NEW YORK RENEWABLE PORTFOLIO STANDARD
MARKET CONDITIONS ASSESSMENT
Final Report

Maple Ridge Wind Farm, Lowville, New York

Prepared for

THE NEW YORK STATE
ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

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NOTICE

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ABSTRACT

New York's Renewable Portfolio Standard (RPS) program, designed to increase the State's retail electricity mix from a baseline of 19% to 25% by 2013, has been in effect since 2004. NYSERDA is required to present the New York Public Service Commission with an evaluation report of the program results through the end of 2008. The report is to be issued for public comment by March 31, 2009. In support of this evaluation effort, Summit Blue Consulting and its affiliates performed a market conditions assessment to help understand the current state of the market and how the program has influenced or been influenced by market conditions since its inception. This comprehensive report presents findings pertaining to this market conditions assessment.

The market conditions assessment focused most heavily on the Main Tier component of New York's RPS, and markets for large-scale renewables in New York. This report summarizes data gathered on past and present market conditions for large-scale renewable energy project development, as well as challenges and opportunities related to future market growth. A more limited review of market conditions was conducted for technologies supported by the Customer Sited Tier of the RPS. Results presented in the report are based on findings from in-depth interviews with a wide range of market participants, as well as a review of primary and secondary data sources.

The assessment finds that New York's RPS has played a critical role in advancing renewable energy markets in the State to date. In particular, long-term contracts offered under the Main Tier program have proven valuable in driving the development of large-scale projects in the State. However, budget limitations and other program design elements, as well as market barriers beyond the State's control, will limit market growth potential going forward. A number of actions NYSERDA and the State should consider taking to advance New York's renewable energy markets in the future are recommended.

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ADG: Anaerobic Digester Gas

AEPS: Alternative Energy Portfolio Standard

BGA: Blue-Green Alliance

C&I: Commercial and Industrial

CEC: California Energy Commission

CPUC: California Public Utilities Commission

CREZ: Competitive Renewable Energy Zones

CST: Customer Sited Tier of the New York RPS

DEC: New York State Department of Environmental Conservation

DOER: Department of Energy Resources

DPS: Department of Public Service

EAF: Environmental Assessment Form

ESCO: Energy Service Company

GATS: Generation Attribute Tracking System

ISO-NE: New England Independent System Operator

LFG: Landfill Gas

LIPA: Long Island Power Authority

LSEs: Load Serving Entities

MACRS: Modified Accelerated Cost Recovery System

MPR: Market Price Referent

NIMBY: Not in My Backyard

NYISO: New York Independent System Operator

NYPA: New York Power Authority

NYSERDA: New York State Energy Research and Development Authority

OATT: Open Access Transmission Tariff

PILOTs: Payments in Lieu of Taxes

PJM: Independent System Operator Serving Pennsylvania, New Jersey, Maryland and Additional States

PSC: New York Public Service Commission

PTC: Federal Production Tax Credit

PUC: Texas Public Utilities Commission

PV: Photovoltaic

R&D: Research and Development

REC: Renewable Energy Certificate

REPP: Renewable Energy Policy Project

RETI: Renewable Energy Transmission Initiative

RGGI: Regional Greenhouse Gas Initiative

RPS: Renewable Portfolio Standard

SACPs: Solar Alternative Compliance Payments

SBC: System Benefits Charge

SEQR: New York State Environmental Quality Review

SREC: Solar RECs

WWTP: Waste Water Treatment Plan

SUMMARY

New York's Renewable Portfolio Standard (RPS) program, designed to increase the State's retail electricity mix from a baseline of 19% to 25% by 2013, has been in effect since 2004. NYSERDA is required to present the New York Public Service Commission (PSC) with an evaluation report addressing the program results through the end of 2008. In support of this evaluation effort, Summit Blue Consulting and its affiliates performed a market conditions assessment to help NYSERDA and the State understand the current state of the market and the influence the program has exerted on the market since its inception. This report presents findings from this market conditions assessment.

Findings from this assessment, together with a program impact evaluation being conducted simultaneously, will inform NYSERDA's March 2009 evaluation report to the PSC. The PSC will use the 2009 evaluation report to track program progress, and to determine what, if any, program changes are necessary to fulfill the 2013 RPS targets.

This assessment focused on the Main Tier component of the RPS and the market for large-scale renewable energy development in the State, as the Main Tier component comprises 98% of the program compliance targets. To a lesser extent, the assessment examined elements of the Customer-Sited Tier (CST) programs and the voluntary green power market in New York.

