NYSERDA New York Green Bank
Financial Market Transformation Evaluation

Final Report

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New York State Energy Research and Development Authority

Albany, New York

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NYSERDA Contract 167099 October 2023

NYSERDA Record of Revision

Document Title
NYSERDA NYGB Market Financial Market Transformation Evaluation Report October 2023

Revision Date	Description of Changes	Revision on Page(s)
October 2023	Original Issue	Original Issue

New York Green Bank Financial Market Transformation Evaluation

Prepared for:

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Submitted to:

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Agreement Number: 167099

October 2023

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Executive Summary

Context

New York Green Bank was established in December 2013 as a state-sponsored specialized investment fund with the mission of accelerating the clean energy transition in New York. Acting to bring about transformative changes in clean energy financing markets, NY Green Bank's overarching objectives are to address financing gaps and barriers and to expand private sector investments in commercial ready clean energy technologies and assets. As of March 2022, NY Green Bank has successfully used its initial $1 billion capitalization to make $1.7 billion in cumulative investments and has mobilized up to $4.5 billion in private-sector lending for community solar, energy efficiency and other clean energy markets.

This market transformation evaluation builds upon the previous study to assess the progress NY Green Bank has made in delivering on its mission, focusing on the period between April 2019 and March 2022. The current study describes observed changes in target financing markets, provides insights on NY Green Bank's market transformation impacts, and informs recommendations for NY Green Bank to further scale its impact in New York's clean energy sector.

Approach

The primary goal of the study is to evaluate NY Green Bank's market transformation impacts in New York's clean energy financing markets. Market transformation occurs as a result of specific interventions that create enduring market changes over the mid- to long-term and which fall beyond those naturally occurring in the market. This study uses seven indicators to uncover likely signals that reveal whether New York's clean energy financing markets are maturing, drawing on a mix of surveys, interviews, case studies and secondary data collection. The indicators have been refined since the previous evaluation to strengthen the rigor and pertinence of findings and to facilitate consistency in future evaluations.

The indicators were selected based on an updated assessment of NY Green Bank's Theory of Change to create alignment with its mission and objectives. The Theory of Change posits that sufficient capital availability and appropriate financial solutions are needed, based on NY Green Bank's focus on commercial ready clean energy technologies and assets. The Theory of Change also indicates that strong market demand for these projects is needed. While NY Green Bank does not expressly contribute to demand creation, most of New York's clean energy markets are supported by NYSERDA's market development activities and incentives.

In addition, to understand NY Green Bank's impact on observed changes, each indicator was analyzed against three metrics: Evidence of Change, NY Green Bank Influence and Robustness. The Evidence of Change metric identifies recent changes and trends in New York's clean energy markets. Observed changes are then closely examined in the "NY Green Bank Influence" metric to determine whether there is compelling evidence that NY Green Bank's investments and activities have helped accelerate changes or effect changes that would not have otherwise occurred. The "Robustness" metric is used to consider the quality and availability of data to gauge whether there is a breadth of evidence to support our assessment of each indicator.

Key Takeaways

While NY Green Bank is a relatively small player compared to the size of NYS' overall clean energy sector, there is compelling evidence that it is helping accelerate and scale clean energy deployment in some clean energy markets.

- As a national leader in climate and clean energy policy, **New York has adopted ambitious climate targets and is experiencing rapid growth in some target markets, including distributed solar and building decarbonization**. For instance, New York has emerged as the leading state for total capacity of community solar installations, wherein NY Green Bank played an early mover role. Recently adopted policies and regulations are also expected to grow investment in building decarbonization and clean transportation markets and deploy significant funds to benefit disadvantaged communities (DACs).
- This evaluation highlights the ways in which **NY Green Bank is playing a strategic role in supporting New York's clean energy sector, despite its small size relative to the overall market.** It is primarily addressing financing gaps and barriers by offering adapted financial instruments that respond to market needs and by investing in projects lacking adequate capital. It also supports the objectives and targets outlined in New York's Climate Leadership and Community Protection Act (Climate Act) through alignment with its strategic priority markets.
- **NY Green Bank's portfolio of projects show compelling evidence that it is playing a meaningful role in transforming a few key markets.** For instance, early community solar projects made use of the Value Stack compensation mechanism,[1] which presented substantial uncertainty and perceived risk to private sector financiers. NY Green Bank played an early mover role in this market, helping establish a strong track record of investing in community solar PV projects that has allowed this market to grow rapidly over recent years. NY Green Bank also offers adapted financing products, including bridge loans, construction financing and term loans, to address existing financing barriers and gaps.
- **NY Green Bank will continue to focus its investments and create impact in gradually maturing clean energy markets through its alignment with New York's recently adopted Climate Act and its priority investment targets**.

  NY Green Bank's forthcoming investments in building decarbonization and green affordable housing within disadvantaged communities, in addition to clean transportation, are expected to bring about transformative changes in these markets over coming years that significantly reduce GHG emissions and support the achievement of State targets.
- **The evaluation revealed some further opportunities to help grow NY Green Banks market transformation impacts.** NY Green Bank can develop new financial instruments and increase risk tolerance to leverage additional private capital and support clean energy technologies, assets and market segments that are not yet as competitive as more mature markets. To tackle the information gap and build financier knowledge of these relatively novel markets, NY Green Bank can also play a more active role in promoting knowledge sharing. Lastly, to improve the understanding of clean energy risk-return profiles, NY Green Bank can play a role in advocating for greater data transparency and sustainable finance disclosures.

[1] The Value Stack is a mechanism that provides compensation for energy created by community solar and other distributed energy resources based on when and where it is generated. For more information, see NYSERDA's Value Stack description at https://www.nyserda.ny.gov/All-Programs/NY-Sun/Contractors/Value-of-Distributed-Energy-Resources.

Main Findings

The following table summarizes the assessment of each market transformation indicator and metric.

Indicator	Description	Findings	Metrics
Indicator 1 *Change in the perceived market opportunity for clean energy investments in New York*	This indicator aims to capture the tendency for many commercial financiers to wait before investing in novel markets until they believe the opportunity is large and profitable enough.	Financiers are generally aware of some attractive financing opportunities in New York's clean energy sector. However, NY Green Bank does not appear to have had a notable influence on improving the perception or understanding of these financing markets in New York.	**Market change**: **Moderate** **NYGB Influence**: **Low** **Robustness: Moderate**
Indicator 2 *Change in clean energy investment risk-return profiles, as demonstrated through improved financing terms*	This indicator aims to capture the tendency for commercial financiers to offer more favorable financing terms as they become more confident in and comfortable with the risk profiles of clean energy technologies and assets, as well as the performance of associated financial products.	Some financiers remain hesitant to invest in clean energy markets, in part due to knowledge gaps. For their part, developers have reported better access to financing over the past three years, but borrowing costs that remain higher than traditional financial products. NY Green Bank helped lower perceived risks on transactions they were party to through a variety of strategies.	**Market change**: **Moderate** **NYGB Influence**: **Moderate** **Robustness: Moderate**
Indicator 3 *Change in the total volume of clean energy project financing*	This indicator aims to capture the growth in the total capital flows to clean energy markets, which is typically a signal that the markets are maturing, with less need for government funding and other initiatives to encourage investment.	There has been a rapidly growing number of clean energy transactions in New York, particularly in the solar and energy efficiency markets, helping financiers develop a better understanding of these markets. However, insufficient standardization across small-scale projects is affecting the scale of capital flows, due to higher transaction costs and complexity. NY Green Bank has thus invested in initiatives that allow for standardization across a portfolio of small-scale projects.	**Market change**: **Strong** **NYGB Influence**: **Low** **Robustness: Moderate**

Indicator 4 *Change in the volume of transactions in specific clean energy markets*	This indicator aims to capture the tendency for strong performance in markets to drive growth and create a greater number of investment opportunities. As a result, developers tend to have access to more substantial financing in mature markets. Large deal sizes also help satisfy the minimum requirements of large-scale investors and justify transaction costs, allowing a broader range of financiers to participate in the market. This indicator looks at three key markets: a. Distributed solar b. Building decarbonization c. Clean transportation	**a. Distributed Solar**	
		The State has committed to achieving 70% renewable energy by 2030 and offers a range of favorable policies, programs and incentives to promote distributed solar. Community solar has grown rapidly in recent years, making New York the top community solar market in the U.S. NY Green Bank was one of the early investors in the community solar market after the new "Value Stack" mechanism was introduced, which had the initial effect of slowing investment due to the perceived uncertainty and complexity of the revenue model. Moving forward, NY Green Bank is expected to recenter its focus on solar plus storage projects, which are less established.	**Market change**: **Strong** **NYGB Influence**: **Moderate** **Robustness:** **Strong**
		b. Building Decarbonization	
		The market for energy efficiency appears to be growing in New York, with a growing number of policies and resources designed to improve access to energy solutions for low- to moderate-income households. NY Green Bank has continued to invest in this market as there are persisting barriers that will need to be overcome to achieve scale in decarbonizing New York's building stock.	**Market change**: **Moderate** **NYGB Influence**: **Low** **Robustness:** **Low**
		Clean Transportation	
		The demand for electric vehicles is growing and supported by financial and non-financial incentives offered by the State. However, NY Green Bank has only recently entered this market and had not completed any clean transportation transactions at the time of this study.	**Market change**: **Low** **NYGB Influence**: **Low** **Robustness:** **Low**

Indicator 5 *Change in the mix of financiers investing in clean energy projects*	This indicator aims to capture the tendency for greater debt financing to become accessible as markets mature, attracting different kinds of financiers than in earlier stages of firm and market development.	NY Green Bank is directing capital flows into less established clean energy markets where small-scale developers are most active. There is some preliminary evidence that suggests greater debt capital can be accessed in the community solar market, which was a market NY Green Bank invested in early on.	**Market change**: **Low** **NYGB Influence**: **Low** **Robustness: Low**
Indicator 6 *Emergence of secondary markets for clean energy assets*	This indicator aims to identify and measure the clean energy asset classes traded on secondary markets. This can attract substantial private sector capital into clean energy markets, making them more liquid. It is often a sign of relative market maturity.	Solar asset-backed securities are one of the few clean energy assets traded on secondary markets. There remains a need to create and demonstrate standardization and recapitalization structures to support other clean energy assets. Since NY Green Bank is a relatively small player in the clean energy sector, it has helped fill financing gaps, though these represent a small proportion of total transaction financing.	**Market change**: **Moderate** **NYGB Influence**: **Moderate** **Robustness: Moderate**
Indicator 7 *Change in the number of transactions benefitting DACs*	This indicator aims to identify and measure projects that directly benefit members of disadvantaged communities (DACs), which support State goals to achieve a just and equitable energy transition.	NY Green Bank has financed several solar and energy efficiency projects that benefit low-income households. In March 2023, the Climate Justice Working Group adopted the final DAC definition, which will make it easier to monitor and report on this indicator in future evaluations.	**Market change**: **Low** **NYGB Influence**: **Low** **Robustness: Low**

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1. Introduction

As the first update to the 2019 NY Green Bank Financial Market Transformation Baseline Study ("2019 Evaluation"),[2] this Market Transformation Evaluation builds upon the findings of the previous study to assess the progress NY Green Bank has made in achieving its goals, focusing on the period between 2019 and end of March 2022. The evaluation is structured around seven indicators, supported by primary and secondary data, which describe changes across New York State's ("New York") clean energy financing sector, as well as NY Green Bank's influence on accelerating the deployment of capital in these markets. As such, the study establishes new and updated baselines for each indicator, provides insights on NY Green Bank's market transformation impacts, and informs recommendations for NY Green Bank to further scale its impacts across New York's clean energy markets.

About NY Green Bank

NY Green Bank was established in December 2013 as a state-sponsored specialized investment fund with the mission of accelerating the clean energy transition in New York. Acting to create transformative changes in the short, medium and long term, NY Green Bank aims to alleviate financing gaps and barriers in the clean energy sector and to scale these markets by crowding in private capital through its investments in proven clean energy technologies and assets.[3]

As of March 2022, NY Green Bank has successfully used its initial $1 billion capitalization to make $1.7 billion in cumulative investments,[4] and has mobilized up to $4.5 billion in private-sector lending for community solar, energy efficiency and other clean energy markets.[5]

In recent years, NY Green Bank has made significant advancements in the community solar market, expanded its focus on climate equity, and closed the largest portfolio monetization completed by an American green bank to date.[6] Moreover, NY Green Bank's investment pipeline continues to diversify across technology, location and end-user segment as it continues to support New York's ambitious climate targets.[7]

NY Green Bank's Investment Mandate

> ***"We invest in financially and technically feasible projects that lack access to appropriately priced capital. Specifically, NY Green Bank steps in to fill gaps in the market where financing might not be available from conventional lenders, potentially due to barriers such as limited precedent, small deal sizes, challenges in evaluating technology risk, lack of familiarity with business models or deal structuring and underwriting complexities. In addition to filling those specific gaps, we work to ensure that, in time, these gaps can be filled by the private sector rather than by public funds."***[8]

[2] DNV GL. (2019). NY Green Bank Financial Market Transformation Study. https://greenbank.ny.gov/-/media/Project/Greenbank/files/2019-03-financial-market-transformation-evaluation-study.ashx
[3] NY Green Bank. Product Offerings. https://greenbank.ny.gov/Investments/Product-Offerings
[4] As of March 2022.
[5] NY Green Bank. (2022). NY Green Bank Impact Report. For the Fiscal Year Ended March 31, 2022.
[6] Ibid.
[7] Green Bank Network. (2020). NY Green Bank. https://greenbanknetwork.org/ny-green-bank/
[8] NY Green Bank. (2022). NY Green Bank Impact Report. For the Fiscal Year Ended March 31, 2022.

Under its current investment mandate, NY Green Bank is working towards addressing clean energy financing gaps by supporting markets with low technology risk combined with limited competition and liquidity premiums. NY Green Bank therefore selects projects that have already demonstrated success and are capable of carrying the commercial cost of debt, but which face capital constraints for new developments or the expansion of existing operations.

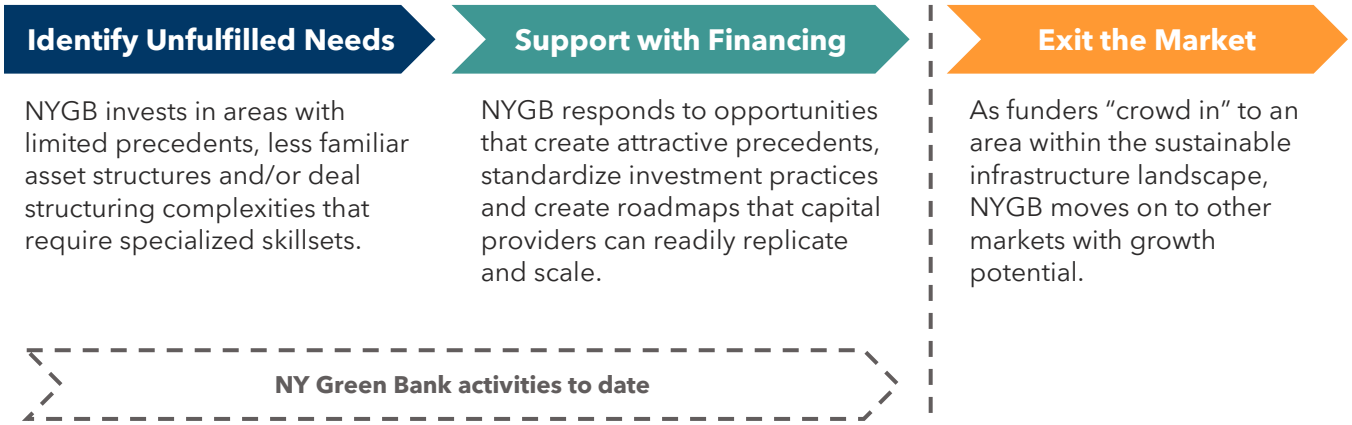
NY Green Bank lends at market rates to signal to the private sector that the associated financing products will deliver attractive risk-adjusted returns. This grows interest from other lenders and investors, allowing NY Green Bank to turn its focus to less familiar areas of the market.

NY Green Bank also aims to replicate private deal structures, evaluating opportunities based on:

- Technology eligibility
- Standard credit and risk assessments
- Financial and risk-return profiles
- Contribution to financial market transformation
- Contribution to greenhouse gas (GHG) emissions reductions through energy savings and/or clean energy generation[9]

Working to address financing gaps and barriers, as well as attracting substantial private sector investment, NY Green Bank operates by identifying opportunities to support market transformation in target markets and financing suitable projects. Once a market has reached sufficient maturity, NY Green Bank moves to new markets to avoid crowding out or competing with private sector financiers **(Figure 1**).

Figure 1: NY Green Bank's Market Transformation Pathway



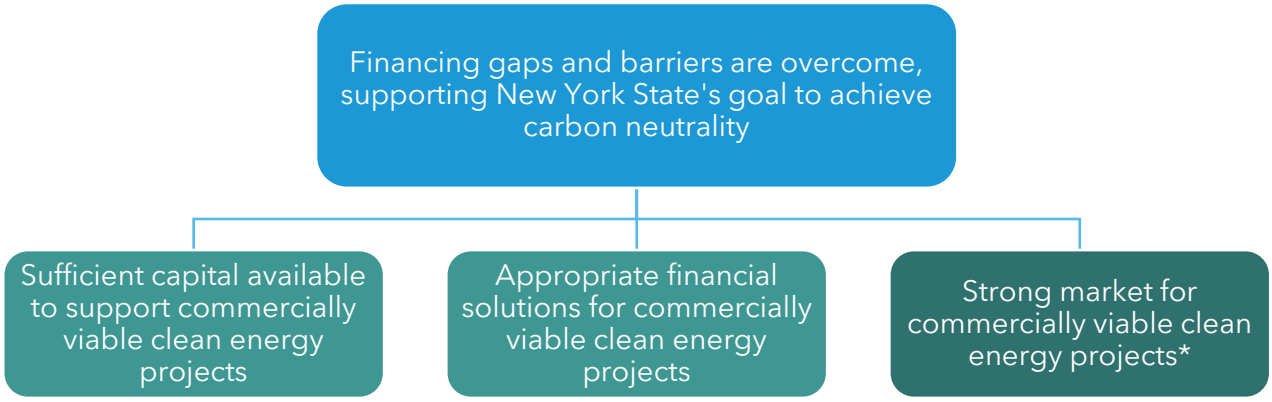
[9] NY Green Bank. (2022). Investment Strategy. https://greenbank.ny.gov/Investments/Investment-Strategy

NY Green Bank's Theory of Change Model

As an early step in the evaluation effort, the Dunsky team worked with NY Green Bank and NYSERDA Evaluation teams to describe the Theory of Change driving NY Green Bank's programming and products. The Theory of Change model outlines the preconditions required to achieve NY Green Bank's market transformation objectives in clean energy financing markets (**Figure 2**), which are then used to establish the seven evaluation indicators applied in this study.

Overall, the Theory of Change centers around NY Green Bank's efforts to address financing gaps and barriers to achieve a carbon neutral economy in New York by attracting private sector capital and developing appropriate financial solutions to support commercially viable projects. While strong market demand is a third precondition, it falls outside the purview of NY Green Bank's activities, though it is in many cases supported by NYSERDA incentives and market development activities.

Figure 2: Summary of NY Green Bank's Theory of Change[10]



*NY Green Bank does not directly influence outcome

NY Green Bank's Investment Portfolio

NY Green Bank has identified four strategic investment targets to achieve by 2025 (**Table 1**).

Table 1: NY Green Bank's Investment Priority Areas

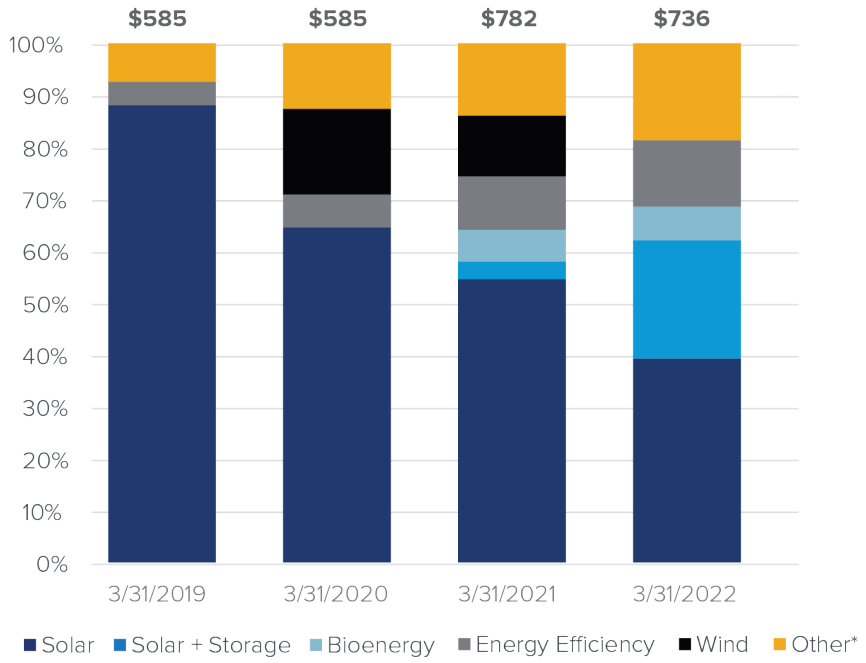
Priority Sector	Investment Target	Committed Capital	Progress Towards Targets	Project Pipeline
Energy Storage	$200 MM	$48 MM	24%	$30 MM
Building Decarbonization	$100 MM	$13 MM	13%	$65 MM
Clean Transportation	$100 MM	-	0%	$40 MM

[10] The detailed model is included in Appendix A: Evaluation Frameworks.

Green Affordable Housing	$150 MM	$14 MM	17%	$12 MM

To date, over a third of NY Green Bank's investments were made through term loans, with warehousing and aggregation loans also contributing notably to the NYGB portfolio. Overall, the majority of the NY Green Bank investment portfolio has been directed at solar investments. Although NY Green Bank has provided preferred equity in one transaction (Saranac Waterfront Lodges), the concentration of most of its investments have been in transactions with comparatively lower levels of risk. In more recent years, NY Green Bank has increasingly offered predevelopment financing to close the financing gaps for new affordable housing projects. It has also supported an increasingly diverse portfolio of clean energy technologies and assets (**Figure 3**).

Figure 3: NY Green Bank Portfolio Distribution by Technology ($MM), 2019-2022[11]



Contextualizing NY Green Bank's Sphere of Activities within New York

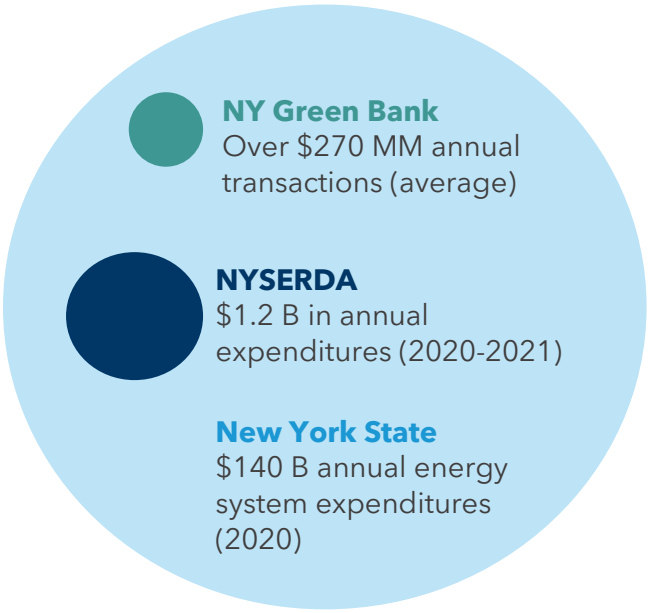
NY Green Bank is a division of the New York State Energy Research and Development Authority (NYSERDA), a public benefit corporation that oversees numerous clean energy initiatives across New York.[12] While its mandate is to accelerate and scale the deployment of financing in clean energy markets, NY Green Bank's pool of funds is relatively small compared to the size of annual energy market expenditures in New York. It invests approximately $270 million annually; by contrast, NYSERDA's annual expenditures are roughly four times as large at around $1.2 billion. However,

[11] NY Green Bank. (2022). NY Green Bank Impact Report. For the Fiscal Year Ended March 31, 2022.
[12] For the purposes of this study, "clean energy sector" is inclusive of energy efficiency markets.

given the close connection between both entities, the two often operate in conjunction within the same markets to drive market transformation.

Figure 4 demonstrates that overall annual energy sector expenditures in New York to support the state's economy and population, representing $140 billion annually,[13] with NYSERDA and NY Green Bank's annual budget representing just 1% of this overall market.[14]

Figure 4: Scale of NY Green Bank's Investments Relative to New York's Clean Energy Financing Sector



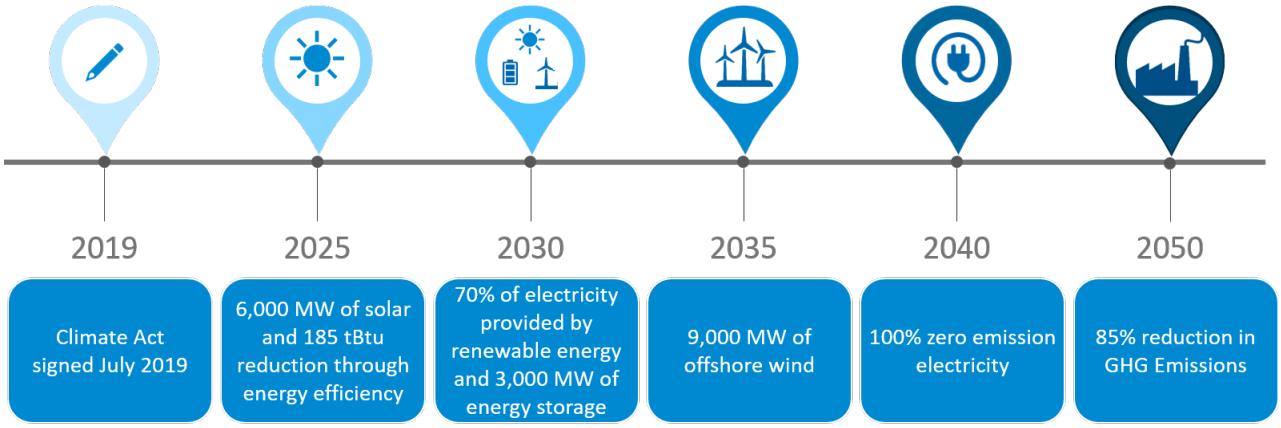
New York's Climate Act Targets

NY Green Bank plays a major role in driving New York's Climate Leadership and Community Protection Act ("Climate Act"),[15] which sets the State on a path to economy-wide carbon neutrality (**Figure 5**). Along this path, the Climate Act sets out the following interim goals:

- 70% renewable energy by 2030 and 100% zero-emission electricity grid by 2040;
- 40% reduction in GHG emissions from 1990 levels by 2040 and 85% reduction and net zero emissions by 2050; and
- The creation of a policy roadmap that ensures at least 35% of clean energy program resources benefit disadvantaged communities (DACs).

[13] This number includes capital investments for energy-consuming devices, liquid and gas fuel costs, and costs for in-State and imported electricity generation.
[14] New York State Climate Action Council. (2022). Scoping Plan. Full Report December 2022. https://climate.ny.gov/-/media/Project/Climate/Files/NYS-Climate-Action-Council-Final-Scoping-Plan-2022.pdf
[15] Ibid.

Figure 5: Climate Act Targets[16]



Market Transformation Explained

Market transformation occurs when a strategic intervention lowers barriers and enhances opportunities within target markets, as evidenced by its lasting effects.[17]

Market transformation can be better understood when compared to its counterpart, a resource acquisition initiative. In a typical resource acquisition initiative, subsidies are offered to promote clean energy technologies. The goal of this type of initiative is to reduce costs, without specific concern for lasting structural effects on the market.

In contrast, a market transformation initiative aims to catalyze long-term, durable changes in the market by eliminating barriers in such a way that no further efforts are needed to encourage clean energy investment. A typical market transformation evaluation therefore focuses on initiatives that lead to broad scale adoption of target technologies or solutions over time.

