cost to deliver home energy ratings; the level of subsidy will ramp down to zero over the course of the pilot.
  - If the pilot is successful, NYSERDA will develop a “How To” kit that will be provided to other communities, enabling them to encourage similar activity among real estate sector market actors and home buyers in their area. The local leadership of the pilot communities will be essential in ensuring the kit is useable and effective. The kit, along with the results of successful pilots, can also serve as a resource to communities who are interested in the

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<sup>5</sup> Advanced M&V is generally defined as technologies and practices that include, but are not limited to, automated M&V software, data analytics, advanced metering or sub-metering, building or home energy management systems, load monitoring systems, utilization of data science practices, and other emerging technologies. A defining criterion for automated M&V software is that it continuously analyzes data as it becomes available.

<sup>6</sup> Through pre-pilot research, rating systems will be pre-screened for their ability to meet select criteria, and those meeting the criteria will be included in the pilot. NYSERDA intends to pilot no more than two, very different, home energy ratings.

<sup>7</sup> Through pre-pilot research, Clean Energy Communities will be pre-screened for their ability to meet select criteria; and discussions with market actors and leaders/energy champions within those communities will be used to understand their level of interest in engaging in a pilot. Those communities responding favorably will be identified to the pilot implementers as possible host communities. Final community selection will be based on the ability of the community to provide the necessary resources and strategies to fulfill their role in the pilot.

	<p>development of local laws or initiatives to disclose building energy performance information during real estate transactions. The kit will be distributed in coordination with NYSERDA's Clean Energy Communities activities.</p> <ul style="list-style-type: none"> <li>• Energy information provided by home improvement market actors <ul style="list-style-type: none"> <li>○ Retailers who sell heating and cooling systems, appliances, lighting, windows and doors, and siding in the residential sector are already engaged with customers implementing home improvements. NYSERDA will leverage this relationship to increase energy efficiency awareness and engagement through home energy audits and ratings.</li> <li>○ NYSERDA will issue a solicitation to select up to six retail establishments to participate in a pilot to test the effectiveness of providing a home energy rating or audit (either directly from the retailer or through a third party) to customers already engaged with home improvement retailers, to determine if it leads to additional energy work in the project. NYSERDA will subsidize the cost of the audits or ratings to reduce the risk for the retailers to try this new business model, and to reduce barriers for customer participation.</li> <li>○ The selected retailers will be trained on the fundamentals of building science and energy efficiency and provided with consumer education materials to ensure that sales staff can properly convey the information regarding the energy opportunities to customers.</li> </ul> </li> <li>• NYSERDA will complement the targeted pilots with consumer awareness campaigns to drive participation in the pilots, as well as increase general awareness of energy efficiency benefits and opportunities. As part of the consumer awareness efforts, NYSERDA will identify appropriate content to add to its web site, in collaboration with utilities and other market participants. The content will be curated to ensure that NYS residents can find information and resources regarding residential energy topics and break down information and awareness barriers cited by energy service providers. Additional consumer awareness and education activities will focus on online targeting, campaigns through large employers or membership-based organizations, and localized messaging campaigns.</li> </ul> <p><b><u>Expanding the Delivery of Energy Efficiency Services</u></b></p> <p>There are many contractors providing home improvement services, but many of those contractors are not including quality installation of energy efficiency measures or high efficiency equipment as a service. Market research shows many contractors do not understand the opportunities, value or potential of offering energy efficiency services, or that they do not have quality assurance systems in place within their company to ensure best practices..<sup>8</sup> NYSERDA will provide training and other resources to demonstrate the benefits of providing energy efficiency services to various market actors and to determine which approaches are most effective. Pilots will include:</p> <ul style="list-style-type: none"> <li>• Leveraging the relationship that upstream partners, including manufacturers, distributors, and industry associations, have with residential contractors to provide information about successful energy efficiency business opportunities. <ul style="list-style-type: none"> <li>○ NYSERDA will issue a solicitation to select a firm to develop energy efficiency business training for residential contractors. This training will be delivered through existing channels of manufacturers, distributors, and trade organizations who routinely offer their customers training. NYSERDA will work with utilities to promote this opportunity to their contractor</li> </ul> </li> </ul>
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<sup>8</sup> NYSERDA Corporate Strategy Assessment, Residential Chapter and voice of the customer research conducted in 2016-2017 by NYSERDA program staff.