The following sections comprise the assessment report:

- RPS Program Background
- Project Approach
- Data Collection Sources and Methods
- Main Tier RPS Program- Wholesale Renewable Energy Market Conditions
- CST RPS Program- Renewable Distributed Generation Market Conditions
- Voluntary Green Power Market Activity
- Efforts to Support Renewable Energy Manufacturing and Related Business Development in New York

- Steps to Transition the RPS to a More Market Based Approach
- Key Findings and Recommendations

S.1 RPS PROGRAM BACKGROUND

New York's RPS was introduced in the 2002 State Energy Plan and adopted through a PSC Order issued in September 2004. The Order called for an increase in the portion of renewable energy included in the State's retail electricity mix from a baseline of 19% to 25% by 2013, including 1% from the voluntary renewable energy market and contributions from other State entities, including the Long Island Power Authority. The 2004 Order set specific renewable energy supply targets[1] for both the compliance and voluntary sector contributions expected to be achieved each year from 2006 through 2013. The compliance part of the RPS is administered by NYSERDA as a two-tier, central-procurement program structure.

The RPS compliance program is funded through a volume-based RPS surcharge paid by all retail electric customers that pay the System Benefits Charge (SBC). The Order authorized the collection of funds in the amount of $741 million from 2006-2013.[2]

The RPS program consists of the following two tiers:

1. **Main Tier**: NYSERDA pays production incentives to renewable energy generators for the environmental attributes associated with delivered energy. Generators are selected through competitive procurements, and most enter into ten year contracts. Three procurements have been conducted thus far and a total of 30 new or expanded[3] renewable energy projects have secured contracts. The first procurement, RFP 916, was issued in late 2004 and resulted in contract awards in early 2005. The second, RFP 1037, was issued in late 2006 and contract awards were made in early 2007. The third procurement, RFP 1168, was issued in the fall of 2007 and contract awards were made in early 2008.

[1] The interim "targets" are not binding, but serve as a guide toward achieving final targets.

[2] This budget reference excludes any LIPA collections. New York State Public Service. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004.

[3] Repowered hydropower plants are included.

Over half of these projects are currently operating, and the remainder of the projects are under construction. These projects will collectively produce 3.8 million MWh of renewable energy annually.[4] The Main Tier is responsible for the procurement of 98% of the total compliance program's target for renewable energy generation.

2. **CST**: The CST program is comprised of a suite of technologies intended to ensure that distributed sources of renewable energy continue to help diversify the State's energy mix and reduce the need for distribution grid upgrades. Eligible technologies include fuel cells, photovoltaics (PV), small wind projects (300 kW or less) and anaerobic digesters. Incentives are provided to project owners in the form of capacity buy-down incentives and "expected" production-based incentives, which vary by the technology. Over 62,000 MWh of renewable energy will be produced from projects either under contract, or with contracts pending under the CST programs.[5]

To be considered eligible, a facility must have first commenced commercial operation on or after January 1, 2003. Customer-sited resources have to be installed on or after January 1, 2003. A limited vintage exception is provided for certain hydroelectric, wind, and biomass resources ("maintenance resources") that demonstrate the need to receive RPS financial support to continue operations.

In addition to the two RPS program tiers, the PSC set forth additional expectations for growth in renewable energy sales to occur through the voluntary consumer market and as a result of Executive Order 111[6]-related procurements by state agencies.[7] To reach the 25% goal, the PSC Order also expected that the Long Island Power Authority (though not subject to the PSC Order) would contribute in proportion to its share of statewide load,[8] and the New York Power Authority would also add an unspecified contribution[9] of which a

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[4] NYSERDA. 2008. "New York State Renewable Portfolio Standard Performance Report, Program Period Ending June 2008."

[5] Ibid.

[6] Executive Order 111 requires New York state agencies to procure 20% of their electricity from renewable sources by 2010.

[7] Expectations for growth in renewable energy sales through the voluntary market and through Executive Order 111 procurements are included in the 25% overall renewable energy target for 2013, but are not included in the "increment target" value in the Public Service Commission's RPS Order. State of New York Public Service Commission, "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004.