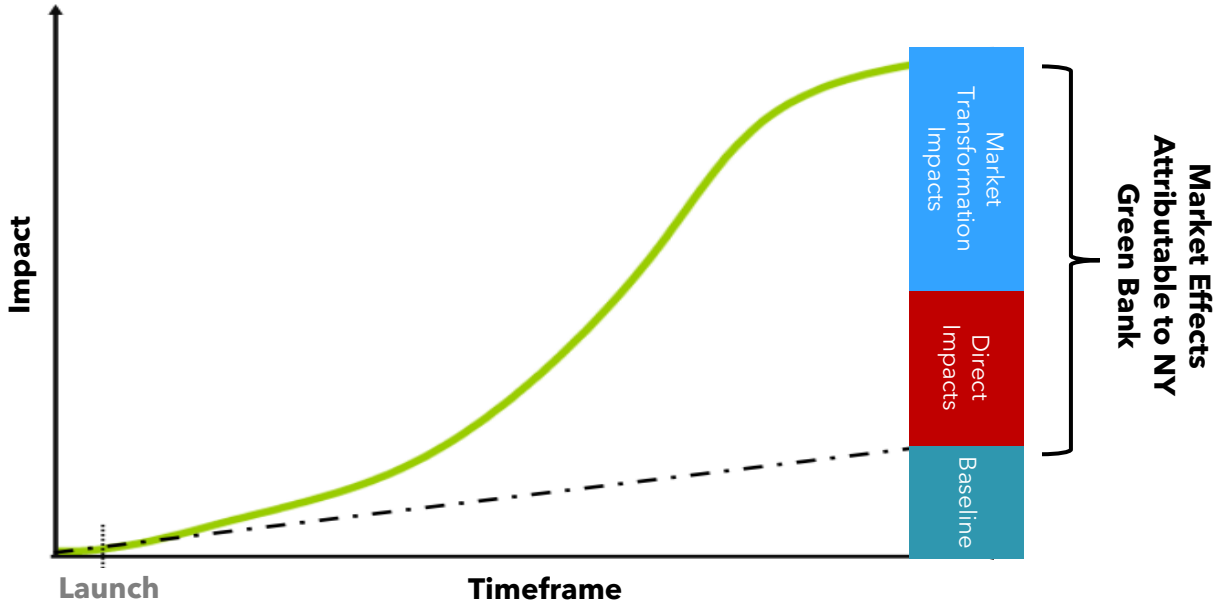
While some initiatives may be purely focused on resource acquisition or market transformation, many share characteristics of both approaches.

To help situate the concept of market transformation, **Figure 6** illustrates the differences between baseline market adoption, direct effects, and market transformation impacts.

[16] Figure from New York State Energy Research and Development Authority. (2023). New York's Climate Leadership and Community Protection Act. https://nyrevconnect.com/climate-act/

[17] Adapted based on Eto, J. H., Prahl, R., & Schlegal, J. (1996). A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs. University of California.

Figure 6: Conceptualization of Market Transformation Impacts



Baseline market adoption captures the market trends that naturally occur in the absence of targeted interventions. Even without any support, gradual market adoption will occur, but at a slower pace. Because the natural uptake of clean energy technologies is not caused by any initiative, it defines the imagined baseline market conditions.

Market effects are the results of a change in the market, such as a new initiative. They include both direct impacts and indirect impacts (e.g., market transformation). Market effects must discount the naturally occurring baseline market adoption to form an accurate depiction of the real impact of the intervention, since the objective is to highlight the changes that would not have occurred otherwise.

Market transformation impacts are a subset of market effects and reflect the indirect impacts of an intervention over time. Market transformation impacts are enduring, and therefore persist after an intervention has been withdrawn or reduced. Initiatives and other interventions are considered successful when innovative technologies or solutions become commonplace in the market.

This study examines market effects in New York's clean energy markets. As part of this effort, NY Green Bank's financial transactions are evaluated in relation to observed changes over time within key markets with a view to distinguish between direct and indirect impacts and understand the role NY Green Bank has played in driving transformative changes.

2. Evaluation Approach

This evaluation effort is the second step in NYSERDA's longitudinal evaluation of NY Green Bank's market transformation impacts. The first evaluation for NY Green Bank[18] was completed in 2019 with the aim of establishing a baseline across an assortment of indicators. The current evaluation builds on the previous approach and findings, applying some revisions to the indicators to strengthen the rigor and pertinence of findings and to facilitate consistency in future evaluations. This study therefore serves to establish baselines against which future studies will be compared, looking primarily at the period between 2019 and 2022 ("Study Period").

Evaluation Objectives

This evaluation aims to identify and measure the influence of NY Green Bank's investments and activities in clean energy financing market in New York. To this end, the study has three overarching objectives:

1. Review the effectiveness of NY Green Bank's activities, including financial instruments that address market barriers and financing gaps, increase investor confidence in clean energy projects, and increase the scale of clean energy financing.
2. Highlight market transformation successes as demonstrated in specific case study transactions supported by NY Green Bank; and
3. Outline recommendations to strengthen and accelerate NY Green Bank's market transformation impacts.

Methodology

The findings of the evaluation were informed by primary data collected from surveys and semi-structured interviews with clean energy financiers and developers (see Web scraping to capture mentions of NY Green Bank and its counterparties, as well as clean energy trends, in online media and public reports for qualitative and quantitative data.

[18] DNV GL. (2019). NY Green Bank Financial Market Transformation Study. https://greenbank.ny.gov/-/media/Project/Greenbank/files/2019-03-financial-market-transformation-evaluation-study.ashx

Appendix C: Detailed Results for more information). Secondary data sources were used to contextualize and supplement findings, and include:

- NY Green Bank and NYSERDA reports, combined with additional web scraping to identify U.S. and state-wide trends;
- New York State climate action policy and program documentation; and
- Additional research on market barriers to clean energy investment.

These datasets were used to evaluate NY Green Bank's impact on seven market transformation indicators,[19] to identify changes over time within New York's clean energy sector and to understand how NY Green Bank's interventions helped transform these financial markets. Finally, case studies across four clean energy markets were prepared. These consider specific NY Green Bank transactions and showcase instances where it played a role in driving successful transaction outcomes.

Market Transformation Indicators

For the purposes of this study, market transformation impacts are defined as enhanced financing activity and other positive changes in target clean energy markets that are directly and indirectly connected to NY Green Bank activity. With this in mind, seven market transformation indicators were selected to highlight changes that have occurred in clean energy markets and to establish a baseline against which NY Green Bank's impact can be measured in future evaluations (see descriptions in **Table 4**). These indicators were developed through a review of NY Green Bank's Theory of Change, the specific program logic behind their financing products, and through a review of past indicators. They have been defined with the objective of describing observable changes over time, by which NY Green Bank's market transformation impacts can be evaluated.

To understand where NY Green Bank has had an enduring impact in New York's clean energy markets, the Dunsky team evaluated the seven market transformation indicators against three criteria:

1. **Evidence of change in the market**
2. **NY Green Bank influence**
3. **Data robustness**

Each criterion is measured according to the strength of findings and quality of the supporting data. It's worth noting that recent investments in new target markets are unlikely to show signs of market transformation impacts attributable to NY Green Bank as too little time has elapsed to draw a clear connection.

1 Evidence of Change: How has the market changed since the last evaluation?

This metric indicates how observed market conditions have evolved during the Study Period (2019 to 2022). While it is meant to build on previous evaluation efforts to identify changes, many of the indicators applied in the previous evaluation were revised or lacked sufficient rigor. As a result, this

[19] The market transformation indicators were selected based on a Theory of Change, which fed into a Program Theory Logic Model that helped identify pertinent metrics. See **Appendix A: Evaluation Frameworks** for more information.

study aims to identify recent trends and establish new baselines against which to measure changes in the New York's clean energy markets.

2 NY Green Bank Influence: What changes has NY Green Bank contributed to?

In addition to determining if and when changes have occurred in a market, the Dunsky team evaluated the extent to which observed changes in New York's clean energy financing markets can be tied to NY Green Bank's investments, rather than exogenous and other factors. Evidence is derived from interviews with financiers and developers, an examination of the sequence of events, an evaluation of the plausibility of the narrative, and an assessment of the relative importance of other potential influences on each market transformation indicator.

A discernible market transformation signal can only be observed when significant resources have been invested to produce an observable outcome, and sufficient time has passed for an intervention to amplify its effects within the market. Possible signs that point to NY Green Bank's influence on market transformation impacts over time include instances where NY Green Bank invested in a target clean energy market during its early stages of market development in New York, which later allowed developers to obtain financing from a range of private financiers more easily.

NY Green Bank and NYSERDA often act in the same clean energy markets in complementary ways. While this evaluation considers their combined impact, efforts are made to isolate and evaluate NY Green Bank's influence separately to the extent possible.

3 Data Robustness: Has the quality and availability of data impacted the analysis?

This measure assesses the quantity and quality of the data used to validate the observations pertaining to evidence of change in the market and NY Green Bank influence. For instance, information from annual surveys with well-documented samples and methods are weighted more heavily than research efforts that report the opinions of a few market actors. **Table 2** below describes the definition of "strong", "moderate" and "low" for each criterion.

Table 2: Indicator Qualification Criteria

Strength of Findings	Evidence of Change in the Market	NY Green Bank Influence	Robustness
Strong	Evidence of favorable or changing conditions in clean energy markets is compelling and consistent across multiple sources or backed by quantitative data.	Evidence of NY Green Bank's influence on observed changes is compelling, consistent across multiple sources or backed by quantitative data, and supported by a plausible causal narrative.	All key data sources meet stringent quality standards.
Moderate	Evidence of favorable or changing conditions in clean	Evidence of NY Green Bank's influence on observed	The majority of sources meet

	energy markets is mixed, but a majority of indications support the hypothesis.	changes is available from at least two credible sources or based on quantitative or qualitative examples and supported by a plausible causal narrative.	stringent quality standards.
Low	Evidence of favorable or changing conditions in clean energy markets is mixed, but a majority of indications do not support the hypothesis.	Evidence of NY Green Bank's influence on observed changes is lacking.	Few sources meet stringent quality standards due to data availability constraints.

Case Studies

By focusing on specific examples of success, the selected case studies provide evidence of emerging changes through a structured retelling of NY Green Bank's market transformation. More specifically, the showcased transactions in key financing markets were examined to demonstrate how NY Green Bank developed successful financing structures adapted to the unique financing needs and business models of clean energy technologies and assets as a way to encourage further private sector investment in less familiar markets. They also highlight NY Green Bank's role in addressing information gaps to improve investor knowledge and confidence in these markets, and in supporting the growth of small-scale operations with limited performance history by financing projects with less established risk-return profiles. The key insights derived from the case studies therefore describe how NY Green Bank helped address financing gaps and barriers in clean energy markets and how it can continue to do so in the future.

Table 3 below lists the case studies that were selected to highlight NY Green Bank's impact in the community solar and decarbonization markets, as well as its success in completing a substantial portfolio monetization. The case studies are further described in the evaluation findings section of the report and in **Appendix D: Case Studies**.

Table 3: Summary of Selected Case Studies

Clean Energy Market	Transaction Counterparties
1. Community Solar	• **Delaware Solar** *Developer that finances, builds and operates Community Distributed Generation (CDG) projects.* • **Convergent** *Developer that deploys storage systems to support the grid using performance-based contracts.* • **BQ Energy**

	Developer that establishes renewable energy facilities primarily on brownfield and community landfills. • **CSG PV I LLC** *Developer that designs, builds and operates renewable energy assets.* • **Generate Capital** *Financier that works with developers to finance and operate sustainable infrastructure projects.* • **Eden Renewables** • *Developer that leads renewable energy and storage project development.*
2. Building Decarbonization	• **Sealed** *Developer that supports residential retrofits using a Pay-as-You-Save model.* • **Ecosave** *Developer that deploys storage systems to support the grid using performance-based contracts.* • **Red Rochester, LLC** *Utilities company based in New York.* • **New York City Energy Efficiency Corporation** *Green bank providing loans for energy efficiency and clean energy projects in New York City and surrounding regions.*
3. Portfolio Monetization	• **Bank of America** *Large-scale debt investor which refinanced a portfolio of NY Green Bank's performing loans across different clean energy markets.*

3. Evaluation Findings

The following section provides an overview of the findings from the current evaluation, which served to identify observable changes within New York's clean energy markets, identify evidence of NY Green Bank's influence on these changes, and update and establish new indicator baselines, focusing on the period between 2019 and 2022. NY Green Bank's influence is often marked as low where new baselines are established, as there is little to no point of comparison; however, future studies may reveal evidence of NY Green Bank's continued impact in these areas. **Table 4** below provides a description of each indicator, an estimated timeframe for observable changes to emerge, and an overview of the evaluation's findings based on the study's three criteria: market change, NY Green Bank influence, and data robustness.

Table 4: Summary of Findings

Legend Strong Moderate Low

	Indicator	Description	Timeframe[20]	Market Change	NYGB Influence	Data Robustness
1	Change in the perceived market opportunity for clean energy investments in New York	This indicator aims to capture the tendency for many commercial financiers to wait before investing in novel markets until they believe the opportunity is large and profitable enough.	Short term	M	L	M
2	Change in clean energy investment risk-return profiles, as demonstrated through improved financing terms	This indicator aims to capture the tendency for commercial financiers to offer more favorable financing terms as they become more confident in and comfortable with the risk profiles of clean energy technologies and assets, as well as the performance of associated financial products.	Medium term	M	M	M
3	Change in the total volume of clean energy project financing	This indicator aims to capture the growth in the total capital flows to clean energy markets, which is typically a signal that the markets are maturing, with less need for government funding and other initiatives to encourage investment.	Medium to long term	S	L	M
4	Change in the volume of transactions in specific clean energy markets	This indicator aims to capture the tendency for strong performance in markets to drive growth and create a greater number of investment opportunities. As a result, developers tend to have access to more substantial financing in mature markets. Large deal sizes also help satisfy the minimum requirements of large-scale investors and justify transaction costs, allowing a broader range of financiers to participate in the market.	Medium to long term	**SOLAR PV** S	M	S
				BUILDING DECARBONIZATION M	L	L
				CLEAN TRANSPORTATION L	L	L
5	Change in the mix of financiers investing in clean energy projects	This indicator aims to capture the tendency for greater debt financing to become accessible as markets mature, attracting different kinds of financiers than in earlier stages of firm and market development.	Medium to long term	L	L	L
6	Emergence of secondary markets for clean energy assets	This indicator aims to identify and measure the clean energy asset classes traded on secondary markets. This can attract substantial private sector capital into clean energy markets, making them more liquid. It is often a sign of relative market maturity.	Long term	M	M	M
7	Change in the number of transactions benefitting DACs	This indicator aims to identify and measure projects that directly benefit members of disadvantaged communities (DACs), which support State goals to achieve a just and equitable energy transition.	Long term	L	L	L

[20] The timeframe describes the length of time expected for material changes to be observed for each indicator. A short timeframe is defined as 1 to 3 years, a medium timeframe is defined as 3 to 5 years, and a long timeframe is defined as 5 or more years.

INDICATOR 1

1 Change in the perceived market opportunity for clean energy investments in New York

▶ **This indicator aims to capture the tendency for many commercial financiers to wait before investing in novel markets until they believe the opportunity is large and profitable enough.**

Evidence of change: Moderate | NY Green Bank Influence: Low | Robustness: Moderate

Key Takeaways

- Financiers expect New York's clean energy markets to continue growing rapidly in coming years.
- While financiers are aware of financing opportunities in New York's clean energy sector, there is no clear signal whether they believe these markets are more established or favorable than other states demonstrating leadership in this sector.
- There is an opportunity for NY Green Bank to further promote awareness of New York's favorable financing opportunities in clean energy markets.

Context

Globally, the United States represents the third largest clean energy investment market in the world, valued at $215 billion in 2021.[21] It continues to expand, driven by advances in technology, firmer policy, regulatory and fiscal measures, and declining prices making green projects more cost competitive. Investors have also become increasingly aware of climate-related material risks and have declared ambitious Environmental, Social and Governance (ESG) commitments. [22]

Yet, despite the surplus of demand for sustainable financing opportunities, many investors lack the capacity and experience to evaluate novel clean energy financing opportunities, which can represent a significant departure from more traditional investment opportunities. The additional training required and higher transaction costs to enter these markets can be a major deterrent for commercial financiers. As a result, lenders and investors tend to favor proven technologies and assets that have already undergone extensive due diligence, as well as developers with a proven track record. As the business case and perception of clean energy markets improve, greater capital flows into these markets is expected.

[21] International Energy Agency. (2022). Energy Investment in 2022: Overview and Key Findings. https://www.iea.org/reports/world-energy-investment-2022/overview-and-key-findings

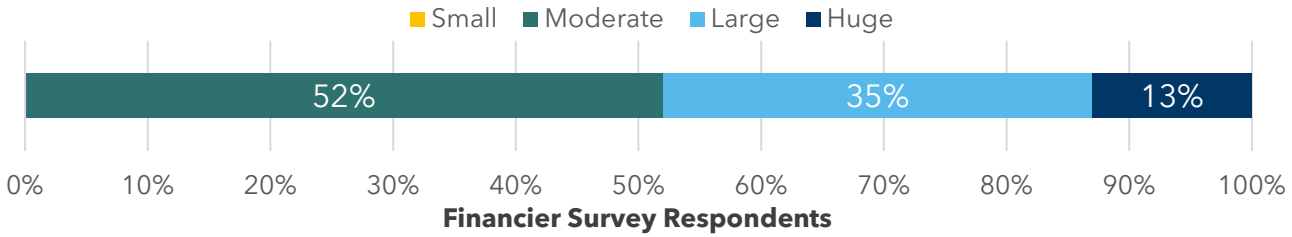
[22] Organisation for Economic Co-operation and Development. (2021). Investing and Climate Transition. Market Practices, Issues and Policy Considerations. https://www.oecd.org/finance/ESG-investing-and-climate-transition-market-practices-issues-and-policy-considerations.pdf

NY Green Bank can therefore play a key role in filling the information gaps within different clean energy markets by developing partnerships with the private sector, supporting projects that establish performance data for new technologies and assets, and building awareness of favorable investment opportunities in less established markets.

Evidence of change: Moderate

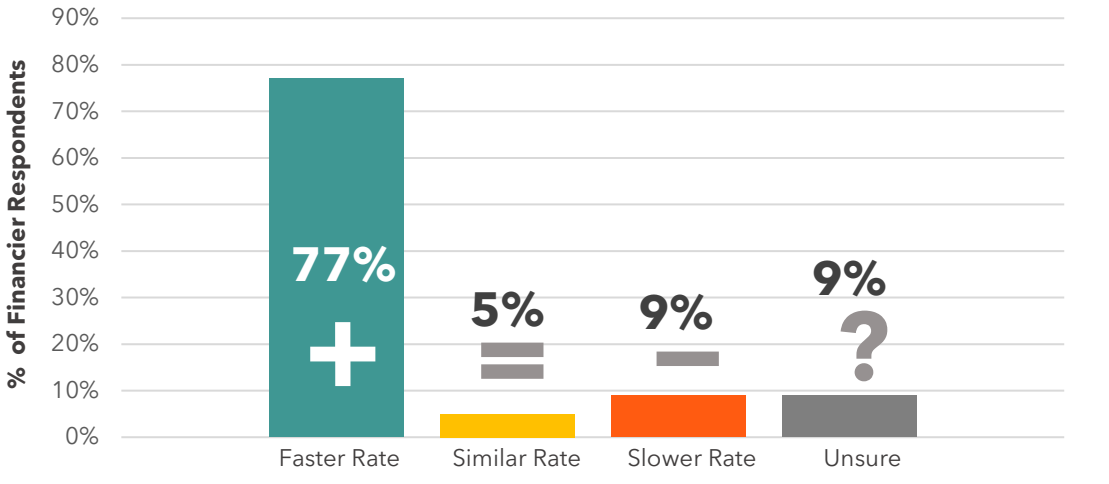
- Financiers described the size of New York's clean energy market as moderate to large (**Figure 7**) and growing rapidly compared to all other investment opportunities (**Figure 8**). They also reported observing similar rates of growth in other states.

Figure 7: Perception of the Size of New York's Clean Energy Financing Market by Financier Survey Respondents



- New York is perceived as an overall favorable state for clean energy investments, with supportive policies, regulations and incentives in place.

Figure 8: Financier Perception of Clean Energy Market Growth in New York



NY Green Bank Influence: Low

- Financiers shared their impression that the solar and energy storage markets were the leading clean energy markets in New York. Although NY Green Bank has invested in these markets, and several respondents were aware of NY Green Bank's solar investments, it is likely that NYSERDA's incentive programs had a greater impact on building awareness.
- Energy efficiency and building decarbonization were identified by financiers as another sizeable market in New York. NY Green Bank has invested roughly $13 million in building decarbonization to date, with another $65 million in its pipeline (**Figure 3**). NYSERDA also has a variety of resources available. While their conjoined efforts may have effectively improved financiers' perception of the opportunities within this market, it is difficult to connect the evidence of change to NY Green Bank specifically.

Robustness: Moderate

The following table describes the rigor of the information and data sources used to establish the baseline for this indicator.

Table 5: Information and Data Sources, Indicator 1

Surveys	Description
Surveys, interviews & case studies	The financier survey sample size was moderate (ranging from 19 to 23 responses), and responses were either overwhelmingly in favor or relatively evenly distributed. In addition, several key insights were derived from the interviews and case studies.
Secondary research	No secondary sources needed for this indicator, as it largely relates to financier perceptions.

INDICATOR 2

2

Change in clean energy investment risk-return profiles, as demonstrated through improved financing terms

▶ **This indicator aims to capture the tendency for commercial financiers to offer more favorable financing terms as they become more confident in and comfortable with the risk profiles of clean energy technologies and assets, as well as the performance of associated financial products.**

Evidence of change: Moderate | NY Green Bank Influence: Moderate | Robustness: Moderate

Key Takeaways:

- Financiers already investing in clean energy intend to expand their clean energy portfolios over coming years. Financiers not investing in clean energy generally remain reluctant to enter these markets. NY Green Bank therefore had minimal impact on attracting new financiers to these markets.
- Knowledge gaps continue to be a barrier to clean energy financing. A lack of historical performance data and internal expertise create due diligence burdens for financiers. An improved understanding of clean energy technologies and assets could therefore encourage new financial market participants to invest in these markets.
- Developers reported better access to financing over the past three years, but at higher borrowing costs than traditional financial products.
- NY Green Bank helped lower the perceived risk on transactions they were party to through a variety of strategies

Context

To accelerate the clean energy transition, developers need better access to lower-cost capital. However, many financial market participants are still reluctant to invest in this sector, largely due to the perception of high risk and low expected returns. This is particularly true for newer technologies and assets that lack historical performance data and for small-scale projects with added transaction complexity and relative cost.

In addition, many investors have relatively short-term investment horizons, which do not adequately account for the physical and transition risks of climate change. The resulting mispricing of risk and underinvestment in some clean energy markets has impacted developers' access to capital and, by extension, the viability of projects. Perceptions of high risk also result in interest rate premiums and restrictive terms and conditions, which increase the cost of borrowing and hinder the scale of investments within these markets. Moreover, many developers have limited capacity to scale up their operations or execute significant capital expenditure plans using their balance sheets. Access to

appropriately priced capital is therefore critical in enabling developers to expand and lead new ventures.

As a mission-driven entity, NY Green Bank is uniquely positioned to understand clean energy markets, drawing from its internal expertise and experience in this sector to judiciously assess investment opportunities and establish a performance track record. NY Green Bank can thus help demonstrate risk-adjusted returns for clean energy technologies and assets, gradually boosting investor confidence in unfamiliar markets and bringing down borrowing costs for developers. At the same time, NYSERDA's programs and incentives can help improve the business case for clean energy investments by bringing down costs.

Evidence of Change: Moderate

- Financiers with existing clean energy portfolios revealed their intent to invest in more clean energy projects over coming years. This is likely an indication that financiers are becoming more comfortable with the risk-return profiles in specific clean energy markets. If experienced investors reported poor risk-return profiles, limited growth or divestment from these markets would likely occur.
- In general, project developers reported having better access to private sector capital, at more favorable terms, than three years prior. While developers suggested that their transaction and borrowing costs are typically higher than traditional investment opportunities, which are better understood by financiers, they reported that these costs are declining in some markets, particularly for solar.
- The previous study suggested that the risk-return profiles of clean energy projects may be improving. This observation was supported by developers reporting better access to long term debt capital for small-scale projects.
- **Persisting barriers:** Financiers that do not have sizeable clean energy investment portfolios in New York shared concerns about higher risks and lower expected returns associated with clean energy markets relative to other market opportunities.

NY Green Bank Influence: Moderate

- While financiers who partnered with NY Green Bank reported that they appreciated the role it played in facilitating transactions, most had already committed to investing in specific clean energy markets prior to identifying NY Green Bank as a financial partner. NY Green Bank therefore appears to have had a limited impact on attracting new financiers without a clear sustainability mandate to these markets.
- Half of financier respondents who worked with NY Green Bank pointed to its role in bringing additional capital to transactions to address funding gaps and allowing them to offer better terms or approach underwriting differently through a better understanding or risk.
- Developers indicated that some of their projects may have effectively been smaller in size or altogether abandoned without NY Green Bank's support due to the financial gaps and constraints they faced.
- **Table 6** below describes widely accepted approaches to improve risk-return profiles in clean energy markets and provides related examples of NY Green Bank's past transactions.

Table 6: Measures to Improve Risk-return Profiles for Commercial Financiers[23]

Measure to Improve Risk-Return Profiles	Examples	NY Green Bank Transactions
Offer risk mitigants to crowd in private investment, while favoring more appropriate risk and return assessments.	Offer credit enhancements, revenue guarantees, first-loss provisions, etc.	• Chautauqua Green Energy: $1 million letter of credit (2022) • Energy Improvement Corporation: two letters of credit totalling $5.5 million (2017)
Reduce transaction costs through warehousing (pooling small transactions), while improve the liquidity of clean energy markets through securitization (transforming illiquid assets into tradable securities) and fostering collaboration, innovation and knowledge-sharing amongst financial market participants.	Standardize contracts and project evaluation structures to the extent possible in order to create aggregation and warehousing facilities that can be traded on secondary markets, while diminishing transaction costs on future projects. These transactions can also facilitate emerging financial instruments, such as green bonds and yield cos.	• Sealed: $7.5 million senior-secured revolving credit facility (2016-2021) • Sunrun: $104 million revolving credit and aggregation-to-term loan facilities (2016- 2020) • Mosaic: $50 million credit facility (2016)
Promote market transparency and standardization by improving data on performance, risks and costs of sustainable energy investments.	Demonstrate the success of newer technologies and markets in terms of origination, deployment, performance and ongoing management. Regulatory requirements to strengthen sustainable reporting requirements, following an internationally accepted green taxonomy, would also reinforce desired outcomes.	• Saranac Lake: $7 million construction financing facility (2019-2020) • Riseboro: $2.6 million predevelopment loan facility (2021)

[23] Organisation for Economic Co-operation and Development. (2015). Mapping Channels to Mobilise Institutional Investment in Sustainable Energy. https://read.oecd-ilibrary.org/environment/mapping-channels-to-mobilise-institutional-investment-in-sustainable-energy_9789264224582-en#page1

Robustness: Moderate

The following table describes the rigor of the information and data sources used to establish the baseline for this indicator.

Table 7: Information and Data Sources, Indicator 2

Data sources	Description
Surveys, interviews & case studies	The developer survey sample size was moderate (35 responses), while the financier sample size varied (ranging from 5 to 20 responses). In addition, several key insights were derived from the interviews and case studies.
Secondary research	Minimal secondary data was used for this indicator, as information on the cost of capital within the clean energy sector is scarce. Financing structures tend to be confidential in nature, so the details are not disclosed and difficult to verify.

INDICATOR 3

3

Change in the total volume of clean energy project financing

▶ **This indicator aims to capture the growth in the total capital flows to clean energy markets, which is typically a signal that the markets are maturing, with less need for government funding and other initiatives to encourage investment.**

Evidence of change: Strong | NY Green Bank Influence: Low | Robustness: Moderate

Key Takeaways

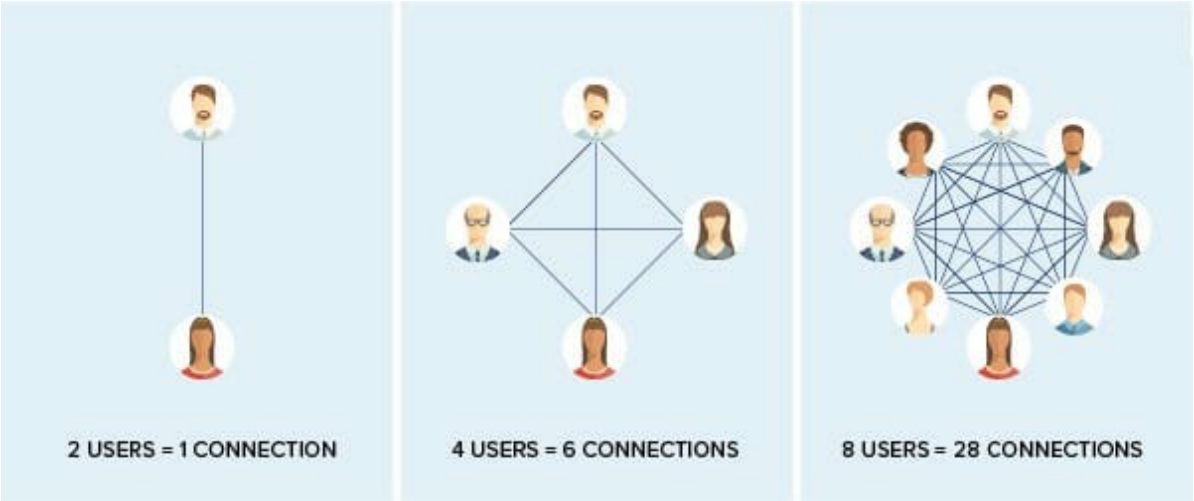
- By partnering with financiers on transactions, it is likely that NY Green Bank is helping build investor experience in these markets and indirectly facilitating future transactions.
- Growing standardization in clean energy markets could reduce transaction costs and lead to increased private sector investment.
- NY Green Bank has supported initiatives that allow for standardization across a portfolio of small and larger-scale projects.