	<p>network, sharing information about the training available through upstream partners.</p> <ul style="list-style-type: none"> <li>○ The selected firm will train the sales or client relations staff of these upstream partners on how to sell the benefits of an energy efficiency business model, as well as develop materials and training resources to be utilized by the partners. The selected firm will also provide business development consultations and marketing and sales support to the upstream partners during the pilot period.</li> <li>○ NYSERDA will collaborate with industry partners to identify appropriate certifications or other credentials that should be encouraged for contractors who install energy efficiency measures, such as Building Performance Institute (BPI) certifications, North American Technician Excellence (NATE) certifications, etc.</li> <li>○ Financial assistance for energy efficiency technical skills and knowledge certifications for those upstream partners and contractors participating in the training pilot will be made available through NYSERDA.</li> <li>○ Changes in the contractors' business models and energy efficiency sales will be tracked to determine the effectiveness of the training. Post pilot, NYSERDA will communicate information on the most effective models of training, effective business models, as well as the training materials, to key influencers, such as professional and trade associations, major retailers and manufacturers who are part of the broader market.</li> </ul> <ul style="list-style-type: none"> <li>● Using home energy ratings as a sales tool. <ul style="list-style-type: none"> <li>○ In addition to using a third party approach to delivering home energy ratings during real estate transactions, NYSERDA will collaborate, through participation agreements, with home performance, home improvement and single trade contractors to pilot home energy rating and certificate methods to determine whether: <ul style="list-style-type: none"> <li>▪ Using home energy performance ratings or certificates developed by third parties but delivered by contractors improves the close rate on projects, or increases the size of the project</li> <li>▪ One type of home energy rating or certificate is more effective than another</li> </ul> </li> <li>○ NYSERDA will subsidize the cost to deliver home energy ratings; the level of subsidy will ramp down to zero over the course of the pilot.</li> <li>○ NYSERDA and the contractors will compare projects where a rating was provided, to a control group not provided with a rating to determine which group saw greater activity and conversion to project implementation. For projects testing the efficacy of one rating or certificate over another, a group utilizing each method, delivered by the same contractor will be compared. The test will be conducted in different communities to avoid confusion. Through the pilots, best practices regarding the use of home energy performance ratings as an energy efficiency project sales tool will be identified and documented.</li> <li>○ NYSERDA will broadly distribute the findings of the pilot to contractors throughout the state, using manufacturers, professional associations, Chambers of Commerce, utilities and other means as appropriate, in coordination with the other activities of this initiative. It is expected that by identifying successful means to increase sales of energy efficiency measures, more contractors will adopt those practices and expand their work in the energy efficiency field.</li> </ul> </li> </ul>
<b>Key Milestones</b>	<p><u>Milestone 1 (2018)</u></p> <ul style="list-style-type: none"> <li>● Develop a package of energy efficiency related trainings for market actors prior to pilot implementation</li> </ul>