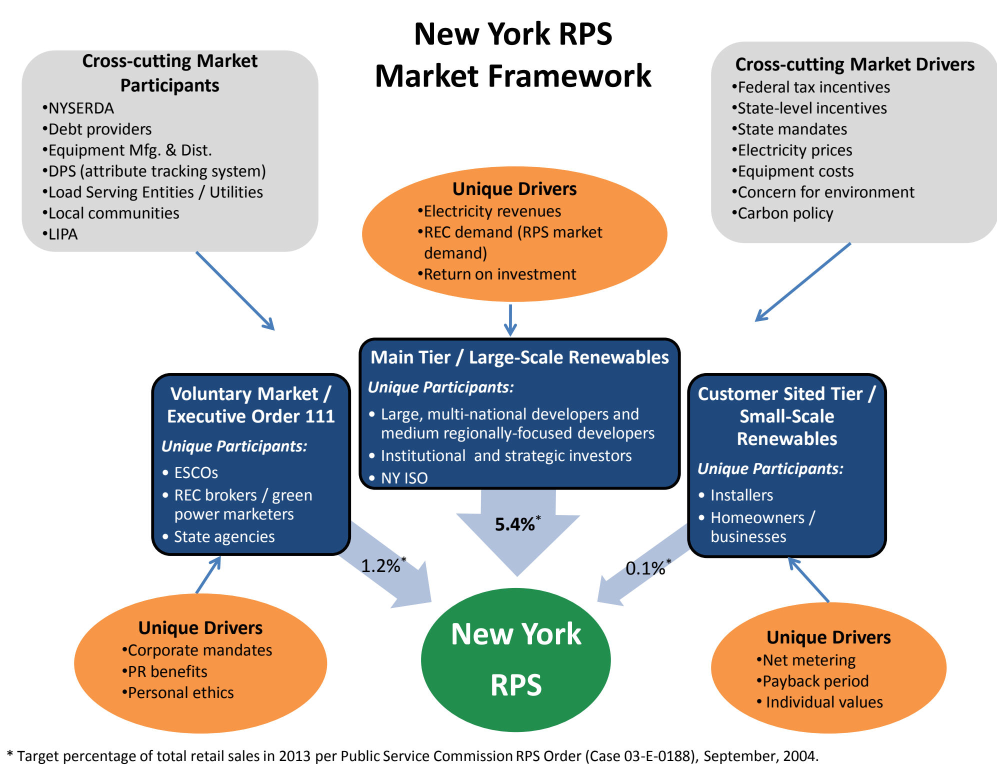
[8] LIPA's share of statewide load in 2004 was approximately 16%, expected to procure 1.9 million MWh of renewable energy by 2013.

[9] State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard" Case 03-E-0188. Issued September 24, 2004.

portion would help support state entities' compliance with Executive Order 111. These targets are minimal in comparison to those associated with the Main Tier of the RPS.

Figure 1 provides an overview of the New York RPS market framework. The figure shows the key market participants and market drivers associated with each of the three primary market components: the Main Tier RPS / large-scale renewables market, the CST RPS / small-scale renewables market, and the voluntary market. The market drivers are those key factors affecting both supply and demand. Cross-cutting drivers affect all market components, unique drivers affect only one. This framework helped structure the development of the interview guides presented in the next section.

Figure 1. New York RPS Market Framework



S.2 PROJECT APPROACH

Data gathered through interviews with program staff and market participants were used, as well as a review of available primary and secondary data sources, to assess the New York markets for large-scale and customer-sited renewable energy applications. The goal was to describe current market conditions, changes that have occurred in the marketplace since the program's inception, and the program's progress in facilitating the development of a more market-based system for supporting renewable energy development in the State. Some key elements of the project approach included: 1) develop market indicators to guide data collection efforts and reporting; 2) assess New York's RPS experience relative to those of other select states; 3) examine the RPS program's influence on the renewable energy market in New York; and 4) estimate potential price suppression effects of the RPS program on markets for natural gas and electricity.

S.3 DATA COLLECTION SOURCES AND METHODS

Primary data collection activities consisted of in-depth telephone interviews with a broad set of renewable energy market participants. Interviews were conducted with 92 market participants, including:

- Wind, biomass, landfill gas, and hydro project developers (both program participants and non-participating developers as well);
- The financial/investment community;
- Equipment manufacturers and distributors;
- Voluntary green power marketers;
- Load serving entities;
- Installers representing each of the technologies funded by the CST program;
- Representatives from the agencies administering RPS policies in other states; and
- NYSERDA program staff.

Secondary data sources were used to supplement the primary data collection efforts. Relevant policy studies, evaluation reports, and other key documents provided necessary background for conducting the market assessment.