Context

A growing number of financial market participants have now adopted ambitious climate and ESG commitments, marking a gradual transition to a clean economy. As financiers generally favor mature markets, the public sector can play a critical role in stimulating market growth for clean energy technologies and assets during their early stages of development. Through incentives, guarantees and other interventions, the public sector can assume a portion of the risks and incremental costs to establish a performance history that demonstrates proof of concept and builds investor confidence in clean energy markets. Over time, public spending is intended to drive enough demand and competition in the private sector that it is no longer needed to catalyze market activity and growth; government agencies tend to then withdraw from these markets to avoid crowding out the private sector. At the same time, state sponsored green banks can demonstrate the viability and attractiveness of clean energy markets through market-based lending activities.

As the volume of both public and private investment in clean energy markets increases, the value of associated technologies and assets become increasingly recognized by financial market participants. Successful, well-established track records help bolster investor confidence in the performance of these markets, driving further demand for similar projects. Exponential growth within a given market can thus occur through chain reaction known as network effects ((**Figure 9**). This is a particularly helpful concept to financial market transformation, given the scale and pace of investment needed to meet climate goals and the imperative to maximize the impact of each public dollar spent in this sector.

Figure 9: Conceptualization of Network Effects[24]

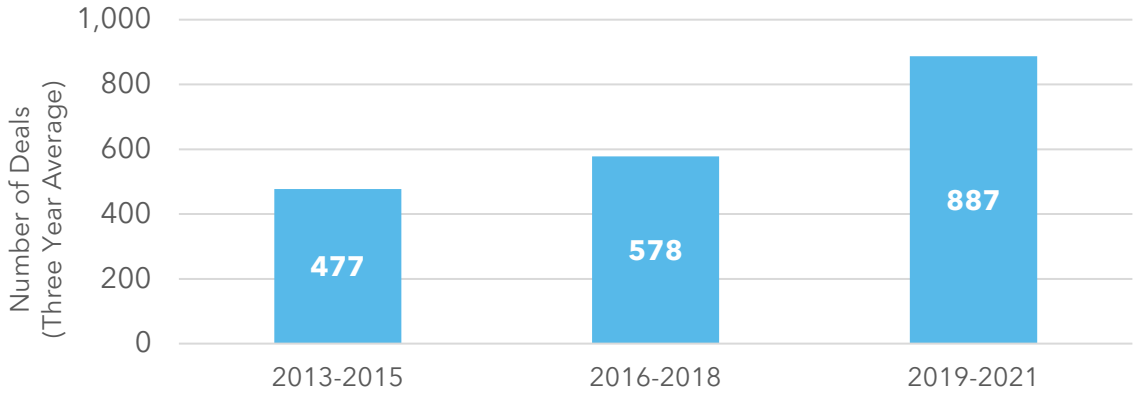


NY Green Bank's mandate is to identify and close funding gaps in clean energy markets by supporting bankable projects that are past the innovation stage. This catalyzing role has the effect of accelerating New York's clean energy transition by expanding private sector investment in maturing clean energy markets. The question of additionality is therefore central to this effort, i.e., evaluating whether NY Green Bank's activities have spurred private sector investment that would not have otherwise occurred as efficiently or at all.

Evidence of Change: Strong

- The overall number of clean energy transactions in New York is growing (**Figure 10**).

Figure 10: Total Clean Energy Transactions in New York, 2013-2021 Rolling Averages[25]

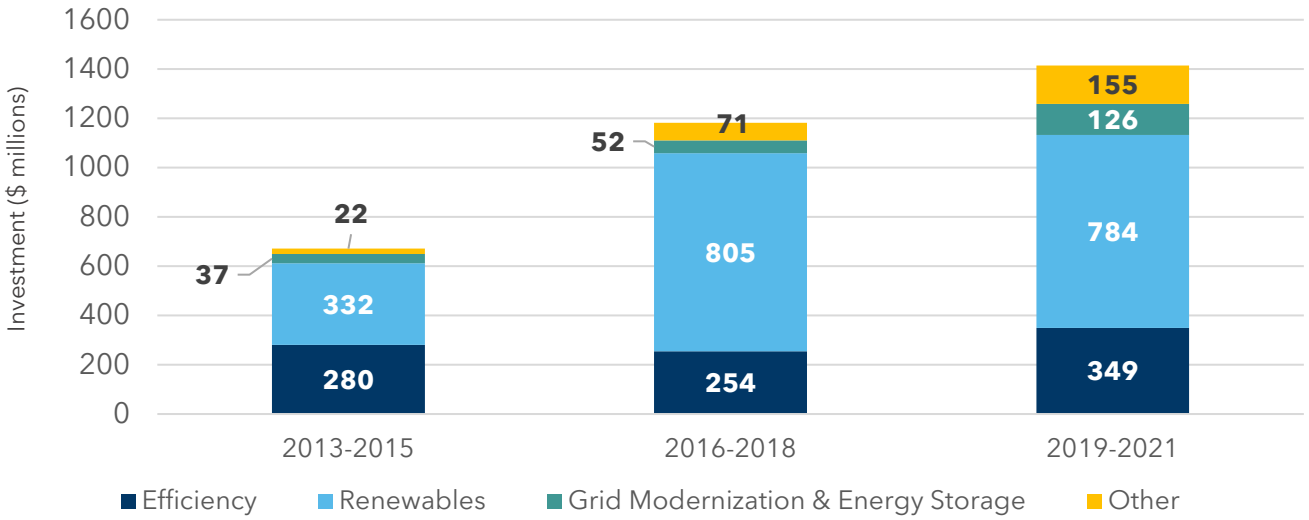


[24] Corporate Finance Institute. (2023). What is a Network Effect? https://corporatefinanceinstitute.com/resources/economics/what-is-network-effect/

[25] Adapted from New York Energy and Research Development Authority. (2022). New York Clean Energy Industry Report 2022.

- Investment in renewables has consistently received the greatest amount of investment, with energy efficiency ranking second and growing over time (**Figure 11**).

Figure 11: Total Clean Energy Investments by Technology, 2013-2021 Rolling Averages[26]



- On average, over one third of surveyed financiers indicated that their organization's total assets under management (AUM) dedicated to the clean energy sector represented under 10% of their total portfolio, and another third indicated that it represented more than half. Over time, a larger share of investors with mid- to large-sized clean energy portfolios is expected.

NY Green Bank Influence: Low

- Interviewed financiers that have partnered with NY Green Bank recognized its impact on financial markets through investment in newer clean energy markets during project pre-development phases and in projects that favor securitization. These types of interventions help address common clean energy financing gaps and barriers.
- However, after completing a transaction with NY Green Bank, interviewed financiers reported that their learnings were not directly transferred to their other transactions, and most felt NY Green Bank had a minimal impact on how often and how much they were investing in similar projects.
- Despite financiers reporting that the transaction structures developed with NY Green Bank were not directly replicated elsewhere, it is likely that overall investor experience in these markets is indirectly contributing to rising private investment in clean energy in New York. In a similar vein, half of financier respondents identified their internal capacity and expertise as a barrier to expanding into new clean energy markets, in part stemming from a lack of exposure to these markets. Partnerships with NY Green Bank can help bridge these knowledge gaps.
- All financier respondents indicated that they tended to use flexible and customized deal structures to invest in clean energy projects. While this kind of approach is often appropriate for large transactions, respondents noted that the relatively higher transaction costs and level of complexity of underwriting multiple small and decentralized projects can be a deterrent for

[26] Ibid.

many financiers. As such, further standardization in clean energy transactions over time could drive down due diligence burdens for financiers while facilitating securitization and warehouse financing.

- NY Green Bank is also supporting developers reach scale. For instance, between 2017 and 2021, NY Green Bank's transactions with BQ Energy fostered standardization across a portfolio of solar projects by following a streamlined, uniform approach to developing contracts and procuring contractors and equipment. This resulted in increased underwriting efficiency, reducing overall transaction costs, and facilitating the execution of each additional transaction.

Robustness: Moderate

The following table describes the rigor of the information and data sources used to establish the baseline for this indicator.

Table 8: Information and Data Sources, Indicator 3

Data sources	Description
Surveys, interviews & case studies	The financier survey sample size was moderate (21 responses). In addition, many key insights were derived from the interviews and case studies, including financier and developer perspectives.
Secondary research	Accessed New York-specific data on growth in the clean energy sector from NYSERDA, whose analyses are drawn from their access to primary data.

INDICATOR 4

4

Change in the volume of transactions in specific clean energy markets

▶ This indicator aims to capture the tendency for strong performance in markets to drive growth and create a greater number of investment opportunities. As a result, developers tend to have access to more substantial financing in mature markets. Large deal sizes also help satisfy the minimum requirements of large-scale investors and justify transaction costs, allowing a broader range of financiers to participate in the market.

Solar PV	**Evidence of change: Strong | NY Green Bank Influence: Moderate | Robustness: Strong**
Building decarbonization	**Evidence of change: Moderate | NY Green Bank Influence: Low | Robustness: Low**
Clean transportation	**Evidence of change: Low | NY Green Bank Influence: Low | Robustness: Low**

Key Takeaways

4a. Distributed solar

- NY Green Bank's market transformation impact in the solar PV market is the most apparent. By playing an early mover role through its investments in community solar shortly after the Value Stack mechanism was introduced, there is compelling evidence that NY Green Bank helped set New York on the course to become the leading state for community solar installed capacity.
- The distributed solar PV market continues to see substantial growth, suggesting that it is quickly maturing. This is likely attributable to a range of factors including falling solar PV costs and federal and state incentives. As capital flows in solar continue to grow, NY Green Bank is expected to progressively shift its focus to other, less established clean energy markets to limit the risk of crowding out private sector investment.

4b. Energy efficiency

- The market for energy efficiency also appears to be growing in New York with an increasing focus on improving access to energy solutions for low- to moderate-income households.

4c. Clean transportation

- While NY Green Bank has completed two transactions in the clean transportation market to date, it is building on its portfolios and product offers in these areas. The findings in this evaluation may therefore offer a valuable baseline against which to measure NY Green Bank's investments in future evaluations.

Context

Many clean energy projects are led by local entrepreneurs and small- to medium-sized enterprises, particularly in markets that are largely fragmented and unstructured. This has resulted in a large number of small-scale projects rather than fewer large-scale projects. This has the effect of limiting the sources of capital available, as certain investors require a substantial minimum investment size, making them unsuited to smaller portfolios. Clean energy projects also tend to be capital intensive, with high upfront investment costs and low long-term operating expenditures compared to fossil fuel assets. While carbon pricing and other measures can encourage capital flows in clean energy, there is also a need to achieve greater scale in these markets and to mobilize significantly more investment from a wider pool of financiers. As such, signs of a maturing market include a greater volume of financing transactions, combined with larger transaction sizes.

NY Green Bank's ability to focus on smaller investment sizes can help stimulate growth in less established markets. It can also help multiply the number of transactions occurring and increase transaction sizes over time by creating suitable aggregation mechanisms, contributing to standardization, and signaling cash flow stability and attractive returns, among other interventions. This, in turn, will help set the stage to attract large-scale debt investors.

This indicator examines three key clean energy markets for NY Green Bank based on its strategic investment targets:

a. Solar PV

b. Building decarbonization

c. Clean transportation

4a: Distributed Solar PV

NYS's Climate Act aims to achieve 70% renewable energy by 2030 and 100% zero-emission electricity grid by 2040.

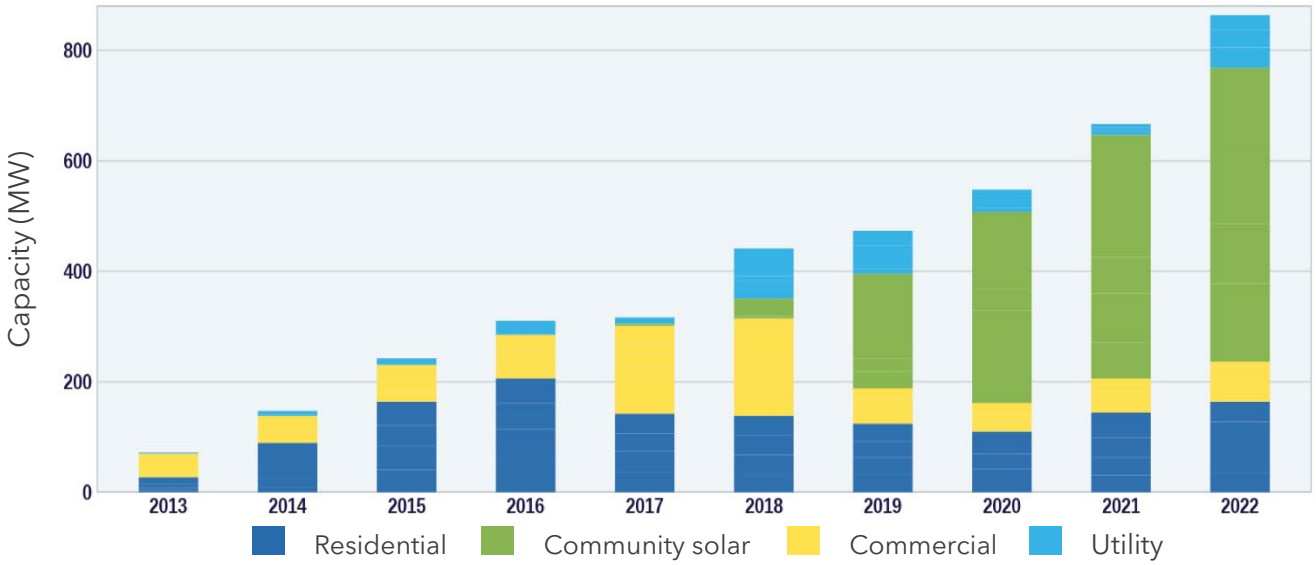
New York is one of the top ten solar markets in the U.S. (**Figure 13)**. In 2021, solar energy provided 3% of New York's total in-state net generation, which is enough to power 593,699 homes.[27] More than two-thirds of its solar capacity comes from small-scale systems, like rooftop solar, with capacities of less than 1 megawatt each.[28] Investment in distributed solar PV systems has grown over the past decade largely as a result of the falling installation costs of solar PV, increasing electricity costs in New York, concerns over electricity system resilience, and access to attractive financing coupled with incentives.[29]

[27] Solar Energy Industries Association. (2022). New York Solar. https://www.seia.org/state-solar-policy/new-york-solar
[28] U.S. Energy Information Administration. (2022). Profile Analysis. https://www.eia.gov/state/analysis.php?sid=NY
[29] Solar Energy Industries Association. (2023). Solar Industry Research Data. https://www.seia.org/solar-industry-research-data

Evidence of Change: Strong

- New York has seen steady growth in the overall capacity of solar PV generation. As shown in **Figure 12** below, this is primarily the result of increased distributed residential and community solar installations in recent years.

Figure 12: New York Solar Installations, 2012-2021[30]



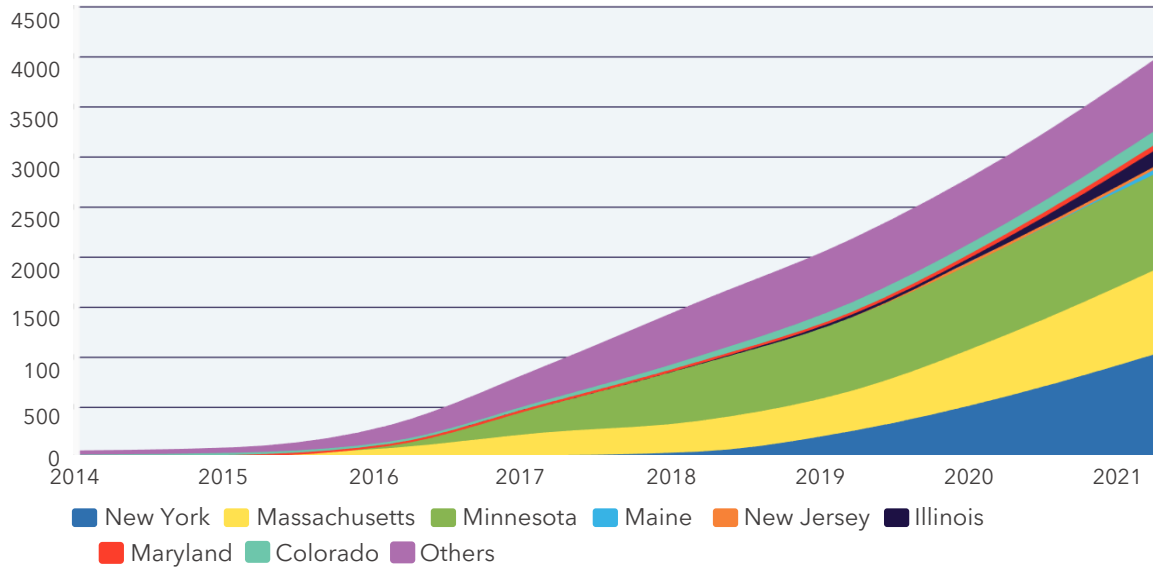
- The State has a range of favorable policies and programs in place to promote distributed solar installations, including:
  - Ambitious energy and GHG emissions targets described in New York's Scoping Plan.
  - The NY-Sun Megawatt (MW) Block Program, which provides up to $1,000 for every kilowatt (kW) of solar power installed.[31]
  - The 25% NY State Solar Energy System Equipment Tax Credit for purchased home solar systems.[32]
  - The property tax exemption on the added home value from a solar and storage system under the Solar Electric Generating System Tax Abatement (SEGS) in New York City.[33]
  - A feed-in tariff offered through Long Island Power Authority (LIPA) that provides guaranteed, above-market price for solar energy producers.
  - The Value of Distributed Energy Resources mechanism (Value Stack), which compensates energy generated by Distributed Energy Resources (DER) based on locational,

[30] Solar Energy Industries Association. (2022). New York Solar. https://www.seia.org/state-solar-policy/new-york-solar
[31] Energysage. (2022). NY-Sun Megawatt (MW) Block Program. https://www.energysage.com/local-data/solar-rebates-incentives/ny/
[32] New York State Department of Taxation and Finance. (2022). Solar Energy System Equipment Credit. https://www.tax.ny.gov/pit/credits/solar_energy_system_equipment_credit.htm
[33] New York City. (2022). Solar Electric Generating System (SEGS) Tax Abatement. https://www.nyc.gov/site/finance/benefits/landlords-solar-roof.page

environmental, and temporal factors. This variable rate is particularly beneficial to solar project developers with small-scale systems, as the maximum project size is 5 MW. [34]

- Against the backdrop of New York's Climate Act goal to achieve 70% renewable energy by 2030, community solar has grown significantly in recent years. New York has become the top community solar market in the U.S., with more than one gigawatt of community solar installed and operational. This represents enough power to serve 209,000 homes across the State. New York also currently has the largest project pipeline in the country, with enough community solar under construction to serve an additional 401,000 homes over the next few years.[35] Moreover, the current rate of growth for community solar is more than twice that of Massachusetts, the second largest community solar market in the U.S.[36]
- The stacked graph in **Figure 13** compares the cumulative community solar installations across top U.S. markets, highlighting the rapid rate of growth in New York compared to other States, and its comparable size to Minnesota and Massachusetts in 2021.

Figure 13: Comparison of Cumulative Community Solar Installations Across U.S. States, 2014-2021 [37]



- Between 2015 and 2021, a total of 135,000 solar projects were completed. In that short timeframe, more than four times more projects were completed than in the 15-year period leading up to then, between 2000 and 2014, where a total of 30,000 projects were completed **(Figure 13)**.
- The State continues to invest heavily in the solar market. In May 2020, NYSERDA's NY-Sun initiative received an $573 million in funding. In June 2022, the program received another $1.5 billion to help achieve 10 GW of distributed solar in New York by 2030.

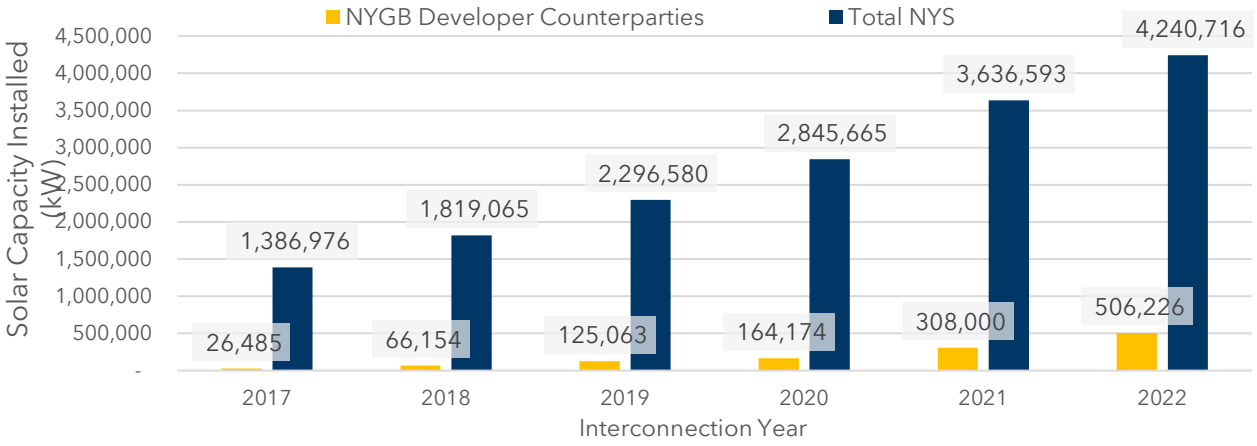
[34] New York State Energy Research and Development Authority. (2023). The Value Stack. https://www.nyserda.ny.gov/All-Programs/NY-Sun/Contractors/Value-of-Distributed-Energy-Resources
[35] New York State Energy Research and Development Authority. (2022). Governor Hochul Announces New York as Top Community Solar Market in the United States. https://www.nyserda.ny.gov/About/Newsroom/2022-Announcements/2022-03-22-Governor-Hochul-Announces-NY-as-Top-Community-Solar-Market-in-the-US
[36] Sylvia, T. (2022). New York Hits 1 GW of Community Solar. https://www.pv-magazine.com/2022/03/24/new-york-hits-1gw-of-community-solar/
[37] Solar Energy Association. (2022). Solar Industry Research Data. https://www.seia.org/solar-industry-research-data

- Across the U.S., financiers continue to report low delinquency and loss rates across a wide range of solar lease, power purchase agreements (PPA), and loan portfolios. Some now have access to over five years of performance data as well.[38]

NY Green Bank Influence: Moderate

- The solar market currently represents the largest share of NY Green Bank's investments to date (more than $900 million). Their investments have coincided with rapid growth in the cumulative installed solar capacity in New York (**Figure 14**).
- Given its early mover role, is likely that NY Green Bank played an important part in accelerating capital flows in community solar, which has since become the fastest growing segment of the overall solar PV market.

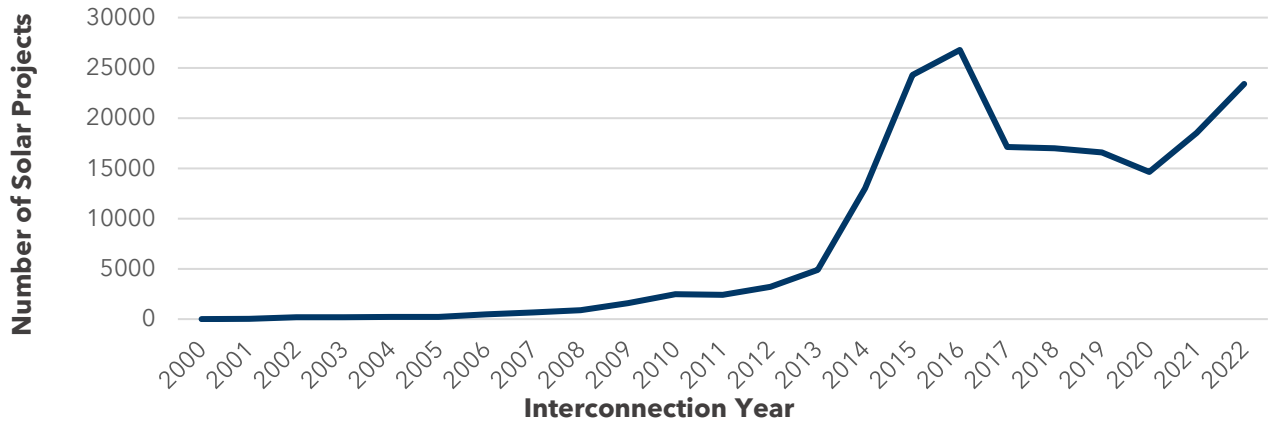
Figure 14: Comparison of New York's Solar Capacity to NY Green Bank's Solar Investments[39]



- NYSERDA's NY-Sun program has also played a key role in supporting distributed solar PV installations since 2011. As of 2022, NY-Sun has:
  - Supported the installation of solar in every county;
  - Provided over $1.3 billion in incentives, leveraging $6.1 billion in private investment;
  - Driven over 2,500% solar growth in the State; and
  - Helped reduce the cost of solar by 70% in 10 years.[40]
- The significant uptick of solar installations starting in 2013 coincides with the launch of NY-Sun program, established in 2012, and NY Green Bank's first four solar loans originated in 2015 **(Figure 15**). The number of installations began to slow somewhat in 2017 and may have initially been impacted by the supply shortages and price increases during the COVID-19 pandemic in 2020-21, since the volume of projects has since gone up despite inflationary pressures on prices **(Figure 16)**.

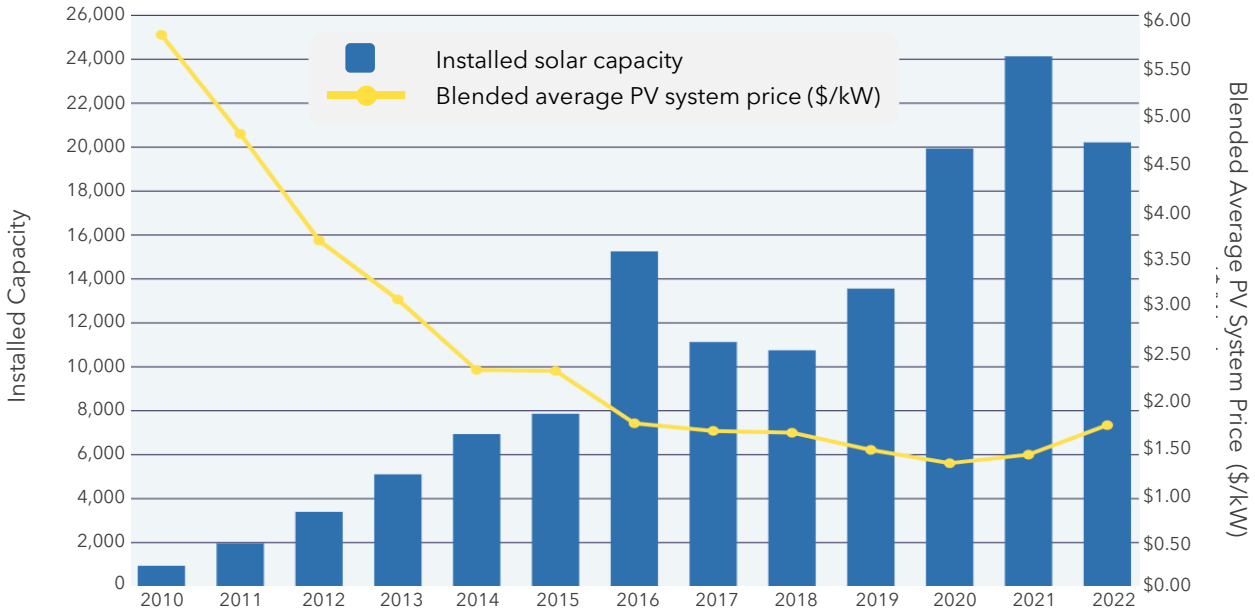
[38] Wood Mackenzie. (2021). Major Financiers Capitalise on a Growing US Residential Solar Market. https://www.woodmac.com/news/opinion/major-financiers-capitalise-on-a-growing-us-residential-solar-market/
[39] Analysis by Dunsky based on NY Green Bank transaction data and NYSERDA solar interconnection data to identify the proportion of projects supported by NY Green Bank.
[40] New York State Energy Research and Development Authority. (2022). NYSERDA and National Grid Announce Round One Results of Community Solar Program Offering for Underserved New Yorkers. https://www.nyserda.ny.gov/About/Newsroom/2022-Announcements/2022-10-17-NYSERDA-and-National-Grid-Announce-Round-1-Results

Figure 15: Number of Installed PV Systems in New York, 2000-2022[41]



- As solar markets continue to mature and funding gaps for this asset class continue to narrow, NY Green Bank is expected to reduce investment in distributed solar PV to avoid the risk of crowding out private capital. This will allow NY Green Bank to continue achieving meaningful market transformation impacts by targeting other, less established clean energy markets, such as energy storage.