	<p><u>Milestone 2 (2018)</u></p> <ul style="list-style-type: none"> <li>• Deploy new content on NYSERDA website</li> </ul> <p><u>Milestone 3 (2018)</u></p> <ul style="list-style-type: none"> <li>• Launch first of targeted consumer education and awareness campaigns</li> </ul> <p><u>Milestone 4 (2018)</u></p> <ul style="list-style-type: none"> <li>• Implement initial pilot for contractors delivering home energy ratings as a sales tool.</li> </ul> <p><u>Milestone 5 (2018)</u></p> <ul style="list-style-type: none"> <li>• Implement initial pilot to imbed home energy ratings into real estate transactions</li> </ul> <p><u>Milestone 6 (2018)</u></p> <ul style="list-style-type: none"> <li>• Implement initial pilot for leveraging relationships that upstream market actors have with contractors</li> </ul> <p><u>Milestone 7 (2019)</u></p> <ul style="list-style-type: none"> <li>• Implement initial pilot for providing energy efficiency information to consumers from home improvement retailers and their contractor network</li> </ul> <p><u>Milestone 8 (2020)</u></p> <ul style="list-style-type: none"> <li>• Develop resources, such as templates or toolkits, for market actors to support the business case for incorporating energy efficiency into their business models.</li> </ul> <p><u>Milestone 9 (2021)</u></p> <ul style="list-style-type: none"> <li>• Data collection and analysis from all pilots completed and results distributed to additional market actors to support intervention adoption.</li> </ul> <p><u>Milestone 10 (2021)</u></p> <ul style="list-style-type: none"> <li>• Kits available for communities to use in imbedding home energy ratings in the home sales process.</li> </ul>
<p><b>Goals Prior to Exit</b></p>	<ul style="list-style-type: none"> <li>• At least one major home improvement retailer adopts energy efficiency sales as a business model across multiple of its outlets.</li> <li>• Upstream partners maintain their trainer status and regularly include energy efficiency in training delivered to affiliated contractors.</li> <li>• Upstream manufacturing or wholesale partners report increases in sales of energy efficient equipment, products and materials.</li> <li>• Increase in BPI certified qualified residential energy efficiency contractors from 4% to 10% of the total residential contractor market.</li> <li>• Home inspector associations regularly provide training on the value of delivering a home energy rating, and information on how to become trained to deliver ratings.</li> <li>• Realtors understand the value of an energy efficient home and regularly advise home buyers on means to improve the efficiency of their new home.</li> <li>• Home energy ratings are available broadly across the state, and 10% of contractors are offering the rating as part of their business model.</li> </ul>

25.1.5 Relationship to Utility/REV

<p><b>Utility Role/Coordination Points</b></p>	<p>NYSERDA has had a series of initial discussions with various utilities on the potential roles for them in this initiative. While formal roles have yet to be established, the following ideas have been discussed and will continue to be investigated with all NYS investor-owned utilities:</p>
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	<ul style="list-style-type: none"> <li>• Provide new homeowner kit that includes information about how to undertake energy projects</li> <li>• Provide access to home energy improvement contractors through the utility marketplace web site</li> <li>• Provide access to a home energy rating through the utility marketplace web site</li> <li>• Provide rebates on some energy efficiency upgrades</li> </ul> <p>Potential additional roles to be considered and discussed with the utilities include the following:</p> <ul style="list-style-type: none"> <li>• Encourage energy efficiency training for contractors participating in utility rebate programs</li> <li>• Provide incentives to the broader market at the conclusion of pilots, where needed as a bridge to a sustainable activity (for example, incentives for home energy ratings for a period of time)</li> <li>• Expand consumer and/or contractor incentives to technologies not currently supported by all utilities, such as insulation and air sealing, by leveraging an expanded network of qualified professionals</li> </ul>
<b>Utility Interventions in Target Market</b>	Utilities currently provide incentives for certain cost-effective energy efficiency appliances and equipment. In addition, utilities are providing web-based “marketplaces” for their customers, who may locate energy efficient products and access the utility rebates, manufacturer rebates or other offers. Some utilities are promoting home energy audits delivered through NYSEERDA’s Home Performance with ENERGY STAR program, and providing the means for home performance contractors to promote their services through the utility marketplace.

25.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1: Annual Market Development Budget Allocation – Commitment Basis**

<b>Commitment Budget</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
Direct Incentives and Services	\$234,000	\$939,500	\$1,140,500	\$0	\$2,314,000
Tools, Training, and Replication	\$3,433,000	\$1,903,000	\$1,460,000	\$150,000	\$6,946,000
Implementation Support	\$4,538,305	\$1,566,815	\$622,895	\$0	\$6,728,015
Total	\$8,205,305	\$4,409,315	\$3,223,395	\$150,000	\$15,988,015

**Table 2: Annual Expenditures Projection**

<b>Expenditures</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
<b>Total</b>	30%	32%	35%	3%	100%