The primary data collection effort was completed before the onset of the credit crisis at the end of September 2008. To the extent data were available from secondary sources regarding the effects of the crisis on renewable energy markets as of the date of this report, they have been considered.

S.4 MAIN TIER RPS PROGRAM: WHOLESALE RENEWABLE ENERGY MARKET CONDITIONS

This section focuses on the Main Tier component of the RPS and topics related to the markets for large-scale renewables in New York. This section discusses the history of renewable energy markets in New York, as well as current market conditions.

S.4.1 History of Renewable Markets in New York

When New York's RPS was adopted in 2004, about 19.3% of the electricity retailed in New York State was derived from renewable resources. There were nearly 400 renewable energy facilities in New York, primarily hydro, representing approximately 6 gigawatts (GW)[10] of installed renewable energy capacity, and delivering over 29,000 gigawatt-hours (GWh) of energy annually.[11]

During 2003 and 2004, the renewable energy market underwent a rapid transition. Early in 2003, the renewable energy industry was using in-house financing structures. The market was fragmented; many small renewable energy developers dotted the landscape. The global investment in renewable energy changed trajectory in 2004 and the industry began to grow rapidly. Most of the market growth in New York was focused on the wind industry. During this timeframe, U.S. wind projects became larger and capital from institutional investors (e.g., commercial banks and lenders) started to participate in some project capitalizations in the form of both equity and debt.[12] The equity component of these investments often took advantage of tax benefits, such as the production tax credit (PTC).

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[10] A gigawatt is a billion watts. The NY Independent System Operator's (ISO's) all time peak demand: 33.9 GW (set August 2, 2006), http://www.ferc.gov/market-oversight/mkt-electric/new-york.asp#dem.

[11] NY ISO *Goldbook.* 2007. Summit Blue Consulting analysis. A watt-hour is one watt of energy over one hour.

[12] John P. Harper et al., *Wind Project Financing Structures: A Review and Comparative Analysis,* Lawrence Berkeley National Laboratory, September 2007.

Fewer than a dozen separate developers and operators were involved in the New York market prior to the adoption of the RPS. These were primarily U.S. companies focusing on wind development. At that point, wind projects could receive state-level financial assistance through NYSERDA’s Wholesale Renewables program, which was funded by the Systems Benefit Charge levied on electric utility ratepayers. The State of New York supported development of three wind projects – two through NYSERDA, the other through another public benefit program administered by Niagara Mohawk, with a total capacity of 48 MW.

The RPS was designed to address gaps in the renewable energy marketplace. In order to secure capital, renewable energy projects needed guarantees of revenues of sufficient duration and amount to repay the investors.[13] After detailed consideration of alternatives, the PSC chose an approach in which long-term renewable energy credit (REC) contracts were offered by a central procurement agent, NYSERDA, as a means of providing the necessary secure revenue stream.

S.4.2 <u>Current Renewable Energy Markets in New York</u>

This section describes current market conditions related to the development of large-scale renewable energy projects in New York. Topics discussed include: current sources of renewable energy supply in New York, the presence and level of market activity by various market participants, barriers to large-scale project development, the influence of the RPS program on large-scale project development, and RPS policies and experiences in other key states.

S.4.2.1 <u>Renewable Energy Generation Supply</u>. From 2005 through 2008, the RPS Main Tier program has issued three solicitations to procure renewable energy generation. The first solicitation resulted in adding 865.6 GWh/year, the second solicitation added another 1,800 GWh/year, and the third