Figure 16: U.S. Solar PV Pricing Trends and Deployment Growth[42]



[41] Adapted from New York State. (2021). Statewide Solar Projects: Beginning 2000. https://data.ny.gov/Energy-Environment/Statewide-Solar-Projects-Beginning-2000/wgsj-jt5f

[42] Solar Energy Association. (2023). Solar Industry Research Data. https://www.seia.org/solar-industry-research-data

Robustness: Strong

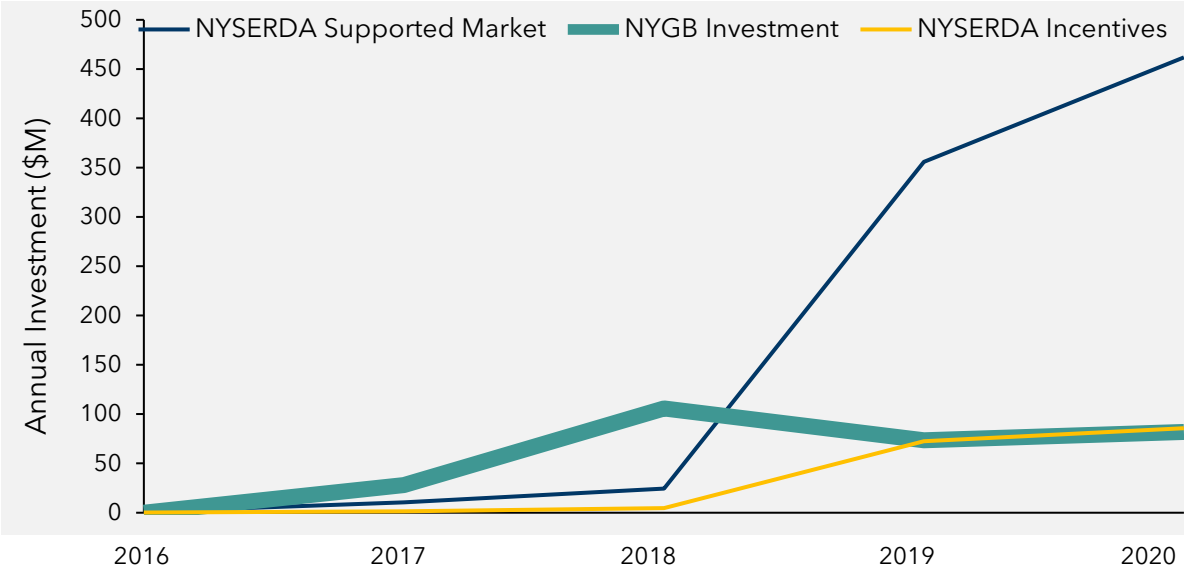
Table 9: Information and Data Sources, Indicator 4

Data sources	Description
Surveys, interviews & case studies	Qualitative data from case studies was used to support analysis of this indicator.
Secondary research	Accessed New York-specific data on growth in the clean energy sector from New York State Energy Research and Development Authority (NYSERDA) and Solar Energy Industries Association (SEIA), both of which completed analyses based their access to primary data.

Spotlight: Community Solar[43]

- NY Green Bank invested in projects with revenue streams stemming from the Value Stack mechanism,[44] which offers a variable revenue structure and uncontracted cashflows that differ significantly from more common deal structures (e.g., PPA). In doing so, NY Green Bank's early mover role helped lower perceived risk and build investor confidence in the market by establishing strong precedents which likely accelerated capital deployment in this market (**Figure 17**).

Figure 17: Annual Communal Solar Investment, 2016-2020[45]



- NY Green Bank also helped fill financing gaps by providing interconnection bridge and construction loans, stages of development in which developers often struggle to secure financing. This is particularly impactful in stimulating more projects led by developers, as the development and construction stages are generally perceived by financiers as higher risk and come with more complex and costly underwriting and transaction administration than term loans.
- NY Green Bank has provided Eden Renewables with a bridge loan facility, successfully filling a financing gap for solar interconnection deposits. There remains a need for more competitive financing from other lenders to cover these costs.

[43] Community solar projects are installed at offsite location and allow multiple customers within a geographic area to purchase the solar energy that is generated. This allows customers who are not otherwise able to install solar systems on their property, including renters, condominium owners and homeowners with rooftops that cannot support solar systems, to access to clean, low-cost energy.
[44] New York adopted its community solar policy in 2015 and introduced the Value of Distributed Energy Resources (i.e., Value Stack) mechanism in 2017 to compensate energy generated by this infrastructure. This novel segment of the solar market presented uncertainties connected to the business model and complex revenue streams of these projects.
[45] Analysis by Dunsky, based on NY Green Bank transaction data and NYSERDA solar interconnection data, to identify the proportion of projects supported by NY Green Bank.

Indicator 4b: Building Decarbonization

New York's existing building stock accounts for roughly two thirds of its GHG emissions,[46] making building decarbonization a key pillar of the State's Climate Act. The State also adopted the New Efficiency: New York strategy, an ambitious plan that strives to accelerate energy efficiency and reduce GHG emissions, decrease consumer energy costs and create new job opportunities.[47] For new construction, the State Governor announced a plan to achieve 2 million climate-friendly, electrified or electrification-ready homes by 2030, and has proposed legislation to require zero on-site greenhouse gas emissions for new construction no later than 2027.[48]

In New York City, even more aggressive actions have been enshrined in law over recent years, including energy use and carbon emissions limits for buildings over 25,000 square feet starting in 2024 and with increasingly strict limits progressing to 2030.[49] Moreover, the updated New York City Energy Conservation Code (NYCECC) came into effect in 2020 and is recognized today as one of the most ambitious in the nation.[50]

However, despite New York's ambitious policy and regulatory frameworks backed by several government programs, there are persisting barriers to the widespread adoption of energy efficiency measures in new and existing buildings. For instance, while the design and performance of energy efficient equipment continues to improve, strengthening the business case for highly efficient buildings – especially when accounting for long term energy and maintenance savings – the upfront, incremental capital costs of integrating efficiency measures into building design and upgrades can pose distinct financing challenges to owners and developers, compounded by a lack of precedent and familiarity with this market. Greater support is therefore needed to build awareness and understanding of the value of efficiency measures among market participants, including financiers whose underwriting processes have historically undervalued the long-term cost and energy savings gained from efficiency. In short, further cost compression and better recognition of the benefits of energy efficient design and upgrades is needed to drive strong demand across this market.

In addition to supporting the energy efficiency market as a whole, dedicated resources are needed to ensure equitable access to energy solutions that improve affordability. Without targeted interventions, disadvantaged communities (DACs)[51] stand to bear a larger portion of the energy burden by remaining in buildings that consume fossil fuels, which are set to become increasingly expensive in coming years.[52] As nearly half of New York's population is comprised of low- to moderate-income (LMI) households, supporting these consumers is a critical part of New York's pathway to a low carbon economy. As such, NY Green Bank is committed to working closely with financiers to address knowledge and information gaps, and with developers throughout the

[46] Ronk, P. (2021). 4 Facts About New York's Transportation Emissions. https://cbcny.org/sites/default/files/media/files/CBCREPORT_4-Facts-NYS-Emissions_11112021_0.pdf
[47] New York State Energy Research and Development Authority. (2018). New Efficiency: New York.
[48] New York State Energy Research and Development Authority. (2022). Governor Hochul Announces Plan to Achieve 2 Million Climate-Friendly Homes By 2030. https://www.nyserda.ny.gov/About/Newsroom/2022-Announcements/2022-01-05-Governor-Hochul-Announces-Plan-to-Achieve-2-Million-Climate-Friendly-Homes-By-2030
[49] City of New York. (2023). Local Law 97. https://www.nyc.gov/site/sustainablebuildings/ll97/local-law-97.page
[50] Urban Green Council. (2020). What's new in the 2020 Energy Code? https://www.urbangreencouncil.org/wp-content/uploads/2022/07/3.9.2020_nyc_energy_code_brief_urban_green.pdf
[51] Disadvantaged communities are defined as communities that bear burdens of negative public health effects, environmental pollution, impacts of climate change, and possess certain socioeconomic criteria, or comprise high-concentrations of low- and moderate- income households, as identified pursuant to section 75-0111 of New York State Climate Justice Working Group Draft Disadvantaged Communities Criteria and List Technical Documentation.
[52] Kramer Mills, C., & Scott, J. (2022). Sustainable Affordable Housing: Strategies for Financing an Inclusive Energy Transition. Federal Reserve Bank of New York. https://www.newyorkfed.org/medialibrary/media/outreach-and-education/community-development/fed-affordable-housing-and-energy-transition-final-10-4-22

development lifecycle, to accelerate capital deployment for building decarbonization and green housing projects, particularly in disadvantaged communities, across New York.[53]

Evidence of Change: Moderate

- Overall, there has been notable growth in energy efficiency and decarbonization investments in New York (**Figure 11**), backed by strong public sector support. ACEEE's State Scorecard report,[54] which evaluates states based on their public policies and programs promoting energy efficiency ranks New York as fifth in the country.
- Among the different energy efficiency programs administered by NYSERDA, the RetrofitNY program was launched in 2019 with the aim of funding pilot retrofit projects in affordable, multifamily buildings, drawing inspiration from the Energiesprong model and with input from building owners, design and construction professionals, and financiers. While these projects helped establish proof of concept, it also highlighted significant market challenges that remain in place and that will need to be overcome to achieve scale across New York's building stock.[55]
- With many of New York's policies and regulatory changes promoting energy efficiency in disadvantaged communities only coming into effect after 2019, too little time has passed to notice observable changes in this segment of the market. Moreover, due to the inherent complexities and perceived levels of risk associated with building green affordable housing, longer development and construction timelines are expected for developers to realize these projects.

NY Green Bank Influence: Low

- NY Green Bank has directed significant investments into this market, totalling $270 million in the period between 2015 and 2022 across all end user types.[56] Energy efficiency thus represents the second largest share of NY Green Bank's total investment portfolio.
- Within NY Green Bank's portfolio of projects, the main energy conservation measures adopted relate to building HVAC systems, appliances and hot water, building envelope, energy management and control systems, fuel conversion, geothermal energy, lighting, water conservation, and load reduction and management. These investments contributed to building contractor experience with the installation of these kinds of technologies and equipment, while promoting awareness and interest in energy efficiency to other building owners and developers.
- NY Green Bank has partnered with developers and energy service providers to structure innovative solutions that address financing gaps and barriers in commercial and residential energy efficiency markets. For instance, NY Green Bank worked closely with Sealed to develop a first-of-its-kind Energy Savings Agreements (ESA) model for the residential market and provided a $5 million revolving credit facility to support the program. NY Green Bank's technical and financial support enabled Sealed to offer an innovative financing option to its customers to cover the upfront and ongoing costs of home energy efficiency measures.

[53] NY Green Bank. (2022). NY Green Bank Impact Report. For the Fiscal Year Ended March 31, 2022.
[54] Subramanian, S., Berg, W., Cooper, E., Waite, M., Jennings, B., Hoffmeister, A., & Fadie. B. (2022). 2022 State Energy Efficiency Scorecard. ACEEE. www.aceee.org/research-report/u2206
[55] New York State Energy and Research Development Authority. (2023). How RetrofitNY Has Evolved. https://www.nyserda.ny.gov/All-Programs/RetrofitNY-Program/All-RetrofitNY-Articles/How-RetrofitNY-Has-Evolved
[56] Based on NY Green Bank transaction data.

- NY Green Bank is committed to expanding its investment in this market, with $65 million worth of projects in its current pipeline. As NY Green Bank increases its building decarbonization portfolio, this baseline will help measure their impact in future market transformation evaluations.

Robustness: Low

Table 10: Information and Data Sources, Indicator 4

Data sources	Description
Surveys, interviews & case studies	Qualitative data from case studies was used to support analysis of this indicator.
Secondary research	As there have been relatively few building decarbonization projects in New York to date, minimal secondary data is available.

Indicator 4c: Clean Transportation

As the transportation sector accounts for over one quarter (28%) of New York's total annual emissions,[57] the State has taken aggressive steps to meet climate targets and currently ranks second in the nation in ACEEE's State Transportation Electrification Scorecard.[58] Given the sector's impact on GHG emissions and its exceptional potential for rapid market growth, NY Green Bank has identified clean transportation as a strategic priority area, setting an investment target of $100 million by 2025.

NYS's Climate Act aims to achieve a 40% reduction in GHGs from 1990 levels by 2040 and 85% reduction and net zero emissions by 2050.

In recent years, the State has offered financial and non-financial incentives for light- and heavy-duty electric vehicles (EVs) and EV chargers. The State is also working on effectively integrating EVs into the grid through its various charging programs, including the roll out of time-varying rates for direct-current fast chargers (DCFC). In addition to the widespread adoption of zero emission vehicles (ZEVs), diversified mobility alternatives, including expanded public transportation and enhanced bicycle and pedestrian infrastructure, are needed to meet climate goals.

As a reflection of its commitment to advance an inclusive green economy, New York has been recognized for its leadership in providing equitable access to electrified transportation by launching targeted programs for low-income, economically distressed, and environmental justice communities

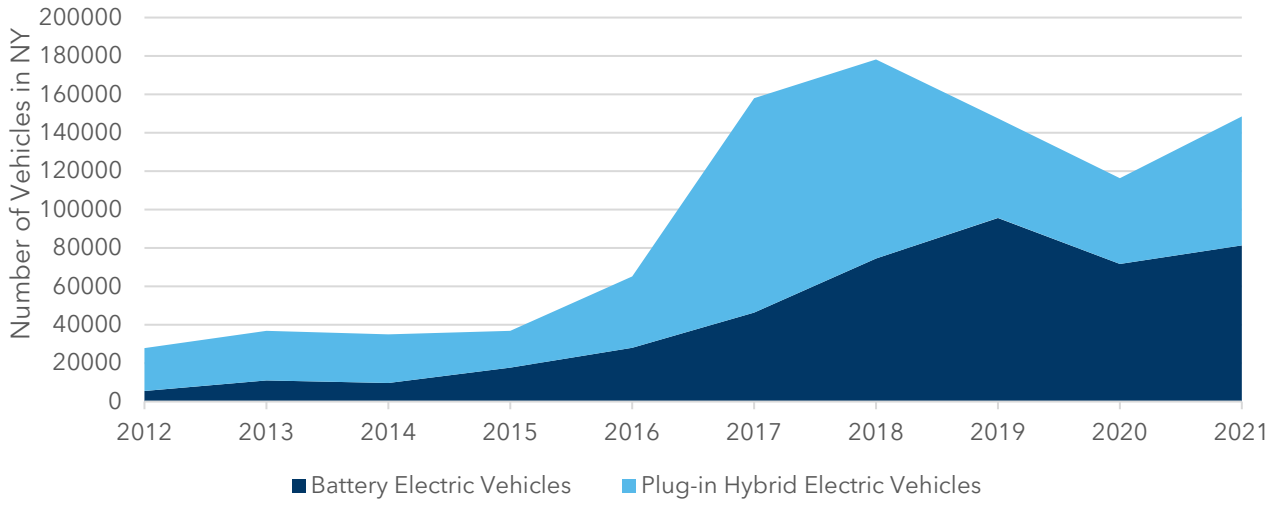
[57] New York State Climate Action Council. (2022). Scoping Plan: Full Report. https://climate.ny.gov/-/media/project/climate/files/NYS-Climate-Action-Council-Final-Scoping-Plan-2022.pdf
[58] Howard, B., Vaidyanathan, S., Cohn, C. Henner, N., & Jennings, B. (2021). The State Transportation Electrification Scorecard. Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/pdfs/t2101.pdf

of concern.[59] NY Green Bank has financed two clean transportation projects thus far and is expected its role in filling financing gaps will accelerate capital deployment in clean transportation.

Evidence of Change: Low

- As of March 2022, there are approximately 103,000 electric and hybrid vehicles on the road in New York, of which 56% are all electric **(Figure 19)**. Over time, efficiency investments are expected to result in EVs making up a larger share of the overall transportation market.

Figure 18: Growth in Electric and Hybrid Vehicles Registered in New York, 2012-2021[60]



NY Green Bank Influence: Low

- NY Green Bank supported New York's active transportation network by providing a $43.3 million term loan and $5 million seasonable variable facility to Motivate International Inc. The investment served to expand New York City's "Citi Bike" bike share system, primarily in LMI neighborhoods, and help sustain its operations through the winter season. By investing in alternative modes of transportation, NY Green Bank has supported efforts to the decrease the number of motorized vehicles on New York roads.
- In addition, NY Green Bank invested in Plug Power's entry and growth in the New York clean transportation market. This has enabled commercial customers to more easily replace existing electric material handling electric truck fleets with cleaner and more efficient GenDrive fuel cells.
- Moving forward, NY Green Bank will offer products that are adapted to the financing needs of clean transportation projects, such as lease financing, incentive bridging, and other arrangements.

[59] Environmental justice communities of concern are communities or neighborhoods, composed predominantly of persons of color or a substantial proportion of persons below the poverty line, that are subjected to a disproportionate burden of environmental hazards and/or experiences a significantly reduced quality of life relative to surrounding or comparative communities.
[60] Analysis by Dunsky based on data from Atlas EV Hub. Accessed data at: https://www.atlasevhub.com/materials/state-ev-registration-data/

- As of March 2022, NY Green Bank has a clean transportation investment pipeline of $40 million. Building on this baseline, future market evaluations will be able to detect changes in the market attributable to NY Green Bank.

Robustness: Low

Table 11: Information and Data Sources, Indicator 4

Data sources	Description
Surveys, interviews & case studies	The qualitative data collected during this study did not provide specific insights into the clean transportation sector.
Secondary research	As a relatively novel market, minimal secondary data is available.

INDICATOR 5

5

Change in the mix of financiers investing in clean energy projects

▶ **This indicator aims to capture the tendency for greater debt financing to become accessible as markets mature, attracting different kinds of financiers than in earlier stages of firm and market development.**

Evidence of change: Low | NY Green Bank Influence: Low | Robustness: Low

Key Takeaways

- NY Green Bank is directing capital flows into clean energy markets where small-scale developers are most active.
- NY Green Bank created an investment vehicle capable of drawing in substantial capital from a large-scale debt investor that indicated interest in growing their sustainability portfolio in the future and will continue to explore other opportunities in this sector.
- These findings provide a baseline by which to measure NY Green Bank's market transformation impacts in future evaluations. In particular, assessing trends that show **increasing debt-to-equity ratios and a growing number of large-scale private sector financiers** over time may provide evidence of NY Green Bank's influence on market maturity.

Context

Small-scale developers and entrepreneurs have distinct financing needs that evolve as they move through the usual stages of development and growth, attracting different sources of capital at each stage. **Figure 20** provides a generalized overview of these stages, including the associated levels of risks and typical sources of financing.

In the early stages, companies often access seed funding from angel and venture investors to support technology innovation and development. These investors are willing to accept the higher risks associated with new and unproven technologies in exchange for high returns and growth potential.

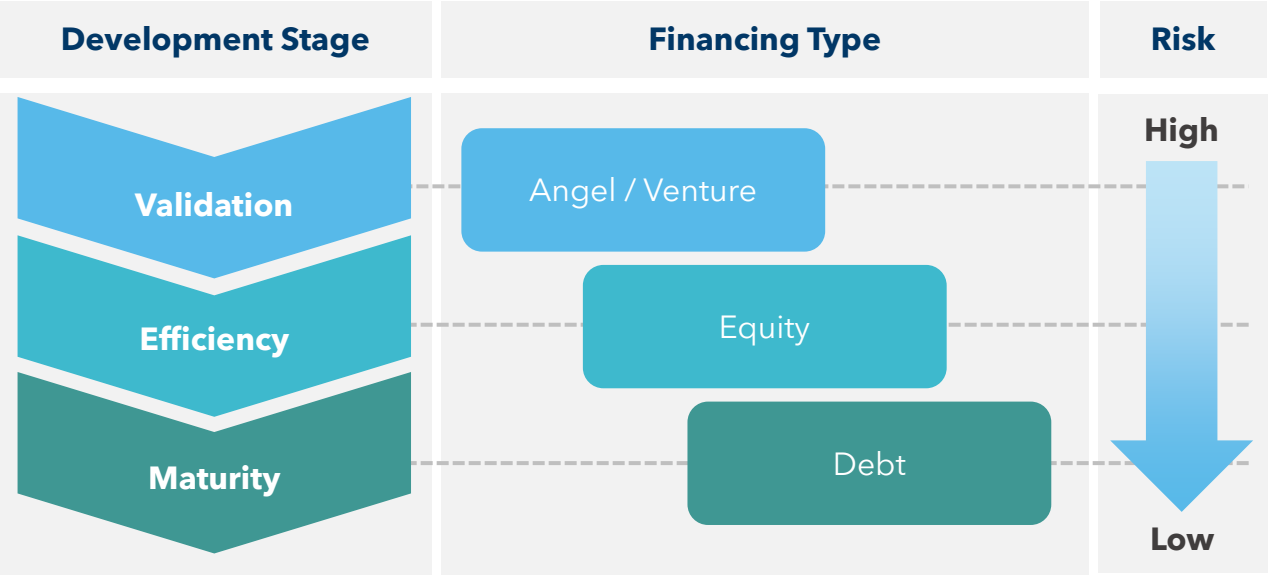
Once technologies have been proven and are commercially ready, developers typically seek growth capital through equity, debt financing or a combination of the two. Most often, equity is better suited to this stage in the firm lifecycle, as revenues can be variable and difficult to forecast, making these investments riskier for financiers. However, improved and more established risk-return profiles can unlock access to lower interest debt financing over time.

For clean energy markets that have reached a large enough scale, institutional investors – including pension funds, insurance companies and endowments – can play an important part in accelerating capital flows to clean energy markets. They not only have access to a substantial pool of funds,

accounting for USD $87 trillion in assets under management worldwide,[61] they also tend to look at longer investment horizons than other private sector financiers. This outlook is well-aligned with the long-term benefits of many clean energy investments, including lower price volatility and exposure to climate-related material risks. Since fossil fuels will progressively be phased out as New York transitions to a low carbon economy, clean energy projects can also pose lower political risk through their alignment with the State's long-term policy and regulatory direction.

While institutional investors have the capacity to inject large and relatively patient capital in clean energy projects, they also have specific needs: their standards on minimum investment sizes can be upward of $300 million; they also commonly seek long-term, low-risk investment opportunities. NY Green Bank can thus help attract this investor group by supporting the development of suitable investment vehicles with the required scale, rating and liquidity.

Figure 19: Financial Growth Cycle of Small Businesses[62]



Evidence of Change: Low

- Based on a sample of transactions, there appears to be a split between equity and debt financier counterparties to NY Green Bank's clean energy transactions (**Table 12**). There are no identified angel or venture investors, as NY Green Bank's mandate is to support proven and commercially viable clean energy technologies confronted with financing gaps.
- Financier respondents primarily reported making equity and debt investment into relatively small-scale projects. However, in community solar projects, a larger proportion of financiers offered debt capital, suggesting that the perceived market risks were comparatively lower than other clean energy markets.

[61] International Renewable Energy Agency. (2020). Mobilising Institutional Capital for Renewable Energy. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Nov/IRENA_Mobilising_Institutional_Capital_2020.pdf?rev=92aa2646b392407f822167e8dfd048cb

[62] Funding Escalator. Adapted from https://ised-isde.canada.ca/site/sme-research-statistics/en/research-reports/untangling-seed-and-early-stage-funding-environment-canada#s3 & https://www.sciencedirect.com/science/article/pii/S0378426698000387

Table 12: Clean energy investment mix findings from surveys

Investment Types	All Financiers (n=30)	Community Solar (n=12)
Equity/growth investors	30%	33%
Small scale debt investors (early majority)	30%	50%
Large scale debt investors (late majority)	20%	17%
Other / advisors	20%	0%

- The previous study also found that community solar developers reported an increase in the number and variety of financiers active in the market, including commercial banks, insurance companies, specialty lenders, and others.

NY Green Bank Influence: Low

- In the absence of complementary secondary data and limited information from the previous study, this indicator aims to establish a new baseline. As a result, it is not possible to determine NY Green Bank's influence on attracting different types of financiers within the scope of this study.
- An interviewee reported that their debt-to-equity ratio was improving over time in the residential solar market. Future evaluations may confirm this observation with a larger sample.
- NY Green Bank completed a major portfolio monetization with Bank of America, one of the largest banks in the world, by offering a large and robust enough investment vehicle to satisfy their lending requirements. This suggests that NY Green Bank's credit and risk assessments are well aligned with commercial practices and may ultimately help build confidence among other large-scale investors in similar transactions.

Robustness: Low

The following table describes the rigor of the information and data sources used to establish the baseline for this indicator.

Table 13: Information and Data Sources, Indicator 6

Data sources	Description
Surveys, interviews & case studies	Qualitative data was based on responses from 30 financiers self-identifying the proportion of equity and debt within their investment portfolios.
Secondary research	Minimal secondary data specific to New York's clean energy financing markets is available.

INDICATOR 6

6 Emergence of secondary markets for clean energy assets

▶ This indicator aims to identify and measure the clean energy asset classes traded on secondary markets. This can attract substantial private sector capital into clean energy markets, making them more liquid. It is often a sign of relative market maturity.

Evidence of change: Moderate | NY Green Bank Influence: Moderate | Robustness: Moderate

Key Takeaways

- Clean energy asset classes have begun to emerge on secondary markets, with solar ABS being the most prominent. However, there remains a need to create and demonstrate standardization and recapitalization structures for other clean energy markets.
- Given the scale of asset classes traded on secondary markets, NY Green Bank's investments have helped fill financing gaps but represent a relatively small proportion of the total transaction financing.

Context

Secondary markets allow financiers to sell securities to other investors, allowing them to redeploy funds into new projects. Secondary markets therefore carry significant potential to expand private capital flows in clean energy markets, while simultaneously bringing down the overall cost of capital as lower interest rates are offered to primary borrowers. However, beyond solar, there are currently few asset classes that are traded on secondary markets.

One of the major barriers to developing and scaling new asset classes relates to the variability and complexity of clean energy business models when compared to conventional asset classes with robust secondary markets, such as mortgages and credit card debt. In many cases, individual clean energy projects are also too small to justify costs, as with distributed solar PV projects. However, by bundling similar projects together, the size of the investment opportunity can help attract larger investors from the private sector and improve liquidity in clean energy markets.

Targeted interventions are needed to create favorable conditions to expand the number of clean energy asset classes traded on secondary markets and to improve their liquidity. Because repayment in the secondary market is guaranteed by the quality of the underlying assets, rather than the creditworthiness of the issuer, consistency across the contracts, documentation, assets, underwriting and due diligence processes can help build investor confidence in new asset classes.[63] To signal the quality of clean energy investments and help generate adequate deal sizes, NY Green Bank can

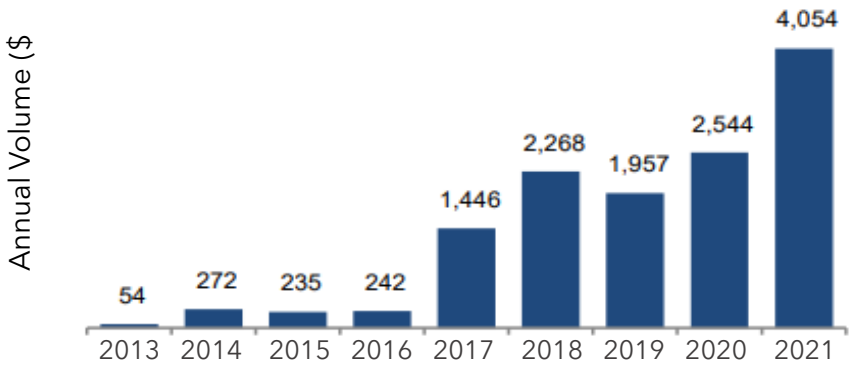
[63] Organisation for Economic Co-operation and Development. (2015). Mapping Channels to Mobilise Institutional Investment in Sustainable Energy. https://read.oecd-ilibrary.org/environment/mapping-channels-to-mobilise-institutional-investment-in-sustainable-energy_9789264224582-en#page1

demonstrate recapitalization models for its own investment portfolio and help foster and encourage replicable and standardized transaction structures and practices that improve consistency and transparency across similar projects in the market.

Evidence of Change: Moderate

- In the U.S. residential solar market, solar asset-backed securities (ABS) are largely recognized as a reliable source of debt financing. Transaction sizes of solar ABS have generally increased since the first transaction in 2013. Since then, a total of 56 transactions have successfully been completed, for an aggregate issuance volume of over $13.1 billion across offerings of different sizes, tenors and ratings, with 2021 being best year on record up to that point.[64] Overall, this demonstrates the growing track record for solar ABS in secondary markets (**Figure 21**).