### 25.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

<b>Indicators<sup>9</sup></b>		<b>Baseline (Before/Current)</b>	<b>2020 (Cumulative)</b>
<b>Activity/ Outputs</b>	Number of upstream partners that include energy efficiency training resulting from this initiative	0	10
	Number of residential contractors whose staff have been trained and/or certified <sup>10</sup> in new skills as a result of this initiative	0	332
	Number of home inspectors providing home energy ratings in NYS as a result of this initiative	0	32
	Number of home energy ratings delivered in NYS as a result of this initiative	0	3,844
	Number of energy efficiency projects contracted, as a result of this initiative	0	8,200
<b>Outcomes</b>	Home improvement retailer adopts energy efficiency sales as a business model	0	1
	Real estate market actors offer energy efficiency basics and home energy training	0	3
	Increase in sales of energy efficient equipment, products and materials by upstream manufacturing or wholesale partners	TBD	2% increase
	Increase in residential contractors offering energy efficiency services	4%	6%

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation. Due to the nature of the activities, estimating energy savings impacts at

<sup>9</sup> TBD denotes that NYSERDA requires more data in order to quantify baseline/market metrics to the degree needed to measure against in the future. Baseline measurements of key market indicators are anticipated to occur soon following initiative approval and NYSERDA will update the information in this table as the information becomes available, which is anticipated within 9-12 months of initiative approval. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

<sup>10</sup> Certified and qualified contractors refers to those with professional credentials, training certifications, or other evidence of manufacturer or professional trade association-approved training. Such credentials may include, but are not limited to, Building Performance Institute (BPI) certifications or completion of training that supports those certifications, North American Technician Excellence (NATE) certifications, training to become a Residential Energy Services Network (RESNET) auditor or rater, and manufacturer training certificates.

this stage is difficult because the specific technologies that will be supported are not known. However, energy savings for projects supported by this initiative will be tracked and reported.

**Table 4. Direct Impacts<sup>11</sup>**

<b>Primary Metrics<sup>12</sup></b>		<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>TOTAL</b>
Energy Efficiency	MWh Annual	25	465	704	1,194
	MWh Lifetime	375	6,980	10,600	17,920
	MMBtu Annual	1,880	34,900	52,800	89,580
	MMBtu Lifetime	46,900	872,000	1,320,000	2,239,000
	MW	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-
	MWh Lifetime	-	-	-	-
	MW	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		124	2,310	3,500	5,930
CO2e Emission Reduction (metric tons) Lifetime		2,970	55,300	83,700	142,000
Customer Bill Savings Annual (\$ million)		\$0.031	\$0.575	\$0.870	\$1.475
Customer Bill Savings Lifetime (\$ million)		\$0.73	\$13.6	\$20.6	\$34.99
Private Investment (\$ million)		\$0.76	\$10.8	\$16.6	\$28.17

**Table 5. Annual Projected Initiative Participation**

<b>Additional Performance Tracking Metrics</b>		<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
Participants <sup>13</sup>	Customer	492	4,234	6,618	11,344
	Market Actor	26	86	146	258
	Total	518	4,320	6,764	11,602

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

<sup>11</sup>Education and awareness activities are assumed to contribute to direct savings of other initiatives. No additional direct impacts have been estimated for consumer education and awareness activities even though they are anticipated.

<sup>12</sup>Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes a 15-year measure life for electric saving measures and a 25-year measure life for heating fuel saving measures. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

<sup>13</sup>Customer participants are defined as individuals or businesses that participate in these pilots. A customer participant is someone who undertook an energy rating, audit, or energy retrofit as a result of the pilot. If a customer participated in more than one activity, they are counted one time. Market Actors participants are defined as organizations or businesses who are an active part of a pilot – such as an energy rater, trained home inspector, participating residential contractor, or retail establishment.

**Table 6. Estimated Indirect Market Impact<sup>14</sup>**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	0	3,420	16,500
	MMBTu Cumulative Annual	0	257,000	1,240,000
Renewable Energy	MWh Cumulative Annual	0		
	MW	0		
CO2e Emission Reduction (metric tons) Cumulative Annual		0	17,000	82,000