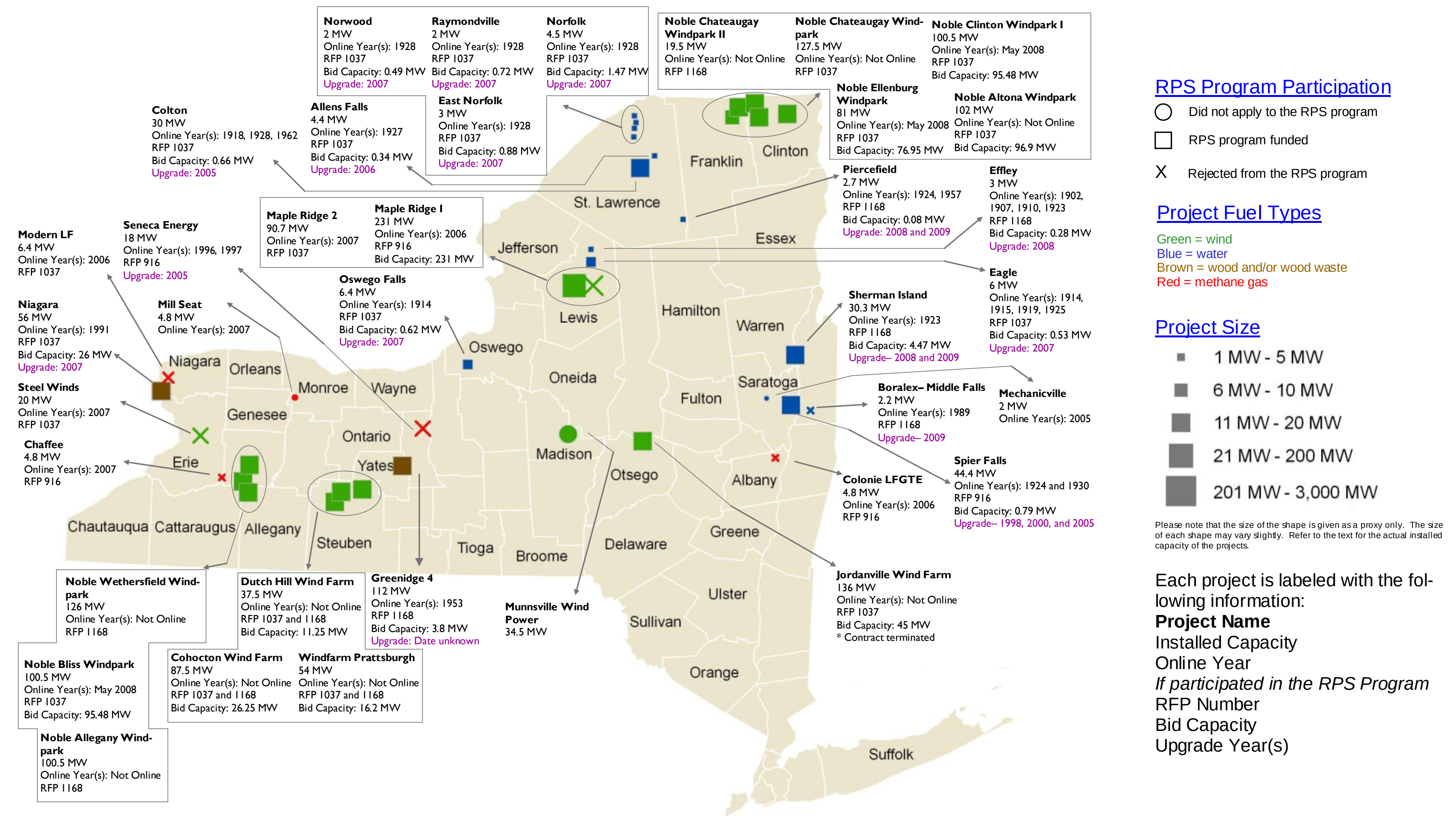
[13] State of New York Public Service Commission. “Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard.” Case 03-E-0188. September 24, 2004, page 51.

solicitation added 824.6 GWh/year,[14] for a total of 3,479 GWh to be added by 2009 when all the contracted facilities are operational.[15] Wind has comprised at least 80% of the energy procured through these solicitations. Most of the Main Tier's renewable energy projects built since the RPS Order are in the western and northern parts of the state, as shown in Figure 2. No Main Tier supported projects have been built in the New York City area or surrounding region.

[14] NYSERDA. 2008. *New York State Renewable Portfolio Standard: Performance Report for Program Period Ending June 2008.* These figures show the maximum annual bid quantities under the contract obligations between NYSERDA and the developers.

[15] The total reflects that Higley and Browns Fall had one year agreements in RFP 916, which allowed them to participate in RFP 1037. However, only their maximum obligated contract quantities from RFP 1037 are used to measure progress towards post 2006 targets.

Figure 2.Location of Post-2004 Renewable Energy Project Activity



Sources: NYSERDA RPS program bid proposal data; NYS Place Locations provided by NYSERDA; NY ISO 2008 Load and Capacity Data "Gold Book," Table III-2, Existing Generating Facilities (as of March 2008).

Note: Jordanville is shown as "RPS program funded" - while Boralex-Middle Falls is shown as "Rejected". Both were selected under their respective RFPs, both projects were subsequently not constructed. (Only difference being Jordanville had already signed a contract with NYSERDA before the project was canceled by the developer - Middle Falls had not yet signed a contract.) Neither project was built.