Figure 20: U.S. Solar Asset-Backed Securities, 2013-2021[65]



- While the demand for solar ABS has grown on secondary markets, there are few other clean energy asset classes. This has restricted large scale private sector investment into clean energy markets.
- Green bonds and other adapted financial instruments are emerging, but the supportive frameworks and regulations are not yet well established. Standardization over time may support the emergence of new asset classes, as investors rely on a common, transparent and reliable definition of underlying assets and their credit quality for securitization.
- Two-thirds of financier respondents were aware of secondary markets where they could sell their clean energy investments. This may indicate a high level of awareness of secondary market opportunities, but the extent to which different kinds of clean energy projects can be sold on secondary markets remains unclear.

NY Green Bank Influence: Moderate

- As of 2021, 92% of the overall solar ABS volume ($12.1 billion) has been backed by pooled investments originated by five solar companies.[66] These leading originators include Mosaic,

[64] Crédit Agricole CIB. (2022). U.S. Residential Solar ABS 101. https://www.ca-cib.com/sites/default/files/2022-03/Project-Bond-Focus-Solar-ABS-2022.pdf
[65] Ibid.
[66] Ibid.

Sunrun/Vivint and SolarCity/Tesla, all of which accessed capital from NY Green Bank, with the first transaction dating back to 2015.

- As highlighted in the 2019 Evaluation, Mosaic, which was co-financed by NY Green Bank, was the first solar company to develop a strongly performing solar business model in New York, and the first to issue a sizeable securitization of residential solar loans. Since then, Mosaic has been able to leverage a total aggregate volume of $2,756 million in solar ABS[67] and to finance more than $3.5 billion residential solar projects.[68]
- NY Green Bank has worked with developers to increase the aggregated scale and consistency of small individual transactions in the energy efficiency market. For instance, it invested in both Sealed and Ecosave, two firms that could allow efficiency projects in the residential and commercial sectors, respectively, to be aggregated and bundled into a larger pool of projects to be traded on secondary markets.
- In the transactions NY Green Bank completed with Sunrun to deploy more than 20,000 residential solar projects in New York, NY Green Bank was party to an agreement with several other large scale debt investors. In 2016, its contribution represented $25 million in the broader $340 million financing, and increased to a total of $35 million to expand the facilities to a total of $595 million two years later. Given the scale at which Sunrun operates, it is able to trade securities on the secondary market. While NY Green Bank contributed a small proportion of the overall syndicated facilities, it encouraged Sunrun to develop a minimum number of new projects in New York. To this end, a project backlog test was included as a covenant in the loan agreement, requiring Sunrun to demonstrate a minimum pipeline of solar projects in New York before drawing on a construction revolver.

Robustness: Moderate

The following table describes the rigor of the information and data sources used to establish the baseline for this indicator.

Table 14: Information and Data Sources, Indicator 6

Data sources	Description
Surveys, interviews and case studies	Qualitative data was based on responses from 22 financiers confirming their awareness of secondary markets for the clean energy asset classes they invest in. In addition, several key insights were derived from the case studies.
Secondary research	Difficulty accessing New York-specific data, given broad scale of secondary markets. In addition, few clean energy assets are currently traded on secondary markets resulting in limited available information.

[67] Crédit Agricole CIB. (2022). U.S. Residential Solar ABS 101. https://www.ca-cib.com/sites/default/files/2022-03/Project-Bond-Focus-Solar-ABS-2022.pdf

[68] Mosaic. (2020). Mosaic Completes $280 Million Solar Loans Securitization, Wins Global Capital Award. https://joinmosaic.com/2020/06/30/mosaic-completes-280-million-solar-loan-securitization-wins-globalcapital-award/

INDICATOR 7

7

Change in the number of transactions benefitting disadvantaged community members

▶ **This indicator aims to identify and measure projects that directly benefit members of disadvantaged communities (DACs), which support State goals to achieve a just and equitable energy transition.**

Evidence of change: Low | NY Green Bank Influence: Low | Robustness: Low

Key Takeaways

- Based on a preliminary definition of DACs, NY Green Bank's investments appear to have had an overall negligible but positive impact on these communities.
- NY Green Bank has recently committed to increasing their impact in DACs, with over $100 million in their investment pipeline that specifically target these communities, as of March 31, 2022.

Context

Disadvantaged communities and vulnerable groups are disproportionately affected by climate-driven impacts. Moreover, they are least able to prepare for, and recover from, extreme weather events. In light of this, New York's Climate Act aims to take concrete action to promote an equitable clean energy transition. The State has thus committed to considering the environmental, health and energy burdens that directly affect these communities, while working towards remedying the structural causes that underpin these burdens.

NYS's Climate Act aims to ensure that at least 35%, with a goal of 40%, of clean energy program resources benefit of DACs.

At the time this study was conducted, the Climate Justice Working Group (CJWG) had not yet finalized a formal definition of DACs that could be applied to evaluate NY Green Bank's impact on these communities. In the interim, a working definition for DACs was released, describing them as "communities that bear burdens of negative public health effects, environmental pollution, impacts of climate change, and possess certain socioeconomic criteria, or comprise high concentrations of low- and moderate-income households." [69] It has therefore not been possible to establish a strong baseline for this indicator within the Study Period, which ended on March 31, 2022. Future market

[69] New York State Climate Action Council. (2022). Scoping Plan: Full Report. https://climate.ny.gov/-/media/project/climate/files/NYS-Climate-Action-Council-Final-Scoping-Plan-2022.pdf

transformation evaluations should revisit this metric to define the baseline and track changes over time, as the final DAC criteria was adopted in March 2023.

NY Green Bank has continued to pursue efforts to engage with relevant stakeholders, develop suitable financial products tailored to specific market needs, and finance projects with special provisions that target and support low-income households. This commitment is cemented in NY Green Bank's Annual Business Plan, which proposes specific, concrete actions to adapt and develop new financing solutions to support DACs.[70]

Evidence of Change: Low

- The most recent U.S. census data suggests that 1 million New York households faced energy poverty in the 5-year period between 2015 and 2019. Energy costs have since risen, disproportionally affecting low-income households.[71]
- Two financiers interviewed for this study noted a portion of their investments targeted disadvantaged communities, one of which uses a social scorecard. Financing options for projects that support these communities thus appears to be somewhat limited, especially without rigorous efforts to monitor and report on financing impacts in DACs being more commonplace.

NY Green Bank Influence: Low

- To date, NY Green Bank has financed several projects benefiting DACs, including:
  - E2i, a high-performance, all-electric, affordable housing project.
  - NYCEEC/Calvert deal to support the development of 310 units of affordable housing and a 200-bed homeless shelter.
  - RiseBoro Community Partnership & UJO of Williamsburg, a 140-unit all-electric affordable housing.
  - Inclusive Prosperity Capital, Inc., a specialty financier investing in energy efficiency, solar and sustainable infrastructure in low- and moderate-income communities and underserved markets.
  - NYCEEC subordinate loan deal to finance clean energy and energy efficiency projects located in New York State that benefit disadvantaged communities.
  - NYCHA deal to conduct energy improvements, primarily through the lighting upgrades, in 18 master-metered multifamily developments.
  - Workforce Housing Group to install solar PV on 18 affordable housing buildings that will benefit low- and moderate-income residents and their communities.
  - Energy Impact Partners' and Aspen Power's 12.5 MW community distributed solar project aimed at bridging the clean energy gap for low-and middle-income households.
- While there continues to be significant barriers to reaching DACs, this baseline suggests that substantial public support remains a critical component in backing clean energy projects that benefit these communities.

[70] NY Green Bank. (2022). NY Green Bank: Annual Plan 2022-23.
[71] Lesser, J. A. (2022). Energy Poverty in New York: The Adverse Impacts of the State's Green Power Mandates. https://www.manhattan-institute.org/energy-poverty-in-new-york

- As the definition of DACs was finalized on March 27, 2023, more consistent and transparent reporting across clean energy transactions will be possible moving forward.

Robustness: Low

As the definition of DACs is still being formalized, there is limited data available to support this metric. Once the final definition is published, organization like NY Green Bank will be better equipped to develop metrics and report on their impact in these communities.

Table 15: Information and Data Sources, Indicator 7

Data sources	Description
Surveys, interviews and case studies	Qualitative data was limited to select financier (2) and developers (6) commenting on whether their portfolios or projects, respectively, support disadvantaged communities.
Secondary research	Difficulty accessing clear reporting data in light of the ongoing process to finalize the definition of disadvantaged communities.

4. Key Takeaways & Recommendations

New York's clean energy sector shows continued evidence of increasing maturity and transformation since the last evaluation conducted in 2019. While NY Green Bank is a relatively new entrant to the market, and its pool of capital represents a small fraction of New York's annual energy spending, there is compelling evidence that NY Green Bank is helping to accelerate and scale clean energy deployment in some clean energy markets. As its target markets become more clearly defined to align with New York State's climate action plan, NY Green Bank will continue to direct its future investments and adapt its practices to meet the evolving needs of New York's clean energy markets.

New York is one of the top states leading the clean energy transformation.

As a national leader in climate and clean energy policy, New York is seeing rapid transformation and expansion of some key clean energy markets.

- Distributed solar investments have expanded in volume and diversity of market segments, suggesting that it is gradually reaching market maturity. In particular, the emergence of solar ABS has expanded rapidly in recent years and is playing an important role in crowding in large private capital providers into the solar market.
- Over a relatively short period of time, New York has emerged as the leading state for community solar installations in terms of total capacity. This infrastructure expands access to low-cost clean energy in underserved markets and shows signs of continued growth.
- Building decarbonization investment in the State continues to grow, and recent policies and regulations are paving the way for further demand and greater opportunities in this market.

Despite it relatively small size in the market, NY Green Bank plays a strategic role in the advancement of New York's clean energy sector.

NY Green Bank is a relatively small player in New York's clean energy financing markets. For example, it committed $310 million to clean energy transactions in 2020, compared to NYSERDA's $1.2 billion expenditures in its 2020-21 fiscal year, and over $140 billion in energy system expenditures statewide in 2020. Moreover, NY Green Bank's investments are often combined with NYSERDA's strategic initiatives, as well as other federal, state and municipal initiatives, which further amplifies its impact, but which also make it more difficult to connect specific impacts to separate entities. Considering that NY Green Bank's investments represent a relatively small portion of the overall energy system investments, even minimal or moderate evidence of its influence on clean energy market transformation indicate that it is delivering on its mandate to address financing gaps and barriers in the market and crowd in private capital to scale and accelerate the deployment of clean energy in New York.

NY Green Bank's targeted investments show compelling evidence that it is playing a meaningful role in transforming a few key markets.

Early community solar projects made use of the Value Stack compensation mechanism, which presented substantial uncertainty and perceived risk to private sector financiers. NY Green Bank played an early mover role in this market, helping establish a strong track record of investing in community solar PV projects that has allowed this market to grow rapidly over recent years. NY

Green Bank helped lower perceived risks on transactions for commercial developers where they were party to through a variety of strategies.

Community solar projects struggled to attract investors after the Value Stack compensation mechanism was introduced in New York in 2017. NY Green Bank was an early mover in this space, leveraging their internal expertise to evaluate the revenue risk associated with its variable revenue structure and uncontracted cashflows. By establishing a performance history through continued investments in these projects, NY Green Bank played a key role in building investor confidence in this segment of the solar market, which has grown rapidly over recent years.

- NY Green Bank offers adapted financing products, including bridge loans, construction financing and term loans, to support community solar projects. During the study period, this was observed to help fill financing gaps and prime financial market participants, and notably contributed to New York taking the center stage as a national leader in community solar investments.
- NY Green Bank boasts the largest private recapitalization by a U.S. green bank to date. By conducting a $314 million transaction with Bank of America, NY Green Bank securitized a pool of performing loans through an innovative transaction structure, setting a precedent that can be replicated by other large market actors seeking to grow their clean energy portfolios. This landmark transaction also allowed NY Green Bank to expand its access to capital, helping maximize the impact of each public dollar used to establish the green bank.

NY Green Bank will continue to focus its investments and create impact in less established clean energy markets through its alignment with New York's recently adopted Climate Act and its priority investment targets.

NY Green Bank's forthcoming investments in building decarbonization and green affordable housing within disadvantaged communities, in addition to clean transportation, are expected to bring about transformative changes in these markets over coming years that significantly reduce GHG emissions and support the achievement of State targets.

- Improvements in the design and performance of energy efficient equipment in this quickly evolving market, backed by strong policies and regulations, as well as multiple incentives and funding opportunities, are expected to improve the business case for building efficiency and create favorable market conditions for investment over time to scale private sector investment.
- The ongoing transformation of the transportation sector is expected to drive demand for EVs. With NY Green Bank's future investments in the market, coupled with generous public incentives, the transition away from vehicles powered by fossil fuels is expected to see accelerated growth in coming years.

Future evaluation studies will provide insights on how these markets have progressed, as well as NY Green Bank's role in unlocking and crowding in private sector capital.

The evaluation revealed some further opportunities to help grow NY Green Banks market transformation impacts.

Based on the findings of this evaluation, the Dunsky team recommends the following actions to help NY Green Bank further scale its transformative impact in the clean energy sector:

- **Develop new financial instruments and increase risk tolerance.** To date, NY Green Bank's main investment strategy has been to offer risk-adjusted terms at market rates to demonstrate developers are able to carry the commercial cost of debt, primarily in the form of senior secured debt financing. Other financial instruments, such as subordinated debt, equity and credit enhancements, can be used to leverage additional private capital. While NY Green Bank

generally bases its financing terms on market pricing for investments of comparable liquidity, credit quality, risk and position in the capital structure, concessional and patient capital, as well as riskier products, may also be needed to support more novel technologies, assets and market segments in earlier stages of development, where the business case and risk-return profiles are not yet as competitive as more mature markets.

  - **Recommendation**: Develop new financial instruments and increase risk tolerance. To date, NY Green Bank's main investment strategy has been to offer risk-adjusted terms at market rates to demonstrate developers are able to carry the commercial cost of debt, primarily in the form of senior secured debt financing. Other financial instruments, such as subordinated debt, equity, and credit enhancements, can be used to leverage additional private capital.
  - **NYSERDA Response to Recommendation:** Implemented. NY Green Bank completed some of the earliest community solar transactions in the State, setting precedents and leading the way for commercial lenders to follow such that competitively priced private capital is readily available for these projects. NY Green Bank continues to address financing gaps and barriers by creating replicable and scalable products (i.e., interconnection bridge, community solar interconnection, construction revolver, and tiered pricing for LMI community solar) and actively work to design other financial tools necessary to meet market needs and support the objectives and targets outlined in New York's Climate Leadership and Community Protection Act (Climate Act). NYGB cannot alter the risk tolerance of another party, but it can work with project owners to prepare transaction offerings, which are attractive to a wider array of capital market participants. The evaluation recognized NYGB's ability to adapt existing project finance loan instruments to meet the needs of NYS community solar borrowers. NYGB continues to seek more opportunity to apply some of the same financing instruments within other clean energy markets in NYS, particularly, energy storage, clean transportation and building decarbonization.

- **Increase outreach and expand knowledge sharing.** There are financiers and developers who remain unaware or unclear of NY Green Bank's role in facilitating clean energy transactions. Extensive outreach and engagement with financiers, developers and other sector stakeholders could provide NY Green with greater visibility in the market and clarify its purpose, while increasing opportunities to offer technical support and build sector-wide capacity. For example, some other green banks have included specific language within their objectives to both disseminate and replicate their clean energy investment strategies. In doing so, NY Green Bank can leverage its track record of success to more broadly share replicable financing structures and information on favorable market conditions, including incentives and regulatory support.
  - **Recommendation:** Increase outreach and expand knowledge sharing. There are financiers and developers who remain unaware or unclear of NY Green Bank's role in facilitating clean energy transactions. Extensive outreach and engagement with financiers, developers and other sector stakeholders could provide NY Green Bank with greater visibility in the market and clarify its purpose, while increasing opportunities to offer technical support and build sector-wide capacity.
  - **NYSERDA Response to Recommendation:** Implemented. NY Green Bank will develop and implement a communication outreach and engagement strategy that emphasizes NYGB's role in supporting and advancing clean energy investments, with a focus on less established clean energy markets.

- **Data transparency.** An improved understanding of clean energy technologies and assets, including their revenue streams, can help expand and accelerate capital flows in less familiar markets. As such, NY Green Bank can play a role in advocating for greater transparency on transaction data to improve risk-return profiles and signal ESG impacts that align with sustainable finance disclosures, while promoting best practices and new program offerings.
    - **Recommendation: Data transparency.** An improved understanding of clean energy technologies and assets, including their revenue streams, can help expand and accelerate capital flows in less familiar markets. As such, NY Green Bank can play a role in advocating for greater transparency on transaction data to improve risk-return profiles and signal ESG impacts that align with sustainable finance disclosures, while promoting best practices and new program offerings.
    - **NYSERDA Response to Recommendation:** Implemented. NY Green Bank will advocate for greater transparency on transaction data to improve risk-return profiles and signal ESG impacts that align with sustainable finance disclosures, while promoting best practices and new program offerings.

Given the size and scope of NY Green Bank's investment portfolio and mandate, it has had a notable impact on the transformation of some of New York's clean energy markets. All in all, NY Green Bank's investments have helped establish a strong track record for newly commercialized clean energy technologies and assets; provide a fair, well-informed assessment of transactions risks to improve borrowing terms; offer replicable financial instruments to reduce future transaction costs; and encouraged standardization and aggregation to attract large investors, with a view to meet the needs of both developers and financiers over the long term.

Appendix A: Evaluation Frameworks

To determine the appropriate indicators to establish whether market transformation effects have resulted from NY Green Bank's activities, the evaluation team:

- Developed a NY Green Bank Theory of Change model to understand the expected preconditions required for market transformation;
- Developed an updated NY Green Bank Program Theory Logic Model (PTLM) to understand how NY Green Bank's activities impact the anticipated outcomes; and
- Developed a Network Analysis to understand how NY Green Bank interacts with the broader clean energy ecosystem in New York State.

The Theory of Change and PTLM are intended to visually represent the theory that leads an initiative towards its targeted outcomes. These were used to identify relevant indicators to understand NY Green Bank's market transformation impacts.

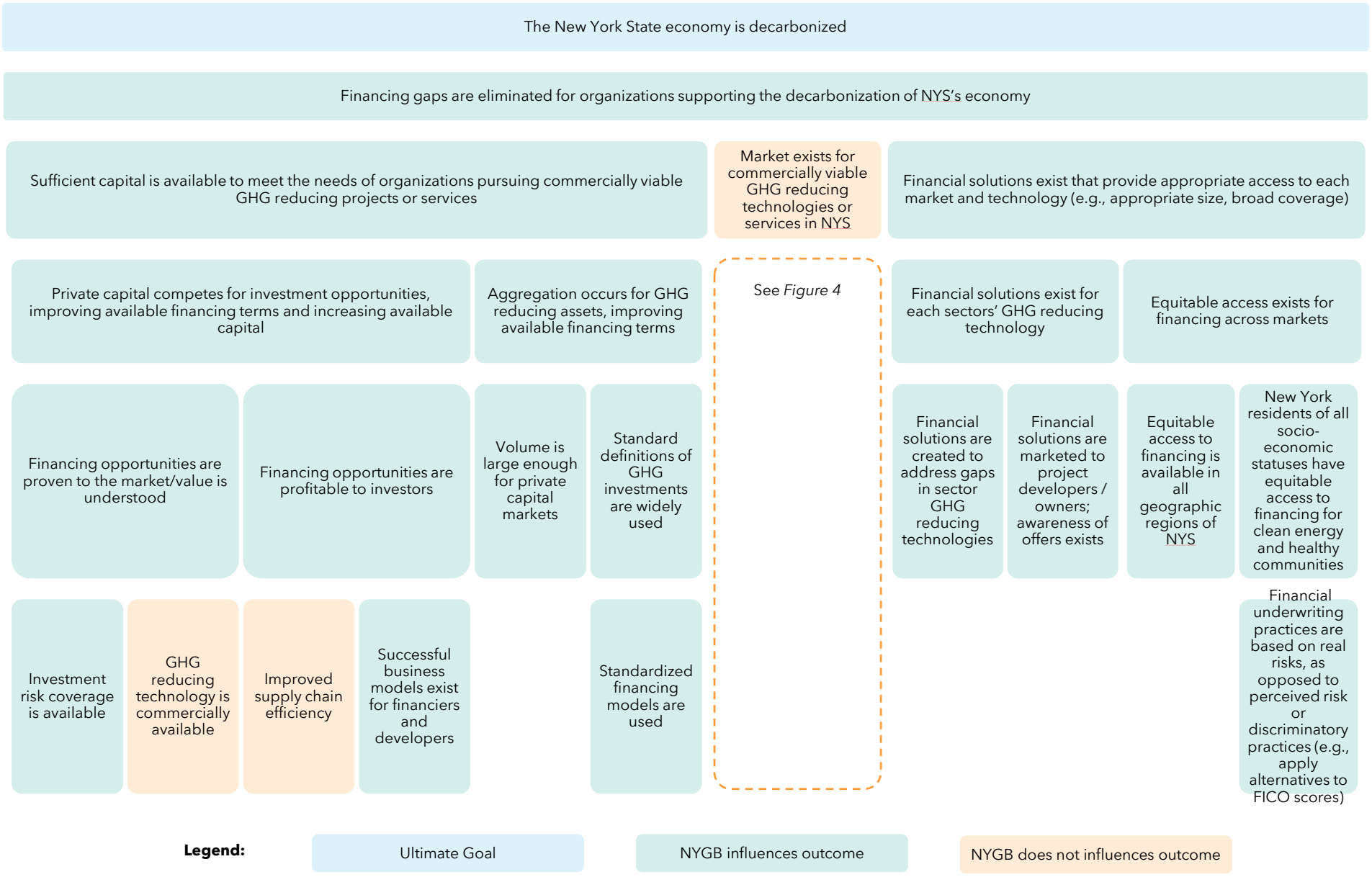
NY Green Bank's Theory of Change Model

The Theory of Change model is intended to help organizations tell the story of how they are creating an impact in the world. The model helped highlight the areas where NY Green Bank can have an impact, and the preconditions needed to achieve its long-term goals.

For the purposes of this evaluation, there are multiple levels of desired outcomes, as described in **Figure 22** and **Figure 23**. The preconditions described in the lower levels are needed to achieve overarching ultimate goal of achieving a carbon neutral economy in New York, described at the highest level. However, not all preconditions fall within the purview of NY Green Bank. For instance, the availability of sufficient capital is contingent on the factors included in the tier below, namely private sector competition and the aggregation of similar projects occurring on a broader scale.

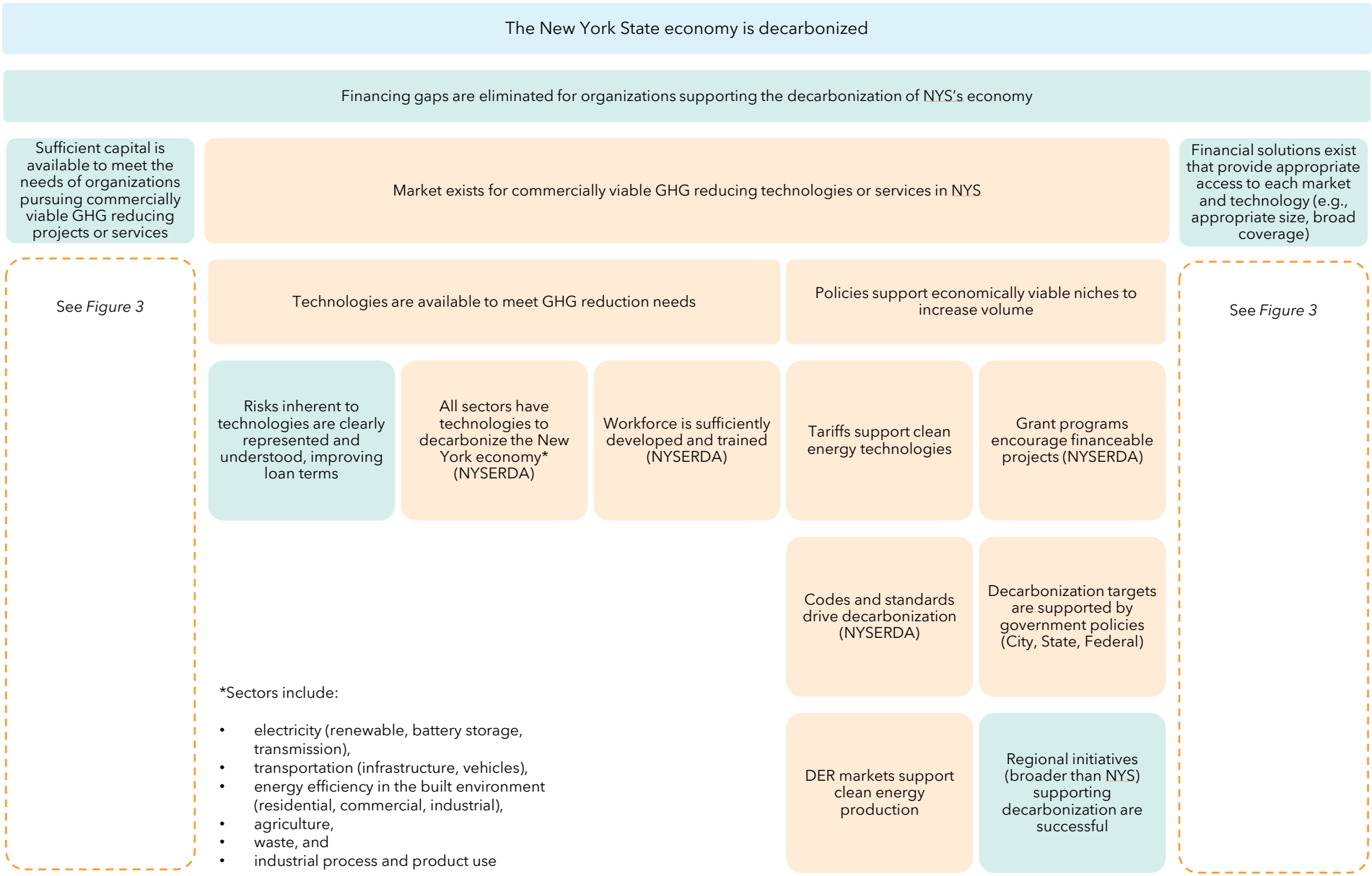
To improve readability, the Theory of Change Model was split between the two figures, the first showing the first and third columns, and the second showing the middle column.

Figure 21: Theory of Change Model for NYGB (1 of 2)[72]



[72] This figure is simplified to demonstrate how financing can support New York's goal of achieving carbon neutrality; however, many other interventions beyond financing are needed.

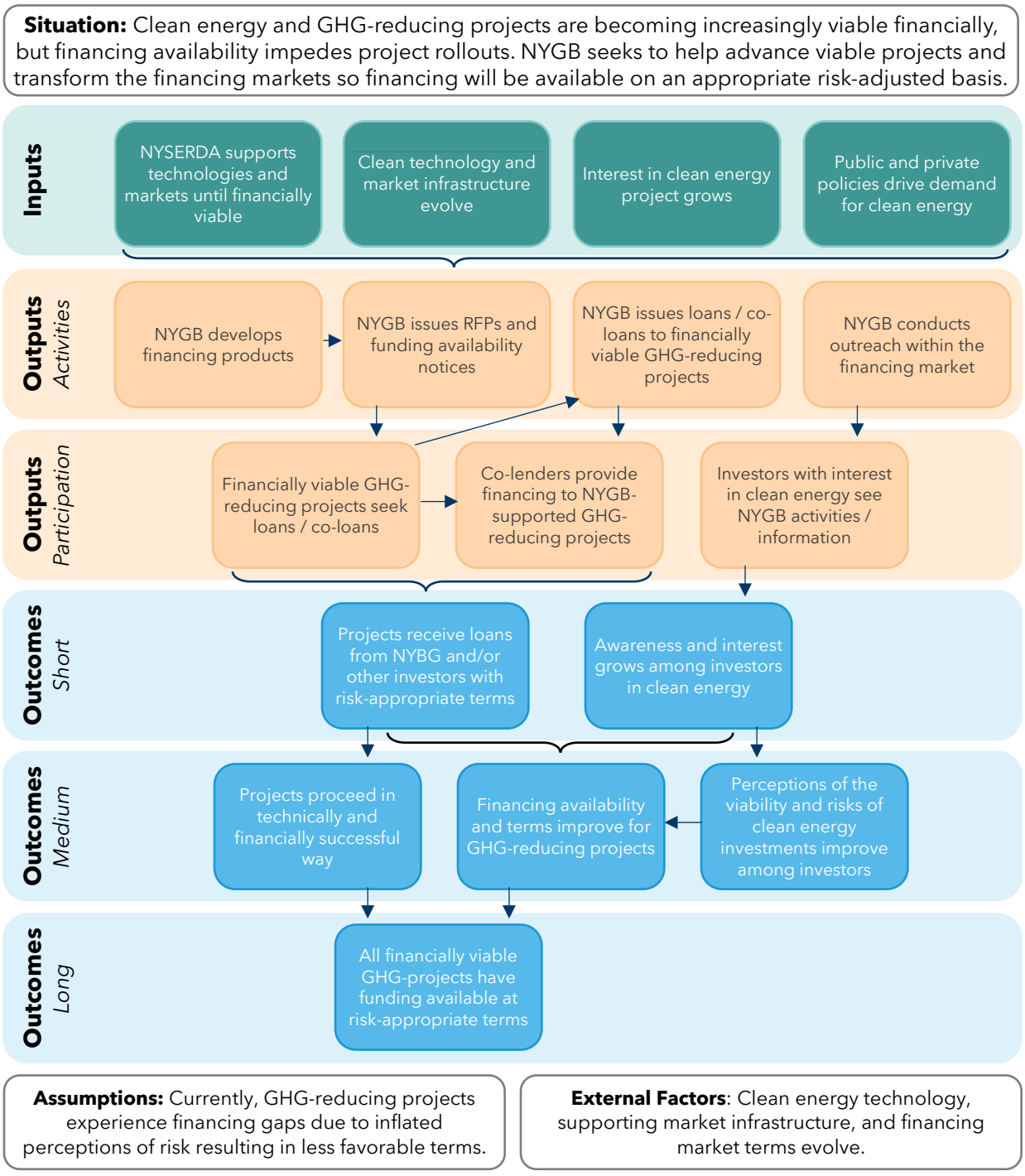
Figure 22: Theory of Change Model for NYGB (2 of 2)



Program Theory and Logic Model (PTLM)

The PTLM is an organization's roadmap for changing the world. It moves one step further from the Theory of Change by including the inputs and activities required to achieve the short-, medium-, and long-term outcomes. The Theory of Change outcomes were summarized to streamline the revised PTLM below **(Figure 24)**.