### 25.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<p>NYSERDA intends to offer this initiative in a fuel neutral manner as heating fuel savings provide larger opportunities for energy savings in the one-to-four family household sector. Offering the strategies in this initiative on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of \$2,696 per ton of carbon, compared to a cost of \$6,739 per ton of carbon in an electric only scenario.</p>
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### 25.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	<p>NYSERDA’s approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.</p> <p><u>Test-Measure-Adjust Strategy</u></p> <ul style="list-style-type: none"> <li>• The strategy design will be tested to gauge the target population’s reaction to the strategy. This information will be used to help inform decisions about how to allocate time and resources within the initiative and to confirm market interest and preparedness for full scale implementation.</li> <li>• Insights as to how the initiative can be optimized will be gathered and applied to initiative design to ensure greatest market impacts within the identified market sectors.</li> <li>• Collect, analyze and report on progress of the initiative by comparing progress against identified goals on a regular basis (i.e., quarterly, bi-annually).</li> <li>• Aggregate and analyze data from NYSERDA-supported projects to verify realized energy savings and persistence of savings. Measure results and gather data to inform the business case of the technologies installed for future projects, as well as to provide contractors information about their performance.</li> </ul> <p><u>Market Evaluation</u></p> <ul style="list-style-type: none"> <li>• Given the targeted market groups and barriers addressed by this intervention, it is anticipated that market evaluation of this initiative will leverage the update of the Residential Statewide Building Stock (RSBS) study planned for 2018. The objective of the RSB study will be to update key metrics from the baseline activity reported in 2014 with particular focus on metrics including, but not limited to, energy use and the penetration of energy-efficient equipment, building characteristics, and energy management practices in the residential single-family sector. Information on respondent household characteristics and the stocking practices of upstream market actors is also planned to be collected.</li> </ul>
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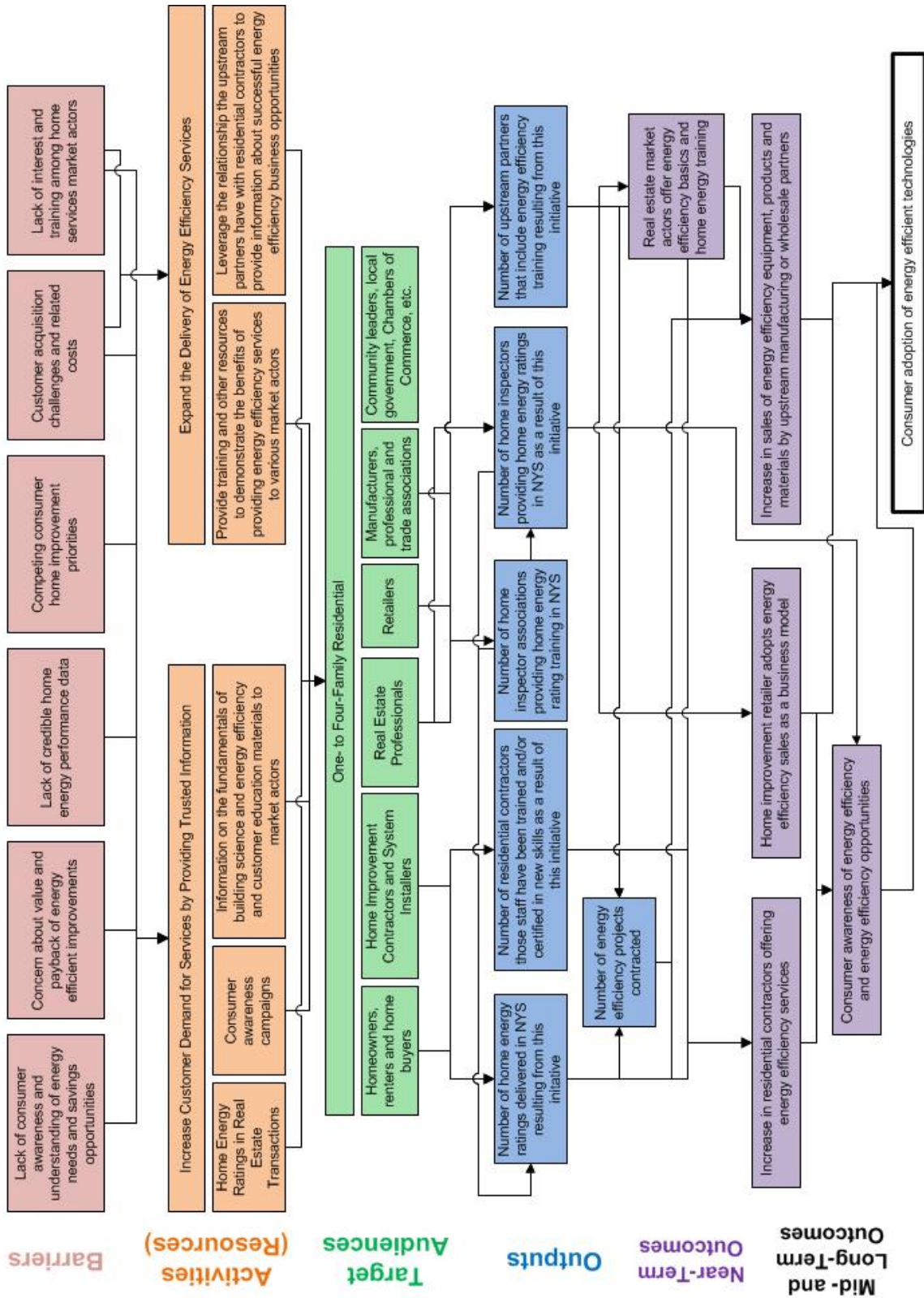
<sup>14</sup> Education and awareness activities are assumed to contribute to indirect savings of other initiatives. No additional indirect impacts have been estimated for consumer education and awareness activities even though they are anticipated.