Figure 23: Program Theory and Logic Model

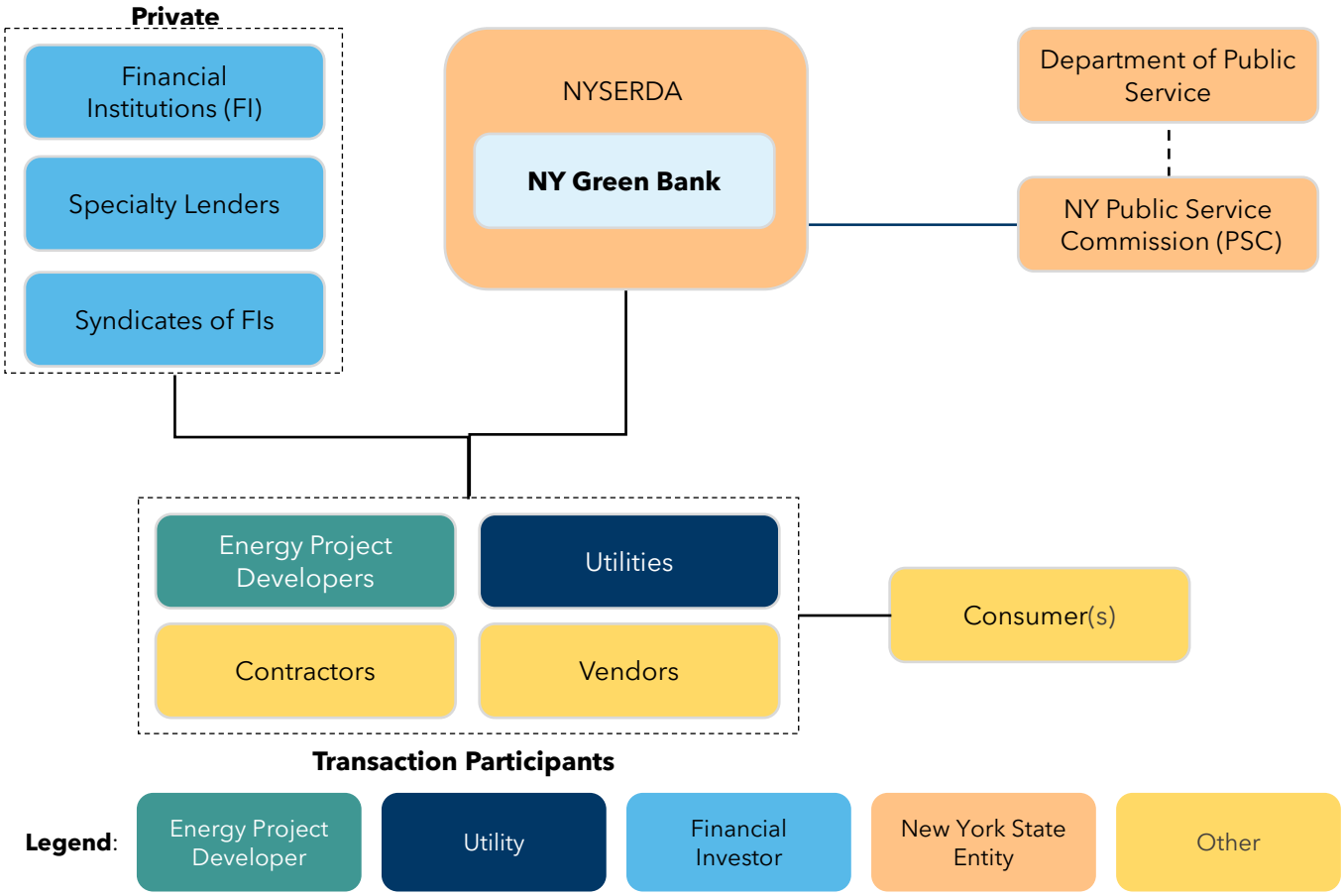


Network Analysis

Market transformation initiatives have wide-ranging impacts on market participants. **Figure 25** provides a visual representation of the stakeholder relationships within the broader clean energy financing network, highlighting their connection to NY Green Bank at the center.

The purpose of completing a Network Analysis was to identify key actors to reach to for the study's surveys and interviews.

Figure 24: Network overview of organizations and entities that interact with NY Green Bank



Market Transformation Indicators

Building on the outcomes of the Theory of Change and PTLM, seven indicators were selected to measure market transformation impacts (**Table 16** below). The indicators represent a mix of new and existing metrics borrowed from the 2019 Evaluation Study (**Table 17**). As such, the original list of fourteen indicators was narrowed down to seven, including three new indicators, and four adapted from the previous study.

Table 16: Indicators of Market Transformation Impacts

	Metric	Description of expected change	Barrier	Timeframe[73]
1	Change in the perceived market opportunity for clean energy investments in NYS	This indicator aims to capture the tendency for many commercial financiers to wait before investing in novel markets until they believe the opportunity is large and profitable enough.	Information gaps	Short term
2	Change in clean energy investment risk-return profiles, as demonstrated through improved financing terms	This indicator suggests that commercial financiers offer more favorable financing terms as they become more confident in and comfortable with the risk profiles of clean energy technologies and assets, as well as the performance of associated financial products.	Information gaps	Medium term
3	Change in the total volume of clean energy project financing	This indicator suggests that growth in the total capital flows to clean energy markets is typically a signal that the markets are maturing, with less need for government funding and other initiatives to encourage investment.	Market maturity	Medium to long term
4	Change in the volume of transactions in specific clean energy markets	This indicator suggests that strong performance in target markets drives growth and leads to a greater number of investment opportunities. As a result, developers have access to more substantial financing in mature markets. Large deal sizes also help satisfy the minimum requirements of large-scale investors and justify transaction costs, allowing a broader range of financiers to participate in the market.	Market maturity	Medium to long term
5	Change in the mix of financiers investing in clean energy projects	This indicator suggests that debt financing becomes more prominent in maturing markets, attracting different kinds of financiers than in earlier stages of firm and market development.	Market maturity	Medium to long term
6	Emergence of secondary markets for clean energy assets	This indicator suggests that clean energy asset classes traded on secondary markets can attract substantial private capital into clean energy markets, making them more liquid and helping demonstrate the maturity of clean energy investments.	Market maturity	Long term
7	Change in the number of transactions benefitting DACs	This indicator suggests that projects that directly benefit members of disadvantaged communities (DACs) support goals to achieve a just and equitable energy transition.	Equity	Long term

[73] Timeframes are used to estimate the amount of time needed to notice changes to the metric, measured against the baseline. Short-term is defined as 1 – 3 years, medium term as 3 – 5 years, and long term as 5+ years.

Table 17: Comparison of 2019 and 2022 Indicators

Indicators included in 2019 Evaluation Study	Indicators included in 2022 Evaluation Study	Comparison
Availability of informative data on clean energy project financial performance	N/A	Not retained
Availability of informative data on clean energy project technical performance	N/A	Not retained
Increased awareness in financial community of clean energy investment opportunities	Change in the perceived market opportunity for clean energy investment in New York	Retained and adapted
Increase in Clean Energy Transactions with Risk/Return Profiles Acceptable to Financiers	Change in clean energy risk-return profiles, as demonstrated through improved financing terms	Retained and adapted
Increase in the scale of individual clean energy project financing transactions	N/A	Not retained
Increase in the number of clean energy financings	N/A	Not retained
Total volume of clean energy financings of a given type	N/A	Not retained
Increase in the volume of clean energy projects of a given type	Change in the volume of transactions in specific clean energy markets	Retained and adapted
Increase in the number of financiers offering products supported by NY Green Bank	N/A	Not retained
Replication by developers of NY Green Bank financing approaches – residential/ commercial	N/A	Not retained
Emergence of secondary markets	Emergence of secondary markets for clean energy assets	Retained and adapted
Reduction in financing costs	N/A	Not retained
Reduced elapsed time to complete transactions	N/A	Not retained
Reduction in clean energy technology costs	N/A	Not retained
N/A	Change in the total volume of clean energy project financing	New indicator
N/A	Change in the mix of financiers investing in clean energy projects	New indicator
N/A	Change in the number of transactions benefitting DACs	New indicator

Appendix B: Methodology

Primary Data

The evaluation team collected primary data from multiple sources including the following:

- **Web surveys**. A survey instrument, programmed in Qualtrics, was used to generate both quantitative and qualitative data from financiers (e.g., lenders) and developers (e.g., contractors, building owners).
- **Target interviews.** A mix of financiers and developers were interviewed to gather more detailed insights on several aspects of NY Green Bank's clean energy investments.
- **Case studies**. A selection of recent NY Green Bank transaction counterparties were selected from a pool of financiers and developers. The case studies were used to highlight different ways NY Green Bank helped market participants overcome financial barriers and gaps, with a view to demonstrate its effectiveness at increasing capital flows in target markets.

To solicit participation in the web surveys, developers and financiers in NY Green Bank's relationship database were contacted. The database includes the same developers and financiers approached in the 2019 Study, as well as new and additional contacts with whom NY Green Bank has had a financial or other relationship through the course of its operations. Outreach was filtered to a single point of contact per firm, with a replacement contacted when individuals declined or were unresponsive. In addition, NY Green Bank staff leveraged their existing relationships with financiers to further encourage participation, by contacting recent partners on financial transactions, which may have improved the response rate.

The surveys were shared by email, with follow up contact initiated by NY Green Bank. To achieve the target response rate, each unsuccessful attempt to solicit a survey response was accompanied by two more attempts, for a total of three contact phases set two weeks apart. To broaden the reach of the survey invitations, NY Green Bank also posted a request on LinkedIn, inviting industry professionals to complete a version of the survey made publicly available. The survey results from this method were analyzed separately because of the potential difference in the respondent population base.

Secondary Data

To complement findings, and get a stronger sense of current conditions in the clean energy sector, secondary data was collected from the following:

- **Government sources**, such as reports, plans and statistics, from government agencies at the federal, state, and local levels for quantitative data.
- **Industry sources** from relevant and credible industry publications, databases, academic literature, and corporate materials (e.g., annual reports) for qualitative and quantitative data.
- **Web scraping** to capture mentions of NY Green Bank and its counterparties, as well as clean energy trends, in online media and public reports for qualitative and quantitative data.

Appendix C: Detailed Results

Study Population

A mix of participant and non-participant developers and financiers participated in the study (**Table 18**).

Table 18: Survey and Interview Respondents

	Web survey		Interview	
Respondents	**Developers**	**Financiers**[74]	**Developers**	**Financiers**
Number of responses	8 participants 37 non-participants	18 participants 13 non-participants	5 participants 7 non-participants	3 participants 4 non-participants
Total	45 respondents	31 respondents	12 interviewees	7 interviewees

To support the case studies, in-depth interviews were completed with 4 developers and 2 financiers in the community solar market, as well as with 3 developers and 2 financiers in the energy efficiency market. An exceptional instance of portfolio monetization was also showcased through an additional case study with a financier.

Survey respondents also worked across a variety of clean energy markets, providing diverse perspectives **(Table 19 and Table 20)**.

Table 19: Activity in Different Clean Energy Markets by Developer Survey Respondents

Investments	% of Respondents	# of Respondents
Residential on-site solar installations	30%	13
Community solar installations	45%	44
Residential building decarbonization and energy efficiency upgrades	39%	44
Commercial building decarbonization and energy efficiency upgrades	32%	44
Sustainable transportation	48%	44

[74] Participant status reported here is based on NY Green Bank's contact list. In the survey, respondents also had an opportunity to self-report their participation status. Self-reported participation status was lower (n = 13 participants, n =18 non-participants) than the status assigned by NY Green Bank. However, because the survey respondent could be unaware of their company's past involvement, we chose to report on NY Green Bank's assessment here and elsewhere in the report.

Table 20: Recent Activity[75] in Different Clean Energy Markets by Financier Survey Respondents

Investments	% of Respondents	# of Respondents
Residential on-site solar installations	37%	11
Community solar installations	63%	19
Residential building decarbonization and energy efficiency upgrades	23%	7
Commercial building decarbonization and energy efficiency upgrades	53%	16
Sustainable transportation	33%	10

[75] Recent activity here defined as the past 12 months.

Data Collection Challenges

While multiple attempts were made to invite developers and financiers participate in the study (**Appendix B**: **Methodology**), the response rate ranged between 7% and 10% for surveys, and between 17% and 32% for interviews (Table 21).

Challenges with data collection included:

- Occasionally outdated information in NY Green Bank's contact list, with some identified contacts moving to new companies;
- Lack of recent engagement with some of the identified contacts;
- Mis-categorization of the contact type (financier vs. developer);
- Ambiguity as to which individual(s) would serve as the best contact at an organization where NY Green Bank has multiple contacts; and
- A lack of meaningful motivation provided by a financial, material or other incentive (relative to the value of people's time).

The comparatively stronger response by targeted contacts for interviews than for general surveys also points to the importance of the human or relationship-focused interaction, as well as, possibly, the importance of seeking a response related to a specific transaction in which the respondent is or was involved, rather than a request that can feel more generic in nature.

Table 21: Survey and Interview Response Rate

	Web survey		Interview	
	Developers	**Financiers**	**Developers**	**Financiers**
Target	25-50 respondents	25-50 respondents	20 interviewees	20 interviewees
Total Attempts	431 attempts	426 attempts	37 attempts	41 attempts
Completes	45 respondents	31 respondents	12 interviewees	7 interviewees
Response Rate	10%	7%	32%	17%

The responses from the surveys, interviews and case studies are detailed in **Table 22** below.

Table 22: Summary of Survey, Interview and Case Study Results, Sorted by Indicator

Source[76]	Survey Question	Response options	Respondents	
			%	#
Indicator 1: Change in the perceived market opportunity for clean energy investments in New York				
S-F **C-F**	If you had to characterize the size of the clean energy and energy efficiency investment market in New York State, would you classify it as…?	Huge	13%	3
		Large	35%	8
		Moderate	52%	12
		Small	0%	0
				N=23
S-F **C-F**	How do you believe the clean energy and energy efficiency investment market is currently changing in size?	Growing	96%	22
		Keeping steady	4%	1
		Shrinking	0%	0
				N=23
S-F	If "Growing": How would you describe its rate of growth of clean energy and energy efficiency investments in New York State compared to all other investment opportunities? Are clean energy and energy efficiency investments …?	Growing at a faster rate than other investment opportunities	77%	17
		Growing at the same rate as other investment opportunities	5%	1
		Growing at a slower rate than other investment opportunities	9%	2
		Don't know	9%	2
				N=22

[76] The first letter represents the qualitative instrument and the second represents the type of respondent. As such, "S" represents surveys, "C" represents case studies, and "I" represents interviews. When proceeded with "-F", it indicates the respondents were financiers and when proceeded with "-D", the respondents were developers.

S-F	If "Not involved": How would you compare the opportunities for clean energy and energy efficiency investments in New York State to clean energy investments in other domestic geographies in which you invest?	New York has more favorable clean energy and energy efficiency investment opportunities	21%	4
		New York and other areas have equally favorable clean energy and energy efficiency investment opportunities	47%	9
		Other areas have more favorable clean energy and energy efficiency investment opportunities	11%	2
		We do not invest in other domestic geographies	0%	0
		Don't know	21%	4
				N=19
S-F	We would like to know in what clean energy and energy efficiency areas (if any) investors, like you, participate. In the past 12 months, has your organization been involved in financing for any ...	Residential customer-sited solar installations	37%	11
		Community solar installations	63%	19
		Residential building decarbonization and energy efficiency upgrades	23%	7
		Commercial building decarbonization and energy efficiency upgrades	53%	16
		Sustainable transportation technology and infrastructure	33%	10
				N=27
	Which technology area or areas do you see as ones to watch?	Solar	67%	4
		Storage	67%	4
		Offshore wind	33%	2

		Energy efficiency and building decarbonization	50%	3
		Climate resilience	17%	1
				N=6
C-F	Overall, how does the potential for clean energy investments in New York State compare to other markets?	New York has a strong clean energy financing sector compared to other states	100%	4
		New York is a leader in some clean energy markets but not others	50%	2
		New York is lagging behind other states	0%	0
				N=4
C-F	Why do you think that?	Favorable policy and regulatory environment	100%	2
		Favorable incentives and programs	100%	2
		Cost of energy	50%	1
				N=2
I-F	Other than your organization's investments where NY Green Bank was involved, please describe any other NY Green Bank activities you have seen in the market.	Solar	40%	2
		Other renewables	20%	1
		None	40%	2
				N=5

Indicator 2: Change in clean energy investment risk-return profiles, as demonstrated through improved financing terms

S-F	Which statement best describes your organization's plans to change the activity or level of investment in clean energy and energy efficiency? [Asked of respondents already involved in clean energy investments.]	Plan to increase the activity or level of investment in clean energy and energy efficiency in the future	100%	20
		Plan to keep the activity or level of investment in clean energy and	0%	0

		energy efficiency the same in the future		
		Decrease the activity or level of investment in clean energy and energy efficiency in the future	0%	0
		I am not sure of the activity of level of investment in the future	0%	0
				N=20
S-F	To what extent do you agree or disagree with the following statements about clean energy and energy efficiency investments? [Asked of respondents not involved in clean energy investments.]	The investment market for clean energy is not mature or developed enough for us to get involved yet	0%	0
		The risk in these investments is higher than the risk in our typical investments	40%	2
		The return from these investments is lower than the return from our typical investments	60%	3
		The market is too small for us to get involved	20%	1
		We do not follow clean energy and energy efficiency closely enough to evaluate opportunities	40%	2
				N=5
I-F	Has your organization's involvement with NY Green Bank affected the breadth of investments you pursue, the way you qualify investments, or the way you quantify risk and terms?	Yes	50%	4
		No	25%	2
		Don't know	25%	2
				N=8
I-F	Please elaborate on how NY Green Bank has affected your organization's clean energy and energy efficiency investments.	Allowed financer to offer a longer-term loan	25%	1

		Helped de-risk certain deals	25%	1
		Provided additional capital	50%	2
				N=4
I-D	Thinking about clean energy projects in which NY Green Bank was involved in financing, what impact did NY Green Bank have on those projects? Please explain in a sentence or two.	Allowed financer to offer a longer-term loan	0%	0
		Helped de-risk certain deals	0%	0
		Provided additional capital	100%	2
				N=2
S-D	These next questions are about your experiences with clean energy projects in the past three years. What changes, if any, have you noticed in the following?			
	Degree of technical opportunity for clean energy	Decreased/worsened	9%	3
		Remained steady	23%	8
		Increased/improved	55%	23
		Don't know	3%	1
				N=35
	Degree of market demand for clean energy	Decreased/worsened	0%	0
		Remained steady	3%	1
		Increased/improved	94%	33
		Don't know	3%	1
				N=35
	Ability to obtain financing or funding for clean energy projects	Decreased/worsened	20%	7
		Remained steady	34%	12
		Increased/improved	40%	14
		Don't know	6%	2
				N=35

	Attractiveness of financing terms for clean energy projects	Decreased/worsened	11%	5
		Remained steady	34%	14
		Increased/improved	46%	8
		Don't know	9%	8
				N=35
	Parity of financing terms for clean energy projects	Decreased/worsened	14%	5
		Remained steady	40%	14
		Increased/improved	23%	8
		Don't know	23%	8
				N=35
	Number of clean energy projects you finance with NY Green Bank involvement	Decreased/worsened	29%	10
		Remained steady	37%	13
		Increased/improved	3%	1
		Don't know	31%	11
				N=35
	Number of clean energy projects you finance without NY Green Bank involvement	Decreased/worsened	3%	1
		Remained steady	37%	13
		Increased/improved	37%	13
		Don't know	23%	8
				N=35
C-D	Do the financing terms for clean energy projects make efforts more attractive, equally attractive, or less attractive than other development opportunities?	Borrowing costs for clean energy is higher than in other markets	50%	3
		Borrowing costs for clean energy is roughly the same as in other markets	17%	1
		Borrowing costs for clean energy is lower than in other markets	0%	0

		Borrowing costs for certain markets are declining	67%	4
				N=6
S-D	Please indicate the extent to which the following statements describe your current experience with financing clean energy work.			
	We can find financing for clean energy projects when we need it.	Strongly agree	6%	2
		Agree	20%	7
		Neither agree nor disagree	17%	6
		Disagree	26%	9
		Strong disagree	31%	11
				N=35
	It takes more effort to get financing for clean energy work than other kinds of development projects.	Strongly agree	0%	0
		Agree	3%	1
		Neither agree nor disagree	54%	19
		Disagree	29%	10
		Strong disagree	14%	5
				N=35
	The cost of financing clean energy work seems to be higher than the cost to finance other projects with comparable risks.	Strongly agree	3%	1
		Agree	14%	5
		Neither agree nor disagree	49%	17
		Disagree	20%	7
		Strong disagree	14%	5
				N=35
	We have had otherwise viable projects scaled back in the past 12 months solely due to financing challenges.	Strongly agree	9%	3
		Agree	20%	7

		Neither agree nor disagree	26%	9
		Disagree	17%	6
		Strong disagree	29%	10
				N=35
	We have had otherwise viable projects canceled in the past 12 months solely due to financing availability or terms.	Strongly agree	17%	6
		Agree	26%	9
		Neither agree nor disagree	26%	9
		Disagree	9%	3
		Strong disagree	23%	8
				N=35
Indicator 3: Change in the total volume of clean energy project financing				
S-F	What share of your organization's total assets under management goes to clean energy or energy efficiency projects?	Less than 1%	14%	3
		1 to 10%	24%	5
		11 to 50%	14%	3
		More than 50%	33%	7
		Don't know	14%	3
				N=21
I-F	Are there any ways in which NY Green Bank has influenced other clean energy and energy efficiency investments you make?	Yes	0%	0
		No	100%	5
				N=5
C-F	In what ways, if any, has the collaboration with NYGB affected how often or how much you are investing in similar clean energy projects?	Some impact	33%	1
		Minimal impact[77]	67%	2

[77] One financier explained that NY Green Bank has been an important partner, but not essential to their clean energy transactions. Without NY Green Bank, they were confident they would have found other partners to realize the project, though it would have required be more work.

				N=3
I-F	What would need to be different for your organization to increase the activity or level of investment in clean energy and energy efficiency? Please tell us in a sentence or two.	Awareness of markets supported by incentives, subsidies and supportive regulations	67%	2
		Sufficient returns to meet internal requirements	33%	1
				N=3
I-F	What would need to be different for your organization to expand into new areas of clean energy and energy efficiency investment? Please let us know in a few sentences.	Access to flexible capital	25%	1
		Internal capacity and expertise	50%	2
		Market certainties (e.g. subsidies)	25%	1
				N=4
I-F	One of NY Green Bank's key goals is to close gaps in financing availability for clean energy and energy efficiency projects in New York. What are your suggestions for what is most needed to close financing gaps for clean energy and energy efficiency?	Increase risk tolerance	21%	3
		Increase outreach	7%	1
		Improve borrowing costs	14%	2
		Streamline processes and turnaround time	21%	3
		Transparency / knowledge sharing[78]	14%	2
		Develop new financial instruments	36%	5
				N=14
I-D **C-D**	One of NY Green Bank's key goals is to close gaps in financing availability for clean energy projects in New York. What suggestions do you have to close financing gaps for clean energy?	Increase risk tolerance	26%	9
		Increase outreach	11%	4
		Improve borrowing costs	20%	7
		Streamline processes and turnaround time	23%	8
		Transparency / knowledge sharing	6%	2

[78] One developer speculated that Value Stack programs can be difficult for financiers to evaluate, so NY Green Bank could share its underwriting and credit approval criteria for such projects as a way to educate other lenders.

		Develop new financial instruments	23%	8
				N=35
S-F	Which statement best describes your organization's plans to change the activity or level of investment in clean energy and energy efficiency? [Asked of respondents already involved in clean energy investments.] *Also used to assess Indicator 2.	Plan to increase the activity or level of investment in clean energy and energy efficiency in the future	100%	20
		Plan to keep the activity or level of investment in clean energy and energy efficiency the same in the future	0%	0
		Decrease the activity or level of investment in clean energy and energy efficiency in the future	0%	0
		I am not sure of the activity of level of investment in the future	0%	0
				N=20
S-F	To what extent do you agree or disagree with the following statements about clean energy and energy efficiency investments? [Asked of respondents not involved in clean energy investments.] *Also used to assess Indicator 2.	The investment market for clean energy is not mature or developed enough for us to get involved yet	0%	0
		The risk in these investments is higher than the risk in our typical investments	40%	2
		The return from these investments is lower than the return from our typical investments	60%	3
		The market is too small for us to get involved	20%	1
		We do not follow clean energy and energy efficiency closely enough to evaluate opportunities	40%	2
				N=5

C-F	[When you offer clean energy investments,] how flexible or customized to the project does that tend to be?	Fairly flexible and customized	75%	3
		Fairly consistent	0%	0
		Varies	25%	1
				N=4
C-F	Please tell me a bit more about what NY Green Bank activities you see in the market.	Investment in emerging assets, where financing barriers deter other investors due to transaction costs (small ticket size and transaction complexities)	100%	2
		Investment during the pre-development phase, supporting developers become more ambitious and designing greener projects	50%	1
		Not adequately investing in disadvantaged communities	50%	1
		Not adequately meeting financing needs by offering senior debt at market rates, thereby assuming minimal risk[79]	50%	1
				N=2
C-D	Please tell me a bit more about what NY Green Bank activities you see in the market	Financing process slower than the private sector	17%	1
		None	83%	5
				N=6

[79] One financier expressed that NY Green Bank's technical support is somewhat superfluous, as both the City and State of New York already offer technical assistance. To catalyze significant private investment, the financier felt that NY Green Bank should instead offer subordinate debt instruments, patient and long-term capital, and below-market rates/concessional loans. To date, NY Green Bank's main investment strategy has been to offer risk-adjusted terms and market rates to demonstrate developers are able to carry the commercial cost of debt, with the aim of facilitating access to additional private capital, while preserving its capital base and generating returns.

S-F	Do you think their activities are having any effects on private market activity in clean energy project financing?	Yes[80]	100%	4
		No	0%	0
				N=4
S-F	Have you seen any new approaches from NY Green Bank specifically—or in the industry generally—on ways of qualifying or securing investments that are a better fit for clean energy than the typical industry tools?	Securitization	50%	1
		Pre-development financing	50%	1
				N=2
Indicator 4: Change in the volume of transactions in specific clean energy markets				
S-F	Which statement best describes your organization's plans to change the activity or level of investment in clean energy and energy efficiency? [Asked of respondents already involved in clean energy investments.][81]	Plan to increase the activity or level of investment in clean energy and energy efficiency in the future	100%	20
		Plan to keep the activity or level of investment in clean energy and energy efficiency the same in the future	0%	0
		Decrease the activity or level of investment in clean energy and energy efficiency in the future	0%	0
		I am not sure of the activity of level of investment in the future	0%	0
				N=20
S-D	Please indicate how involved your organization is in each of the clean energy areas listed below.			
	Residential customer-sited solar installations	Core part of our work	9%	4

[80] One financier remarked that NY Green Bank's additionality may be minimal on projects with multiple investors, rather than on projects where they are the sole lender. At the same time, NY Green Bank intentionally aims to leverage private co-financiers in many of its transactions.
[81] Also included under Metric 3.

		A component of some of our work	21%	9
		Never/rarely get involved	70%	30
				N=43
	Community solar installations	Core part of our work	14%	6
		A component of some of our work	32%	14
		Never/rarely get involved	55%	24
				N=44
	Residential building decarbonization and energy efficiency upgrades	Core part of our work	20%	9
		A component of some of our work	18%	8
		Never/rarely get involved	61%	27
				N=44
	Commercial building decarbonization and energy efficiency upgrades	Core part of our work	20%	9
		A component of some of our work	11%	5
		Never/rarely get involved	68%	30
				N=44
	Sustainable transportation technology and infrastructure	Core part of our work	16%	7
		A component of some of our work	32%	14
		Never/rarely get involved	52%	23
				N=44
Indicator 5: Change in the mix of financiers investing in clean energy projects				
S-F	Firm's role (among investors only)	Angel/venture investor	0%	0
		Equity investor	30%	9
		Small-scale debt investor	30%	9
		Large-scale debt investor	20%	6

		Other and advisors	20%	6
				N=30
C-F	When you offer clean energy investments, what positions do you tend to take within the capital stack?	Mainly debt	75%	3
		Mainly equity	25%	1
				N=4
S-D	Roughly, what is the distribution of your funding sources for clean energy work (by share of $ volume) in a typical year? For example, if half of your funding is self-funded and the other half is client-funded, you would enter 50 in each of those categories.	Self-funded	26%	
		Client-funded	27%	
		Debt financing	20%	
		Third party equity	22%	
		Other	5%	
				N=40
Indicator 6: Emergence of secondary markets for clean energy assets				
S-F **C-F**	Are you aware of secondary markets to which you can sell your investments in clean energy and energy efficiency?	Yes	68%	15
		No	32%	7
				N=22
Indicator 7: Change in the number of transactions benefitting disadvantaged communities (DACs) members				
C-F	NY Green Bank has policy goals related to the share of their investments that benefit disadvantaged communities. I am curious whether diversity of investment recipients is something you have goals around or that you track, and to what extent?	We have goals to support DACs.[82]	50%	1
		Our goals do not explicitly support DACs, but we finance projects in DACs as much as possible.	50%	1
		We are not aware of our impact on DACs.	0%	0
				N=2

[82] One financier noted that they use a social scorecard when evaluating investment opportunities.

C-D	NYGB has policy goals related to the share of their investments that benefit disadvantaged communities. I am curious whether serving disadvantaged communities is something you have goals around or that you track, and to what extent	We have goals and/or track our impact on DACs.	100%	6
		We are not aware of our impact on DACs.	0%	0
				N=6

Appendix D: Case Studies

Solar Case Studies

Community Distributed Generation (Community Solar)

NY Green Bank has played an instrumental role in accelerating the deployment of capital in the community solar market in New York.

In 2015, the New York Public Service Commission (PSC) established the Community Distributed Generation (CDG) program, a community solar program designed to provide customers with shared access to power from a local solar generation facility. In 2017, the PSC also introduced the Value of Distributed Energy Resources (Value Stack) mechanism as an improvement over net metering, by compensating energy generated by Distributed Energy Resources (DER) in a way that better reflects its true value. Within this system, credit value is determined by the timing and source of electricity provided to the grid **(Figure 26)**.

Figure 25: Elements influencing the Value Stack compensation mechanism

Community solar projects allow New York residents to access solar energy from this infrastructure by purchasing solar credits. In doing so, participating residents benefit from net energy bill reductions, which vary according to the solar value stack credit each month. As a result, community solar provides an opportunity for residents who have limited capacity or resources to install solar systems on their own property to access to clean, low-cost energy.

Private sector lenders were initially reluctant to invest in the community solar market, particularly after the introduction of the Value Stack mechanism in New York, due to the perceived risk and uncertainty associated with a new business model. To help mobilize private sector investment, NY Green Bank completed its first transaction shortly after the introduction of the Value Stack. As an early mover in this market, NY Green Bank helped build market confidence to unlock and accelerate private sector investment in New York's community solar infrastructure. Today, New York has become the top community solar market in the country, with more than one gigawatt of community solar installed and operational.[83]

In terms of impact, NY Green Bank has committed $855 million to solar projects to date, of which $161 million has been allocated to community solar plus storage projects.[84] This has generated up to 1,425 MW of distributed solar capacity in the State.

[83] NYSERDA. (2022). Governor Hochul Announces New York as Top Community Solar Market in the United States. https://www.nyserda.ny.gov/About/Newsroom/2022-Announcements/2022-03-22-Governor-Hochul-Announces-NY-as-Top-Community-Solar-Market-in-the-US

[84] NY Green Bank. (2022). NY Green Bank Impact Report. For the Fiscal Year Ended March 31, 2022.

SPOTLIGHT 1: DELAWARE RIVER SOLAR

From the market perspective, the Value Stack system was initially perceived as a large departure from the simple, volumetric net-metering mechanism that was formerly in place. The Value Stack model was not only new, but relatively complex, resulting in a variable revenue structure and uncontracted cashflows. This created significant uncertainty over the value that community solar systems would generate over time, increasing the perceived risk for lenders. Further, to create a new interconnection to the grid, developers are required to make a deposit worth 25% of the cost estimate, followed by full payment 120 business days later.

Faced with these financial pressures, combined with the perceived risks associated with the Value Stack mechanism and a fairly novel community solar market, Delaware River Solar had difficulty securing construction financing for some of their projects. Alleviating this financing gap, NY Green Bank closed three separate transactions with them in 2018, totaling $87 million and resulting in up to 70 MW of distributed solar capacity.

THE NUMBERS

In 2018, NY Green Bank committed $87 million to Delaware River Solar through three, complimentary loan facilities:

- A construction loan, without a personal guarantee, of $25 million, used to finance the construction of up to 70 MW of community solar projects.
- A bridge loan of up to $7 million, used to fund 90% of the required interconnection upgrades.
- A term loan of $55 million to finance community solar projects. This transaction was the first time a short-term contract and floating rates were utilized to support community solar.

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated clean energy generated (MWh)	1,648,300	2,060,400	65,930	82,410
Estimated clean energy generation installed capacity (MW)	56.0	70.0	Not Applicable	
Estimated GHG emission reductions (metric tons)	867,100	1,083,900	34,680	43,360

MARKET TRANSFORMATION

NY Green Bank helped de-risk the community solar market in New York: In 2017, the Value Stack mechanism was introduced in New York when the community solar market was still relatively novel. There were few financing precedents, which would have established a performance history and helped address the uncertainties surrounding these projects to incentivize private sector investments. NY Green Bank's investment helped de-risk community solar projects by generating historical performance data to demonstrate the value and competitiveness of these investments, while creating financing structures that could be replicated by future investors to facilitate future transactions.

NY Green Bank invested in projects that benefit members of DACs: On-site solar is not always a feasible option for residents and businesses. For instance, there are a variety of factors that can deter or prevent New Yorkers from installing rooftop solar PV, including personal or family finances, siting requirements, property ownership, and consumer preferences. Community solar projects, like the one led by Delaware River Solar, can increase access to clean, low-cost energy for any New York resident with an electric utility account. Access to community solar can also reduce the energy burden, improve housing affordability and advance equity goals within the clean energy transition through its inclusivity.

SPOTLIGHT 2: CONVERGENT ENERGY + POWER

Convergent was an early adopter of solar plus storage technologies in New York, facing similar financing challenges to Delaware River Solar. The relative novelty of the technology, alongside the perceived risks associated with the Value Stack mechanism, made it challenging for Convergent to secure adequate financing to complete their planned project.

In 2021, NY Green Bank provided construction-to-term financing to Convergent to support the development, ownership, and operation of three solar plus storage projects in New York, helping establish a track record for local solar plus energy projects. In demonstrating the viability of their business model, NY Green Bank helped signal to the market that solar plus storage projects are bankable. NY Green Bank also supported innovation in this market, as one of the three projects built included the first energy plus storage system providing non-wires-alternative (NWA), a technology that promises to deliver more cost-effective, reliable and sustainable electricity.[85]

The Numbers

In April 2021, NY Green Bank committed $110 million to a construction-to-term loan facility to finance three DER solar plus storage projects in New York.

[85] Convergent Energy + Power Partners with National Grid. https://www.convergentep.com/nationalgrid/

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated clean energy generated (MWh)	1,556,560	1,729,511	62,262	69,180
Estimated clean energy generation installed capacity (MW)	56.50	56.50	Not Applicable	
Estimated GHG emission reductions (metric tons)	778,633	865,148	31,145	34,606

Market Transformation

NY Green Bank helped de-risk a novel technology: When Convergent began its operations, solar plus storage projects relied on a novel technology that presented large uncertainties in the market, resulting in high perceived risk. As an early mover supporting this market, NY Green Bank has helped address financing gaps to increase capital investment in solar plus storage projects. The three installed projects will also set a track record for solar plus storage systems, which is expected to help expand this market and crowd in private investors.

SPOTLIGHT 3: BQ ENERGY

BQ was one of the first to develop clean energy projects on brownfields and landfills, as these lands are uniquely suited for renewables given that there are few possible alternative site uses without costly and extensive site remediation. Today, BQ has a total of thirteen fully operational solar projects and six additional projects under construction or development in New York.

Prior to working with NY Green Bank, BQ had difficulty securing financing for its small-scale solar projects less than 10 MW in size. The company also lacked a credit history, as they had a long-term contract to access financing from an institution that did not have a credit rating, which contributed to the transaction risk perceived by financiers.

In 2016, NY Green Bank completed its first transaction with BQ, accepting the higher technological and credit risks. NY Green Bank thus provided a $1.5 million construction and takeout loan to support BQ's Pattersun solar landfill project. Through this transaction, NY Green Bank developed a transaction structure that may enable other unrated financial institutions to participate in clean energy projects in the future.

In 2020, NY Green Bank also financed BQ's 550 kW Mt. Kisco community distributed generation project with combined solar plus storage. As with the Delaware River Solar and Convergent case studies, New York's new Value Stack mechanism deterred many financiers from investing in this market at the time. While the Pattersun project preceded the introduction of this system and offered

a fixed price contract, the Mt. Kisco project could not offer a guaranteed rate. Many lenders were uncomfortable with the potential volatility of the revenue stream of the Value Stack, which was made evident when BQ approached several financial institutions and was unable to access the financing they needed.

"Mt. Kisco was not a difficult project; however, even two years ago, no banks would touch it. We would not have been able to build half the projects we have if not for the NY Green Bank." - *Paul Curran, Chief Executive Officer (2022)*

The Numbers

Between 2016 and 2021, NY Green Bank committed over $55 million to five solar projects and one solar plus storage project in addition to two corporate investments, to BQ Energy.

Pattersun:

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated clean energy generated (MWh)	36,300	44,400	1,450	1,780
Estimated clean energy generation installed capacity (MW)	1.37	1.37	Not Applicable	
Estimated GHG emission reductions (metric tons)	19,100	23,400	765	935

Mt. Kisco:

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated clean energy generated (MWh)	15,948	20,036	638	801
Estimated clean energy generation installed capacity (MW)	0.55	0.55	Not Applicable	
Estimated GHG emission reductions (metric tons)	7,977	10,023	319	401

List of all NY Green Bank – BQ collaborations:

Project	Financing	Closing date
BQ Energy - Pattersun	$1.5 MM	July 2015
BQ Energy - Esopus	$1.1 MM	March 2017
BQ Energy - Beacon	$3.1 MM	November 2017
BQ Energy - Homeridae LLC	$4.9 MM	June 2018
BQ Energy - Steel Sun 2	$12.5 MM	October 2018
BQ Energy - Corporate	$10.0 MM	December 2019
BQ Energy - Mt. Kisco	$2.3 MM	April 2020
BQ Energy - Corporate Upsize	$20.0 MM	June 2021

Market Transformation

NY Green Bank promoted standardization, as these two case studies form part of a larger portfolio of similar projects led by BQ. Through their involvement, NY Green Bank helped BQ follow a streamlined, uniform approach to developing contracts, contractors, and equipment, thereby increasing underwriting efficiency and reducing overall transaction costs.

SPOTLIGHT 4: CSG PV I LLC (A JOINT VENTURE OF NEXTENERGY CAPITAL AND ENERGY IMPACT PARTNERS)

CSG PV I ("CSG") is a New York-based solar energy company with a focus on providing affordable renewable energy and economic development to Upstate communities.

In June 2021, NY Green Bank entered into a financing agreement with CSG to support the deployment of up to 12.5 MW of community distributed PV solar generation in New York, with an expectation to support the deployment of another 36.9 MW of community solar projects within a year. Aspen Power, a solar developer hired by CSG to manage their development profile, helped arrange this transaction, while leveraging their experience to rapidly grow the portfolio.

NY Green Bank's enhanced risk tolerance and knowledge of both distributed solar and the local context poised them to fill the existing financing gap for this portfolio and complete the transactions efficiently. Without their involvement, CSG would likely not have been able to undertake such a large transaction, as few other financiers were willing to underwrite this deal at the time. Importantly, NY Green Bank is also mission-aligned with CSG, as both parties are committed to creating a strong positive impact in DACs and bridging the clean energy gap for low-income households. The shared understanding of this population base allowed NY Green Bank to judiciously assess the risk-return profile of the project.

By supporting CSG's portfolio of community solar infrastructure across the State, NY Green Bank helped signal the financial viability and competitive risk-return profiles of community solar business models.

The Numbers

In 2021, NY Green Bank committed $14.9 million to a construction-to-term loan to support the deployment of up to 12.5 MW of community solar projects in New York.

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated clean energy generated (MWh)	220,723	366,389	8,829	14,656
Estimated clean energy generation installed capacity (MW)	7.5	12.5	Not Applicable	
Estimated GHG emission reductions (metric tons)	110,411	183,278	4,416	7,331

Market Transformation

NY Green Bank helped crowd in private investment in community solar. Since NY Green Bank's initial capital investment into CSG, Aspen Power has continued to deploy community solar projects across New York. As a result of its strong financial performance, other lenders and investors beyond NY Green Bank are now more comfortable investing in the firm's community solar projects.

NY Green Bank helped signal the bankability of community solar projects serving DACs. NY Green Bank's investment in a community solar portfolio that is accessible to low-income households is expected to help demonstrate the performance and business case for these types of projects. Supporting the expansion of the market serving these population groups is critical given the size of the opportunity and the impact on achieving New York's targets intended to promote an equitable energy transition.

SPOTLIGHT 5: GENERATE CAPITAL

NY Green Bank provided a total of $83.9 million to Generate Capital ("Generate") in back-leveraged credit facilities in 2020 and 2021 to support the acquisition of community solar and solar plus storage projects in New York, representing 136.8 MW of solar generation. The transaction was supported by 38 Degrees North, a private investment firm specializing in renewable energy infrastructure. While 38 Degrees North does not hold any ownership interest in the projects, they receive a payment from Generate for their origination and structuring work.

At the time of the transaction, many financiers were hesitant to invest in the community solar market and unfamiliar with the associated risk-return profiles given the complexity, restrictive regulations and volatile cashflow associated with community solar projects. NY Green Bank brought their expertise and experience to address these financing barriers and support a transaction of this scale. Having established a track record for these projects, 38 Degrees North has since reported better access to new sources of capital.

The Numbers

In April 2020, NY Green Bank provided $26.9 million in back-leveraged credit facilities to support Generate's acquisition of 14 community solar projects in New York. In June 2021, NY Green Bank provided an additional $57 million to finance the acquisition of 20 additional community distributed generation solar and solar-plus-storage projects in New York State.

The estimated gross lifetime impacts of these term loans from April 2020 and June 2021 are:

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated clean energy generated (MWh)	412,361	434,064	16,494	17,363
Estimated clean energy generation installed capacity (MW)	15	15	Not Applicable	
Estimated GHG emission reductions (metric tons)	217,170	206,311	8,252	8,687

Market Transformation

NY Green Bank helped mobilize and crowd in private sector investment in community solar. Through this transaction, NY Green Bank contributed to lowering the perceived investment risk in community solar by establishing a performance history. In supporting the emergence of more financing opportunities for developers, this case study suggests that NY Green Bank has helped lower the cost of capital, helping to accelerate the deployment of solar projects in New York.

SPOTLIGHT 6: EDEN RENEWABLES

Eden Renewables LLC (Eden) is an international renewable energy and energy storage developer with operations in the United Kingdom, United States and sub-Saharan Africa. In the U.S., Eden currently has a pipeline portfolio of 19 community solar farms, all of which are in New York.

For Eden's first New York transaction in 2019, NY Green Bank provided a $2.5 million bridge loan facility to finance the community solar project deposits for interconnection to the electricity grid. As part of the State's requirements for interconnecting PV systems to the grid, developers are required to provide substantial deposits during the application process. NY Green Bank's bridge loan facility thus helped Eden overcome this short-term financing gap.

Bridge loans for this purpose meet a current market need and are expected to attract more competitive financing from other lenders over time. Financing for interconnection deposits also

allow project sponsors to make better use of their equity, freeing up developer capital to deploy in new community solar projects.

The Numbers

In November 2019, NY Green Bank provided a 24-month senior-secured bridge loan facility of $2.5 million to Eden Renewables. In March 2020, the value of the bridge loan was increased to $4.3 million. In August 2020, NY Green Bank further increased the bridge loan to a total value of $6.3 million. Several months later, in December 2020, a third increase in the value of the bridge loan was provided, bringing the value of the facility to $7.7 million. Finally, in July 2021, there was a fourth increase to the bridge loan, bringing the final value of the facility to $9.2 million.

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated clean energy generated (MWh)	1,304,802	2,528,706	52,192	101,148
Estimated clean energy generation installed capacity (MW)	45	87	Not Applicable	
Estimated GHG emission reductions (metric tons)	652,697	1,264,926	26,108	50,597

Market Transformation

NY Green Bank is signalling new market opportunities. NY Green Bank's bridge loan for interconnection deposits helped fill a financing gap not currently met by most other lenders. By demonstrating the demand for this financing, and the associated risk-return profiles, NY Green Bank expects other lenders will begin to offer similar financial instruments to support developers.

Portfolio Monetization Case Study

NY Green Bank finalized a $314 million portfolio monetization with Bank of America in August 2021, helping to enhance its liquidity and ensure adequate capital remained available. This type of transaction is a first for NY Green Bank and the largest for any U.S. green bank. This transaction has allowed NY Green Bank to use the proceeds to continue delivering on its mission by making additional capital available, without requiring further public investment.

SPOTLIGHT: BANK OF AMERICA

By early 2020, NY Green Bank had committed a large portion of its capital, creating a need for additional liquidity. It turned to the private sector to identify financiers that would be interested in purchasing a portfolio of its performing loans. Through this process, NY Green Bank selected Bank of America, the second largest bank in the world, with an ambitious target to achieve $1.5 trillion in sustainable financing by 2030. The Bank of America's latest report reveals that they mobilized and deployed approximately $250 billion in 2021 toward this goal, including more than $155 billion towards the environmental transition.[86]

Normally, Bank of America would underwrite each loan within the portfolio to reduce their risk exposure. However, NY Green Bank was able to address their underwriting requirements through a third-party endorsement of their own process, which served to validate the underlying credit value of NY Green Bank's portfolio. This allowed Bank of America to evaluate the investment opportunity through its aggregate cashflow, rather than each individual loan product, which contributed to the success of the transaction.

Based on the transaction structure **(Figure 27)**, a Trust was created to buy NY Green Bank's loans using a senior loan provided by Bank of America and backed by a receivables purchase agreement between NY Green Bank and the Trust. This allowed Bank of America's financing to be secured by the receivables of the underlying loans, rather than the loans themselves, and to increase their sustainable investment portfolio. It also provided NY Green Bank with an upfront purchase payment that represented a percentage of the full value of the portfolio. As a result, NY Green Bank removed itself of the debt obligations associated with the loans included in the transaction portfolio, enabling them to finance new projects without needing additional debt capital. At the same time, NY Green Bank is the servicer of the loans on behalf of Bank of America, which allows NY Green Bank to remain involved in the portfolio.

> **"The beauty of this transaction is that the NY Green Bank got their money, but they are not the obligator on the loans."** - Joseph Branca, Managing Director, Bank of America

In addition, the novelty of this agreement for Bank of America enhanced awareness of these types of financial products amongst risk officers and underwriters in the commercial bank.

The Numbers

The structure of the transaction allowed Bank of America to evaluate the aggregate cashflow derived from the portfolio's underlying loans, rather than each loan individually. This approach enabled NY Green Bank to successfully leverage an additional $314 million by selling off a portfolio of nineteen of its performing loans to one of the world's leading financial institutions.

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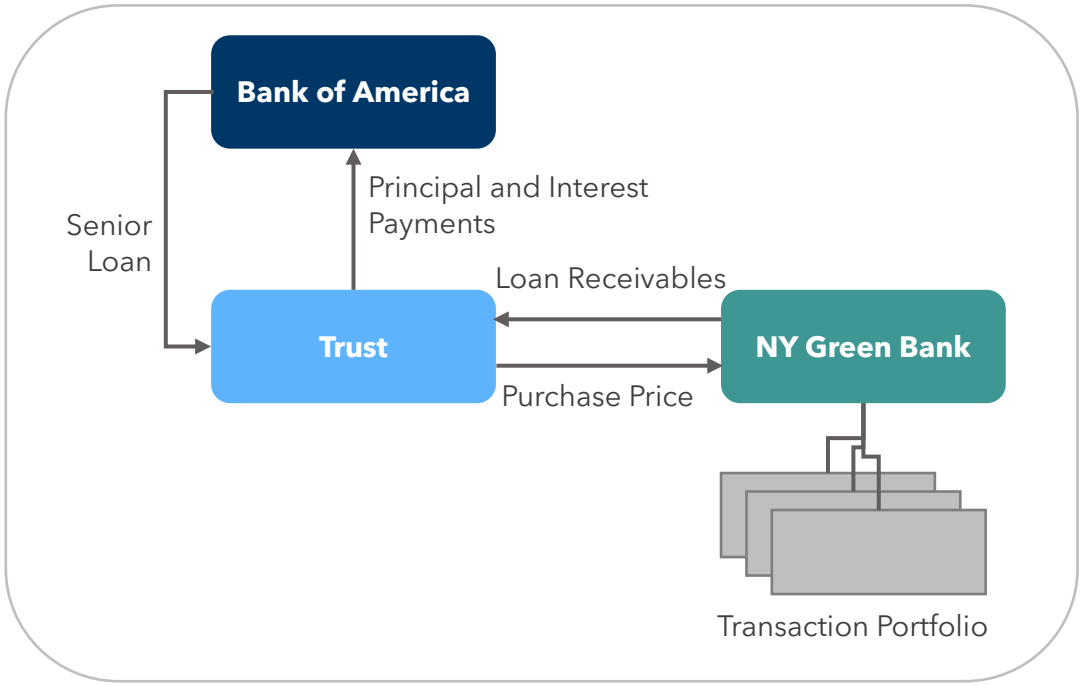
[86] Bank of America. (2022). Task Force on Climate-related Financial Disclosures (TCFD) Report. https://about.bankofamerica.com/content/dam/about/pdfs/BANK OF AMERICA_TCFD_2022%209-22-2022-VOX220929%20split%20paragraph%20Secured.pdf

Figure 26: NY Green Bank and Bank of America Transaction Structure



Market Transformation

NY Green Bank created an investment precedent for highly regulated financiers. To address risk exposure, NY Green Bank's underwriting process was validated both by an external rating agency and by its ability to finalize the transaction. This approach brought down the transaction costs that would have otherwise been incurred to underwrite each of the underlying loans.

NY Green Bank set a leadership tone in this space. Through this portfolio monetization with one of the largest banks in the world, NY Green Bank helped build market confidence in the clean energy sector by demonstrating strong risk-adjusted returns.

Energy Efficiency Case Studies

NY Green Bank has financed businesses designed to support energy efficiency projects in the residential, commercial and industrial sectors. With the autonomy and flexibility to respond to emerging needs within the market, NY Green Bank was able to address financing gaps and barriers by working closely with Sealed, Ecosave, NYCEEC and Red Rochester to develop innovative solutions and invest in impactful projects.

SPOTLIGHT 1: SEALED

Sealed is a New York-based company that offers a repayment for home energy upgrades and electrification based on the energy reductions achieved. Initially, Sealed's financing model created savings through an indirect arrangement, whereby customers paid Sealed a shadow bill that was a few percentage points lower than their pre-upgrade energy costs, which were estimated based on historical energy consumption data. Sealed was then responsible for paying the utility. While the savings appealed to many households, customers were required to cover the upfront costs, which acted as a barrier to program uptake and Sealed's ability to expand their operations. Sealed therefore sought additional capital to shift their business model to one capable of covering the upfront costs of energy upgrades, in addition to providing savings.

Sealed's innovative approach helped expand its reach and impact across New York, with hundreds of participating households. Unlike traditional energy savings models that offer a single financing option to all program participants, and which place performance risk on the homeowner, Sealed's pay-as-you-save model assumes all the performance risk as homeowners' payments are based on their utility bill savings.

While the model is appealing to homeowners, it can be more administratively heavy and costly to manage, as contract terms need to be negotiated on a case-by-case basis. Until recently, this kind of model had a proven track record in the commercial sector where the energy savings potential of individual buildings is more substantial and cost effective. NY Green Bank's investment in this program thus allowed Sealed to adapt an existing model to meet their customer needs in the residential sector.

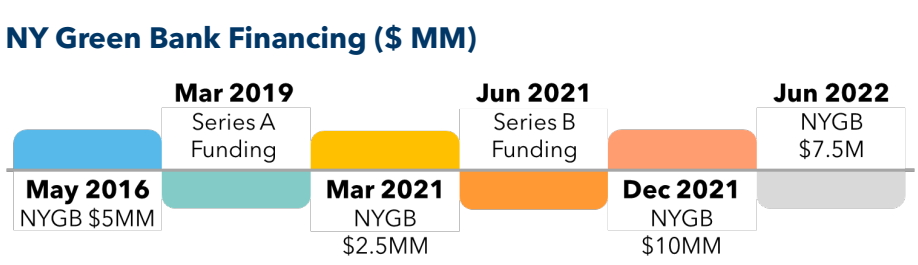
> **"NY Green Bank was willing to take product risk in a way others were not."** - *Andy Frank, Founder and President, Sealed*

By considering Sealed's business model and mission, the benefits to New Yorkers, and its contributions to emissions reduction targets, NY Green Bank worked with Sealed to develop a financial solution allowing them to adapt and expand their operations. The initial loan was structured as a $5 million senior secured revolving credit facility, subject to a borrowing base, and secured by cashflows from energy efficiency savings payments due under Sealed's customer agreements. The transaction also enabled Sealed to leverage its balance sheet capital to finance customer projects, as it adopted a more efficient operating model.

The Numbers

In 2016, NY Green Bank provided $5 million though an asset-backed revolving credit facility. It has since increased that amount to a total of $25 million through three additional capital commitments **(Figure 28)**. These transactions have allowed Sealed to complete energy efficiency upgrades in more than 1,205 homes in New York as of September 2022.

Figure 27. Sealed funding rounds 2016 – present



Project Impacts

4,360 MWh in estimated electricity savings

479,000 MMBTU in estimated energy savings from fuel efficiency measures

34,200 metric tons in estimated GHG abatement

Market Transformation

NY Green Bank's support contributed to efforts to make home energy upgrades more affordable and accessible. High upfront costs and limited access to financing are common barriers to home energy efficiency upgrades. With the support of NY Green Bank, Sealed was able to overcome this barrier by offering an innovative financial product allowing homeowners to access financing that is repaid over time with guaranteed savings.

NY Green Bank set a precedent for residential energy efficiency financing. NY Green Bank helped demonstrate the viability of small-scale energy efficiency projects in the residential sector. Other developers can adopt similar approaches to expand their operations, while creating opportunities to aggregate projects into a larger portfolio in order to reach the scale needed to attract a broader range of financiers.

SPOTLIGHT 2: ECOSAVE

Ecosave is a Philadelphia-based company that offers Energy Service Agreements (ESAs) and Energy Performance Contracts (EPCs) to deliver performance-based savings at no upfront cost to organizations. During its first few years of operation, Ecosave relied on Community Development Financial Institutions (CDFIs) to finance their pipeline of projects on a case-by-case basis. The high level of customization required significant time and resources to execute, resulting in high transaction costs per project. Although this approach allowed Ecosave to demonstrate the viability of the company's concept, CDFI financing was not well suited to support the company's growth. However, in trying to access other sources of capital, Ecosave ran up against two main challenges that disincentivized private sector investment:

- Due diligence burdens and high transaction costs associated with small-scale projects.
- Knowledge gaps given that there were relatively few commercial and industrial energy efficiency projects in New York at the time.