	<ul style="list-style-type: none"> <li>• Many of the metrics collected as part of the RSBS will inform this specific initiative directly and potentially offset separate initiative-specific data collection needs. Further, evaluations conducted by utilities and other stakeholders will be utilized as appropriate to inform the evaluation of this initiative and triangulate results of primary data collection. Any additional market evaluation specific to this initiative will draw on the logic model and will include baseline measurements of the key market indicators listed below. Regular longitudinal measurements (e.g., annual or biennial) will include updates of the baseline metrics as well as additional measurements to assess market change resulting from the initiative.</li> <li>• Key market indicators for any initiative-specific evaluation activity will include, but not be limited to, the number of qualified and active energy-focused firms; the rate at which clean energy activities specific to this initiative are adopted and replicated by participants and non-participants; knowledge of and confidence in the benefits of clean energy approaches and technologies by homeowners, contractors, real estate professionals and other key market actors; and the impact that changes to incentive offerings have on measure adoption, participation, and demand for energy efficiency information and services.</li> <li>• A market-based evaluation approach will leverage industry sales data, market actor survey responses, and awareness studies and will seek to measure the adoption rate of clean energy for homeowners influenced by initiative market actors and related activities. Primary data collection will include surveys of manufacturers and upstream market actors and will be supplemented with secondary data including sector-level market studies. Publicly and commercially available data will be utilized to inform the measurement of key market indicators .</li> </ul> <p><u>Impact Evaluation/Field Verification</u></p> <ul style="list-style-type: none"> <li>• Evaluation will be conducted for a representative sample of projects completed through the program. Survey activities will be carried out to determine a Measure Adoption Rate (MAR) for participants and will also seek to understand the impact of any incentives or funding utilized to support the implementation of recommended measures. Determination of the savings realization may include billing analysis or open-site verification, as appropriate.</li> <li>• Evaluation measurement and verification (EM&amp;V) of direct savings will focus on areas of greatest impact and will draw upon project-level data collected by the program. Where feasible, advanced EM&amp;V approaches will be applied to gain a "near-real-time" understanding of energy impacts as well as additional insights that will help inform contractor performance. <ul style="list-style-type: none"> <li>○ Depending on the extent of replication identified in market evaluation activities, impact evaluation may also be conducted on a sample of replication projects.</li> </ul> </li> <li>• Data from impact evaluation activities can be used to help build confidence in the market, especially among other end users.</li> </ul>
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# Appendix A – Logic Models

## LOGIC MODEL: Engaging New Markets in the Residential Sector



## Appendix B –Investment Plan Review Supplement<sup>1</sup>

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<sup>1</sup> As this report includes performance through Q2 2017 and the Engaging New Markets Initiative was filed in Q4 2017, that initiative is not included herein.



NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

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