NY Green Bank provided financing to Ecosave that allowed them to scale up their portfolio of projects, while establishing a performance history for middle-market, unrated customers. The initial loan was structured as a $15 million multi-draw term loan, supported by receivables from energy efficiency savings under ESAs and EPCs. The deal was designed to allow small commercial projects to be aggregated into larger facilities to help Ecosave appeal to private sector investors, many of which are drawn to mid- to large-scale investment opportunities. When compared to CDFI financing, NY Green Bank's deal offered more competitive terms and did not impose any restrictions on the type of clients the financing could support. Working with NY Green Bank also improved Ecosave's credibility in the market, as they were endorsed by a State-sponsored financial entity.

"Without NY Green Bank, we might not have been able to scale."
- Marcelo Rouco, CEO and Founder, Ecosave

The Numbers

In 2019, NY Green Bank provided a $15 million credit facility to Ecosave, that was expanded by an additional $15 million in 2020, to finance energy efficiency and distributed energy resources projects. As of August 2022, Ecosave has used NY Green's Bank credit facility to implement $26 million in EPCs and ESAs in New York.

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated electricity savings (MWh)	158,471	198,089	10,565	13,206
Estimated fuel savings (MMBtu)	486,108	607,635	32,407	40,509
Estimated GHG emission reductions (metric tons)	105,114	131,393	7,008	8,760

Market Transformation

Financing market segments with limited access to capital: Through this transaction, NY Green Bank produced a scalable financing model, which established performance history for medium-sized, unrated commercial and institutional customers, a market segment that has historically had difficulty accessing capital.

Increased opportunities for commercial EE projects in New York: NY Green Bank's participation facilitates the aggregation of small commercial energy efficiency projects into larger portfolios that can be refinanced on secondary markets to attract a larger number of financial market participants, while stimulating more commercial and industrial energy efficiency projects in New York.

SPOTLIGHT 3: NYCEEC

Third party capital can be difficult to secure for affordable housing developers during the pre-development phase of construction projects. Seed capital is typically needed to advance project planning and design work and to secure additional funds for construction and operations. In its absence, developers drawing on their own funds may be further discouraged from integrating innovative green design principles and practices due to the additional capital cost and complexity.

In August 2021, NY Green Bank entered into an agreement with the New York City Energy Efficiency Corporation (NYCEEC), along with three other entities (Hudson Companies, Calvert and St. Nick's), to provide two pre-development loan facilities aimed at facilitating the development of 310 affordable housing units and a 200-bed homeless shelter on the Greenpoint Hospital campus. The development teams designed both projects to achieve Passive House certification, a voluntary standard recognizing highly energy-efficient buildings with exceptional thermal performance, superior indoor air quality and minimal energy consumption. Through this investment, NY Green

Bank helped fill an important financing gap in the market by supporting a developer committed to designing high performance buildings.

As of 2023, the Greenpoint Hospital Campus projects are still under development and Loan B for the homeless shelter was paid off before maturity. [87]

The Numbers

In August 2021, NY Green Bank committed up to $2.5 million to participate in two pre-development loan facilities administered by NYCEEC.

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated fuel savings (MMBtu)	558,000	812,115	12,400	18,047
Estimated GHG emission reductions (metric tons)	29,610	43,110	658	958

Market Transformation

NY Green Bank co-financed projects benefiting DACs. The affordable housing and homeless shelter project co-funded by NY Green Bank have a direct and positive impact on DACs. The funding provided to NYCEEC for these projects not only showcases NY Green Bank's commitment to social impact, but also serves as an example to the affordable housing market that building energy performance and successful project development can go hand in hand, benefiting both communities and the environment.

NY Green Bank addressed a critical funding gap in the market by offering pre-development lending, supporting project developers pursuing more ambitious and sustainable building design standards. The provision of pre-development loan facilities addresses financing gaps and enables and incentivizes developers to focus on clean energy and sustainability.

[87] Davey, E. (2023). Former Greenpoint Hospital Space Turning into Mixed-use Affordable Housing Campus. Greenpointers. https://greenpointers.com/2023/01/05/former-greenpoint-hospital-space-turning-into-mixed-use-affordable-housing-campus/

SPOTLIGHT 4: RED ROCHESTER AND IRONCLAD ENERGY PARTNERS

Originally established in 1891 as a manufacturing site for Kodak, the Eastman Business Park (EBP) is a 1,200-acre business park that now serves over 70 industrial and commercial clients and is one of the largest district energy systems in the U.S. today. While initially powered with coal, NY Green Bank's co-investment in this fuel switching project, backed by Ironclad Energy Partners and its subsidiary Red Rochester, LLC, enabled EBP to transform the coal-fired power plant into a new natural gas-fired power plant with on-site cogeneration.

Coal is very emissions-intensive relative to other sources of electricity generation, releasing high concentrations of carbon dioxide and other pollutants into the atmosphere for every kilowatt-hour (kWh) of electricity produced. In comparison, gas cogeneration is a more energy-efficient process that simultaneously produces electricity and useful heat, resulting in higher overall efficiency and reduced greenhouse gas emissions. Also known as combined heat and power (CHP), cogeneration involves the simultaneous generation of electricity and useful heat from a single fuel source.

Through this transaction, NY Green Bank supported a unique opportunity to retrofit an existing coal plant into a much less emissions-intensive facility powered by natural gas. Additionally, the incorporation of on-site cogeneration technologies further enhanced the efficiency and environmental performance of EBP. As a result of this transaction, Red Rochester can power EBP at twice the efficiency of a typical public utility.

The Numbers

In December 2020, NY Green Bank provided $25 million as part of a larger $100 million credit facility extended to Red Rochester, LLC.

Energy & Environmental Impact	Lifetime Low Estimate	Lifetime High Estimate	Annual Low Estimate	Annual High Estimate
Estimated electricity savings (MWh)	171,295	180,310	11,420	12,021
Estimated fuel savings (MMBtu)	11,759,359	12,378,273	783,957	825,218
Estimated energy generation installed capacity (MW)	0.52	0.54	N/A	
Estimated GHG emission reductions (metric tons)	943.197	992,839	62,880	66,189

Market Transformation

NY Green Bank supported an industrial park's energy transition to significantly reduce its carbon footprint. NY Green Bank's investment in EBP's gas cogeneration project highlights a financially viable approach to investing in the adaptation of existing industrial energy systems to more sustainable technologies.

Appendix E: Survey

Developer Survey

Your role in the industry

A1. Which of the following best describes your organization's role in clean energy projects and developments? [Programming note: Shown in groups that I suggest we maintain in the online programming of the response options, if feasible.]

Real estate	*Clean energy / energy efficiency*	*Other*
1) Real estate / property developer	5) Clean energy project developer	8) Design professional (architect / engineer)
2) General builder	6) Energy efficiency installer	9) Consultant / advisor
3) Remodeler	7) Clean energy / efficiency advocate	10) Investor
4) Property owner / manager		11) Other – please describe: _____

A2**. What is your main role at your organization?**

1) Owner / Executive / leadership
2) Project leader / manager
3) Technical professional
4) Financial professional
6) Legal professional
7) Business development / sales
8) Communications
9) Other – please describe: _____ [force response if chosen]

Clean energy involvement

B1. Please indicate how involved your company is in each of the clean energy areas listed below.

Clean Energy Area	(1) Core part of our work	(2) A component of some of our work	(3) Never / rarely get involved
a) Residential customer-sited solar installations			
b) Community solar installations			
c) Residential building decarbonization and			

energy efficiency upgrades			
d) Commercial building decarbonization and energy efficiency upgrades			
e) Sustainable transportation technology and infrastructure			

[Code Involvement dependent on answer to B1. Involvement = 1 if any sub-answer to B1 is 1 or 2. Otherwise, Involvement = 0.]

B2. Does your organization develop or implement other kinds of clean energy projects not already listed?

1) yes
2) no
3) don't know

B3. [IF B2= 1] Since you responded that your organization works in other areas of clean energy or energy efficiency, please describe the other areas. [text box]

B4. If you make this information public, what is the approximate value of your development, building, or remodeling projects in a typical year?

$_____

If this information is not public, please skip this question by clicking the right arrow below.

B5. What share of your total project work is clean energy development, including energy efficiency upgrades? *(Please indicate as your share of your total $ volume of project work.)*

_____ %

B6. Roughly, what is the distribution of your funding sources for clean energy work (by share of $ volume)? If you do not know, please skip this question by clicking the right arrow below.

self-funded: _____ %
client-funded: _____ %
loans: _____ %
third-party equity funded: _____ %
other: _____ %

Project Funding Experiences and Trends

[IF Involvement = 1, show this section]

C1. These next questions are about ***your experiences*** with clean energy projects ***in the past three years***. During the past three years, what changes, if any, have you noticed in the following?

Hover over each characteristic with your cursor for examples, if needed.

Characteristic	Decreased / worsened	Held steady	Increased / improved
Degree of technical opportunity for clean energy			
Degree of market demand for clean energy			
Ability to obtain financing or funding for clean energy projects			
Attractiveness of financing terms for clean energy projects			
Parity of financing terms for clean energy			
Number of clean energy projects you finance with NY Green Bank involvement			
Number of clean energy projects you finance without NY Green Bank involvement			

Programming / Reviewer Note: The table above will offer the following text as hover boxes for respondents wishing to see more information about any of the characteristics.

Characteristic	Hover box text
Degree of technical opportunity for clean energy	By technical opportunity, we mean available sites, structures, technology, etc.
Degree of market demand for clean energy	By market demand, we mean interest in your clean energy offerings.

Ability to obtain financing or funding for clean energy projects	Here, we are interested in whether your ability to obtain financing for clean energy has changed.
Attractiveness of financing terms for clean energy projects	Here, we are interested in how the terms you get for clean energy projects have changed.
Parity of financing terms for clean energy	Here, we are interested to know whether you can get similar terms for clean energy financing as for other developments with similar financial risk.
Number of clean energy projects you finance with NY Green Bank involvement	Please indicate whether there has been any change in how many clean energy projects you develop with NY Green Bank financing.
Number of clean energy projects you finance without NY Green Bank involvement	Please indicate whether there has been any change in how many clean energy projects you develop without any NY Green Bank involvement.

C1b. (Optional) Please elaborate on any important issues or nuances related to your answer to the question above. [text box]

C2. Please indicate the extent to which the following statements describe your current experience with financing clean energy work.

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
We can find financing for clean energy projects when we need it.					
It takes more effort to get financing for clean energy work than other kinds of development projects.					
It seems to cost more to finance clean energy work than other projects with comparable risks.					
We have had otherwise viable projects scaled back in the past 12 months solely due to financing challenges.					

We have had otherwise viable projects canceled in the past 12 months solely due to financing availability or terms.					

Experience with New York Green Bank

[IF Involvement =1, show this section. Otherwise, begin with D3 but reword the beginning of that question for respondents who do not see D1-D2.]

D1. Next, we would like to ask about your organization's involvement with NY Green Bank. In about how many of your company's separate clean energy projects did NY Green Bank help finance? If none, please enter 0. [numeric box]

D2. [IF D1 > 0] Thinking about clean energy projects in which NY Green Bank was involved in financing, what impact did NY Green Bank have on those projects? Please explain in a sentence or two.[text box]

D3. Even if your organization has not been involved with NY Green Bank, have you seen NY Green Bank activities in the market?

1) yes

2) no

D4. [IF D3 = 1] What is the most meaningful NY Green Bank activity you have seen in the market other than direct financing of projects? Please tell us in a sentence or two. [text box]

D5. One of NY Green Bank's key goals is to close gaps in financing availability for clean energy projects in New York. What suggestions do you have to close financing gaps for clean energy? [text box]

D6. (If not already addressed in your suggestions above) What suggestions do you have to close financing gaps specifically for projects in disadvantaged communities? [text box]

[Programming note: Create hover box for disadvantaged communities that says: Disadvantaged communities is a reference to specific geographic areas whose residents are likely to be affected disproportionately by climate change as well as low-income New Yorkers regardless of location. New York State policy seeks to ensure equitable access to clean energy for disadvantaged communities, which includes access to financing for projects that serve these communities.]

Closing

E1. Please provide your name and email address below to be entered in the drawing and to receive an advance copy of the study report. *We will not use the personal information you enter below for any other purpose, and we will delete it from our dataset before conducting any survey analysis.*

Name: _____
Organization: _____
Email address: _____

Thank you. If you have any questions regarding this study, please contact the individuals listed below. The report for this study will be completed in August 2022 and will be available in Fall 2022.

If you would like to learn more about NYSERDA and NY Green Bank, please visit https://greenbank.ny.gov/[EMAIL]

Financier Survey

Your role in the industry

A1. Which of the following best describes your firm's role in the financing market?

1) Angel investor
2) Equity investor
3) Lender for custom projects
4) Lender for routine projects
5) Other – please describe: _____

A2. What is your role?

1) Owner / principle
2) Portfolio manager
3) Loan officer
4) Other – please describe: _____

A3. If you make this information public, how much in total investments does your firm currently manage?

$_____
__ Check here if you do not share this information

Clean energy investment areas

B1. We would like to know what clean energy areas (if any) investors like you participate in. Please indicate whether you or your organization has provided financing in the types of projects listed below in the past 12 months.

Clean Energy Area	(1) Have been personally involved	(2) My organization has financed	(3) Neither, but we might	(4) Neither and we are unlikely to
a) Residential customer-sited solar installations				
b) Community solar installations				
c) Residential building decarbonization and energy efficiency upgrades				
d) Commercial building decarbonization and energy efficiency upgrades				
e) Sustainable transportation technology and infrastructure				

[Programming instructions: Compute variable *Involvement* to show the number of clean energy areas in which the respondent or his/her organization has been involved (i.e., B1x = 1 or 2).]

B2. Does your company invest in other areas of clean energy not listed above?

1) yes Please describe: _____
2) no
8) don't know

No / low clean energy investments [Involvement = 0; do not show this header]

C1. To what extent do you agree or disagree with the following statements about clean energy investments?

Statement	(1) Strong disagree	(2) Disagree	(3) Agree	(4) Strongly agree
a) We do not follow clean energy closely enough to evaluate opportunities				
b) The investment market is not mature or developed enough for us to get involved yet				
c) The risk in these investments is too high				
d) The return from these investments is too low				
e) The market is too small for us to get involved				
f) I do not see this market growing in the near term				
g) I do not see this market growing in the long term				

C2. What would need to be different for you to increase your activity or level of investment in clean energy? [text box]

Single area investments [Involvement = 1; do not show this heading]

D1. Among the clean energy areas we listed, you indicated that your company invests only in [pipe in area of clean energy investment]. What share of your company's total investment volume falls in this area?

1) less than 1%
2) 1 to 10%
3) 11 to 50%
4) more than 50%

D2. What led to your company's involvement in this aspect of clean energy? [text box]

D3. What would need to be different for you to increase your activity or level of investment in clean energy? [text box]

Multiple areas of investments [Involvement > 1; do not show this heading]

E1. What share of your company's total investment volume goes to clean energy-related projects?

1) less than 1%
2) 1 to 10%
3) 11 to 50%
4) more than 50%

E2. How would you describe your relative volume of investment activity in each of these areas?

Clean Energy Area [show only areas cited in B1]	Approximate % of total clean energy investments
a) Residential customer-sited solar installations	
b) Community solar installations	
c) Residential building decarbonization and energy efficiency upgrades	
d) Commercial building decarbonization and energy efficiency upgrades	
e) Sustainable transportation technology and infrastructure	

E3. What would need to be different for you to increase your level of investment in these clean energy areas? [text box]

E4. Are there any other areas of clean energy you are looking into and might include in your portfolio in the future?

1. yes Please describe: _____
2. no

E5. What would need to be different for you to expand into new areas of clean energy investment? [text box]

E6. Are there secondary markets to which you can sell your investments in clean energy?

1. yes Please elaborate in a few words or a sentence: _____
2. no

Observed industry trends

F1. Next, we will ask about your perceptions about industry trends in clean energy investment regardless of how active you are in these investments.

If you had to characterize the size of the clean energy investment market in New York State, would you classify it as…?

a) huge
b) large
c) moderate
d) small

F2. How is it currently changing in size?

1. growing
2. keeping steady
3. shrinking

[if F2=1]

F3. How would you describe its rate of growth of clean energy investments in New York State compared to all other investment opportunities? Are clean energy investments…

1. growing at a faster rate
2. growing at the same rate
3. growing at a lower rate

[if Involvement > 0]

F4. How would you compare the opportunities for clean energy investments in New York State to other domestic geographies in which you invest?

1. NYS has more favorable clean energy investment opportunities
2. NYS and other areas have equally favorable clean energy investment opportunities?
3. Other areas have more favorable clean energy investment opportunities

F5. Are there secondary markets to which you can sell your investments in clean energy?

1. yes à Please elaborate in a few words or a sentence: _____
2. no

NYGB observations

[if Involvement > 0]

G1a. In how many separate clean energy projects have you invested in the past three years? *[An approximate or round number is all we are looking for. Enter the word "skip' if this is proprietary.]* _____

G1b. In how many of these investments did NYGB take a stake? _____

G2. In what ways, if at all, has your experience with NYGB influenced the extent, nature, terms, or technical parameters of clean energy investments you make without their involvement? [text box]

[if G1b = 0]

G3. Have you seen NYGB activities in the market?

1. yes Please describe: _____
2. no

G4. One of NYGB's key goals is to close any gaps in financing availability for clean energy projects. Do you have any suggestions for what is most needed to close financing gaps for clean energy? [text box]

Closing

H1. Do you have any other comments or observations you would like to share about the clean energy market? [text box]

H2. Please provide your name and email address below to be entered in the drawing and to receive an advance copy of the study report. *[We will not use the personal information you enter below for any purpose, and we will delete it from our dataset before conducting any survey analysis.]*

Name: _____
Email address: _____

Thank you.

Appendix F: Interview Guides

Developer Survey

Background

A1. I'd like to start by understanding what you do a little bit more.

Probe to understand:

- Title / role
- How long with the company?
- How long in current role?
- Sectors the company works in – single-family, multifamily, commercial, non-building developments, other
- Focus areas - general development, clean energy focus (what types), or community or utility scale renewable energy facilities (or confirm and put in sequence of importance if already identified)

Clean Energy Investment Practices [10-12 mins]

B1. Now, please tell me a bit more about your company. What kinds of projects do you consider to be your bread and butter? What else do you work on? [Interviewer note: Rely on what we already know if the interviewee is a known entity to NYGB, but be mindful that NYGB's understanding may involve just a component of what the interviewee does. Adjust wording as needed to make more formal if that works better for the interviewee.]

Listen for and probe to confirm if needed:

- Is this company primarily a general builder, a clean energy project developer, or something else?

[if not clean energy focused]

B2. Next, I would like to ask about clean energy components of your work. How and how often does clean energy fit into what your company does? [If needed: By clean energy, I mean anything from going beyond requirements on energy efficiency to the inclusion of renewable energy on buildings or stand-alone renewable energy installations or transportation efficiency efforts.]

B3. Which of the following clean energy technology areas or applications do you work in? [Interviewer note: Be ready to explain or give examples if interviewee does not immediately understand what we mean with each of these categories.]

- Clean Energy Tech Group
- Residential customer-sited solar installations
- Community solar installations

- Residential building decarbonization and energy efficiency upgrades
- Commercial building decarbonization and energy efficiency upgrades
- Sustainable transportation technology and infrastructure

B4. What is it about these clean energy investments that makes them attractive?

Listen for and classify interviewee into:

- They provide better returns than other work we do or could do
- They enhance the appeal of our projects for customers
- They are core to our mission or values
- They are just the business area we are in
- [Write a similar statement that captures the response]

B5. Would you be able to provide a ballpark estimate of the market value of clean energy work you do currently in a typical year? [If needed: Please include incorporation of renewable energy, decarbonization technology, and energy efficiency that goes beyond the norm.] [If needed, that could be as broad as thousands of dollars, single digit millions, double digit millions, and so forth.]

Probe:

- Has it been increasing, holding steady, or decreasing over the past three years?

B6. How do you typically fund your development projects?

Listen for:

- Owners / buyers fund with cash.
- Owners/ buyers finance, but we are not involved.
- We finance with project-specific loans.
- We use other sources of equity.
- A mix [Probe as needed to understand mix of sources and hierarchy of distribution of $s.]
- Other

B7. Next, I would be curious about your observations on the financing terms available for clean energy projects. Do the financing terms for clean energy projects make those efforts more attractive, equally attractive, or less attractive than other development opportunities?

Probe:

- How has this changed in the past 3 years?
- What direction does it seem to be going in?

B8. Are you seeing any changes in the number of financing entities that are realistically available to you for your clean energy projects?

Probe:

- Are the types of investors you can tap into changing (i.e., from equity investors to lenders or changes to different types of lenders?

B9. Have you received financing from New York Green Bank for any of your clean energy work?

Probe if yes:

- What share of your clean energy projects have involved financing through NYGB? How many is that?
    - If 1-3, which ones?
    - If a few or more, how has that changed in the past three years?

Probe if no:

- Have you gotten other kinds of support from NYGB for any of your clean energy projects?
    - What kind?

Probe if any kind of support (financial or other) from NYGB:

- In what ways, if any, has the collaboration with New York Green Bank affected how often or how much work you are doing in clean energy projects?

NYGB Observations [4-6 mins]

C1. Please tell me a bit more about what New York Green Bank activities you see in your part of the market.

Probe to understand:

- What do you see them doing in the market?
- How, if at all, have you interacted with them?

If interviewee has worked with NYGB on developments:

- Have they been collaborative?
- Worked with you to develop solutions that meet your financing needs?
- Been able to crowd in additional sources of capital for your company or sector?

C2. Do you think their activities are having any effects on the availability of financing for the types of projects you do?

Probe:

- Which activities?
- What effect is that having on financing available to you from the private market?

C3. Do you think the NYGB activities are having any effects on the terms of financing for the types of projects you do or are planning to do?

Probe:

- What were they?

C4. One of the key goals of NY Green Bank is to close any gaps in financing availability for clean energy projects. What else should they be doing to accomplish this?

C5. NYGB has policy goals related to the share of their investments that benefit disadvantaged communities. I am curious whether serving disadvantaged communities is something you have goals around or that you track, and to what extent. [Interviewer note: NYGB and NYS definitions of disadvantaged communities are still evolving. We are not interested in whether the interviewee aligns with these definitions, but whether the interviewee's organization has a particular focus of their own on the diversity of investment recipients or the beneficiaries of clean energy projects.]

Probe if yes

- Do you have goals, track it, or both?
- What kinds of trends are you seeing, if any?

Probe if have goals

- How are the goals defined or structured?

Wrap Up [1 min]

D1. Those are all the questions I have. Is there anything else you would like to share that you think might be useful for NYSERDA and New York Green Bank to know?

Thank you for your insights and participation in this interview. Feel free to reach out if you have any additional thoughts in the future or any questions about our study. [Interviewer Note: If needed, we can refer the interviewee to Carley at the same contact information in the outreach emails: Carley Murray, Senior Project Manager, NYSERDA Performance Measurement and Evaluation, carley.murray@nyserda.ny.gov. We can also offer to put them on an early distribution list for the study report once it's public.]

Financier Interview

Background

A1. I'd like to start by understanding what you do a little bit more. [If appropriate, add: I've done a little background reading, but want to confirm some things and fill in gaps in what I was able to find.] [Interviewer note: Use this question as an intro to build rapport, but with a light touch to confirm key things we think we already know. Ask in detail only as needed if we were not able to get important contextual information before the interview.]

Probe to understand:

- Title / role
- How long with the company?
- Associated with a particular "practice area"?
- How long in current role?
- *Types of investments company engages in (angel equity, venture capital equity, small-scale debt investor, large-scale debt investor)
- Any particular areas of focus for the company?
- Any particular areas of focus for the interviewee?

A2. Do you provide financing for residential buildings, commercial buildings, or both?

Clean Energy Investment Practices [10 mins]

B1. How does investment in clean energy projects fit into what your company does? (If needed: For example, is it something you (1) tend to avoid or not do, (2) handle, but not because of any clean energy focus, or (3) seek out because clean energy is something you do?) [Interviewer note: Rely on what we already know if the interviewee is a known entity to NYGB, but be mindful that NYGB's understanding may involve just a component of what the interviewee does. Adjust wording as needed to make more formal if that works better for the interviewee.]

Probe to understand:

- Any areas of focus for clean energy projects (if relevant)
- Types of clean energy projects they have invested in (if relevant)

B2. What is it about some clean energy investments that makes them attractive?

B3. I'd like to go through a list of clean energy technology areas or applications. For each one, please tell me if that is an area your company focuses on, might invest in, or generally does not do. [Interviewer note: Complete table; leave rightmost column blank for now.] [Interviewer note: Be ready to explain or give examples if interviewee does not immediately understand what we mean with each of these categories.]

- Clean Energy Tech Group
- Residential customer-sited solar installations
- Community solar installations
- Residential building decarbonization and energy efficiency upgrades

- Commercial building decarbonization and energy efficiency upgrades
- Sustainable transportation technology and infrastructure

B4. Now, for the areas that you focus on, I'd be interested in getting a sense of how often you make investments and on what scale. I'm not interested in exact numbers or proprietary information, just a sense of how often investments like that come along for your company and whether they tend to amount to thousands of dollars, single digit millions, double digit millions, or something else in annual new investments annually.

Probe for each clean energy technology group above that is an area of focus (or the top "might invest" groups if there are no areas of focus). Record in shaded column in table above.

- Frequency of investments
- Scale
- Trend (increasing, steady, decreasing)

B5. Have you collaborated with NY Green Bank on investments in any of these areas?

Probe if yes:

- Which ones?
- How many?
- How long ago was the first? the most recent?
- In what ways, if any, has the collaboration with NY Green Bank affected how often or how much you are investing in similar clean energy projects?

B6. When you offer clean energy investments, what positions do you tend to take within the capital stack?

Probe:

- How flexible or customized to the project does that tend to be?
- Is this approach similar or different from your approach in other investment areas?

B7. Do you sell your investments to secondary markets?

Probe if no:

- Do secondary markets exist for the clean energy investment areas in which you are active? If so, which ones?

Observed Industry Trends [5-8 mins]

C1. Let's zoom out from your activities to your perceptions of the market for clean energy investments in New York State regardless of how active you are in it. If you had to characterize the size of that market, do you think of it as…?

a) huge
b) large
c) moderate
d) small

Probe:

- If you had to put a dollar number or range to the size of that market, what would you estimate currently?
- Is it growing, staying the same, or decreasing?
- Which technology area or areas do you see as most significant in size?
- If you are willing to share, which do you see as ones to watch?

C2. Overall, how does the potential for clean energy investments in New York State compare to other markets?

Probe:

- Why do you say that?
- What is prompting the differences? [Interviewer Note: Ask this if at all relevant. Listen for any direct or indirect mentions of NYGB activities.]

C3. Are the main opportunities you see for clean energy investment in New York State generally in the realm of angel investment, venture capital equity investment, small scale debt investment, or large scale debt investment?

Probe:

- Are you seeing that changing?
- How?

NYGB Observations [3-5 mins]

D1. Please tell me a bit more about what NY Green Bank activities you see in the market.

Probe to understand:

- What do you see them doing in the market?
- How, if at all, have you interacted with them?

D2. Do you think their activities are having any effects on private market activity in clean energy project financing?

Probe:

- Which activities?
- What effect is that having on private financing?

D3. Have you seen any new approaches from NY Green Bank specifically—or in the industry generally—on ways of qualifying or securing investments that are a better fit for clean energy than the typical industry tools?

Probe:

- What were they?
- Are you using any of them?

D4. One of the key goals of NY Green Bank is to close any gaps in financing availability for clean energy projects. What else should they be doing to accomplish this?

D5. What can be done to improve the underwriting of mortgages that support clean energy upgrades?

D6. Are there subordinate loans that can be offered for specific elements of building electrification?

[time permitting only]

D7. NY Green Bank has policy goals related to the share of their investments that benefit disadvantaged communities. I am curious whether diversity of investment recipients is something you have goals around or that you track , and to what extent. Interviewer note: NYGB and NYS definitions of disadvantaged communities are still evolving. We are not interested in whether the interviewee aligns with these definitions, but whether the interviewee's organization has a particular focus of their own on the diversity of investment recipients or the beneficiaries of clean energy projects.]

Probe if yes

- Do you have goals, track it, or both?
- What kinds of trends are you seeing in incorporation of diversity targets in clean energy investments, if any?

Probe if have goals

- How are the goals defined or structured?
- Are they about financing recipients or the ultimate users / beneficiaries of whatever is being built or done with the funds?

Wrap Up [1 min]

E1. Those are all the questions I have. Is there anything else you would like to share that you think might be useful for NYSERDA and NY Green Bank to know?

Thank you for your insights and participation in this interview. Feel free to reach out if you have any additional thoughts in the future or any questions about our study. [Interviewer Note: If needed, we can refer the interviewee to Carley at the same contact information in the outreach emails: Carley Murray, Senior Project Manager, NYSERDA Performance Measurement and Evaluation, carley.murray@nyserda.ny.gov. We can also offer to put them on an early distribution list for the study report once it's public.]

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