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S.4.2.2 <u>Presence and Level of Market Activity</u>. During the last few years, a significant amount of industry consolidation has taken place. Wind development in New York and in the rest of the U.S. has been driven by large corporations. These well-capitalized firms can contribute to the significant amounts of capital required to develop, construct, and operate wind facilities. Large international corporations with experience developing wind in Europe have emerged as important drivers in the market for wind, and institutional investors with domestic taxable income have been partners in making use of the tax benefits. Specialized financial structures have been developed to accommodate such partnerships, typically limiting capital contributions to equity, rather than including debt.

The larger investors have operations in multiple states around the country to diversify project risks. As a result, projects in the development stage in New York are competing for resources with projects in the development stage in Oregon and Texas, for example. The markets with the best balance of risk and return on investment are pursued first to maximize shareholder benefit.

Because of the dominance large corporations have acquired in the wind industry in recent years, it has been difficult for small- and medium-sized developers to compete in the market for wind development. Their size precludes them from taking advantage of economies of scale and the risk mitigation benefits that accrue to the larger firms.

The market for landfill gas is still dominated by smaller developers and is fragmented, relying on entrepreneurs to identify and develop niche markets. This fragmentation exists because landfill gas projects require relatively low levels of capital and have less exposure to fuel supply risk over time when compared to other biomass technologies. Like other biomass technologies that serve as baseload resources, landfill gas can secure power purchase agreements, which contribute to the low risk profile desired by small and independent developers. While other biogas development opportunities exist in New York, this potential has gone largely unrealized. This is likely due to the fragmented nature of the biogas industry, and the fact that development opportunities are typically small, lacking the economies of scale that can be realized with other renewable resources in the State.

The most recent woody biomass projects were primarily developed by large energy corporations. Larger firms have the ability to withstand the higher levels of risk connected to the fuel supply. The most recent two woody biomass projects participating in the New York RPS program are being developed at the site of existing coal facilities as a co-firing opportunity. The co-firing scenario provides flexibility to respond to volatility in energy market pricing and fuel feedstock availability risk.

S.4.2.3 <u>Barriers to Large-Scale Project Development</u>. The top five barriers to large scale renewable energy development in New York are:[16]

1. Uncertainty about federal tax incentives, cost of supplies, and raw materials;
2. Transmission constraints;
3. The permitting process;
4. Local opposition to development; and
5. Interconnection costs and processes.

The short-term and uncertain nature of the PTC has resulted in a boom and bust development cycle that has made it difficult for developers, manufacturers, and others to plan for the future of their businesses. This challenge is not unique to New York. There is little the State can do to alleviate this problem other than advocating for longer-term policies at the federal level, and offering its own incentives that are flexible and can support development even in the absence of the PTC. Similarly, the cost of supplies and raw materials is a major barrier to development over which the State has little control. Developers report that equipment costs have undergone cost increases of 15 to 20% between a project's planning and construction phases.

Transmission constraints, permitting process, local opposition to development, and interconnection costs and processes are barriers associated with geographic location and infrastructure. Developers recognize that the nearly 8,000 MW of proposed wind capacity in the New York Independent System Operator's (NYISO's) interconnection queue[17] will face significant obstacles if transmission infrastructure does not undergo immediate expansion.

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[16] These would be barriers in most states, although there can be others, such as availability of resource.

[17] There was 7,700 MW of wind in the NYISO Interconnection Queue in August 28, 2008. Obtained from http://www.nyiso.com/public/services/planning/interconnection_studies_process.jsp.

New York's current State Environmental Quality Review permitting process is viewed by many as a serious impediment to fulfilling the State's renewable energy development potential, largely due to the fact that New York is a "home rule" state, vesting local officials with authority to make decisions that affect their locality. This often results in uncertainty regarding the timeline for the project planning schedule and related decision-making. While a diverse set of stakeholders supports re-enactment of the State's former Article X power plant siting law, which expired in 2003, there is concern that communities will lose their authority in the decision-making process if a statewide law is enacted that supersedes home rule. A number of bills have been proposed to re-introduce an Article X law, but none has gained full approval by the New York State Legislature thus far.

Developers voiced concern about the lengthy interconnection procedures followed by the NYISO, and noted some inconsistencies in requirements from one utility territory to the next. NYSERDA is not in a position to change these procedures, but should continue to recognize (as demonstrated by granting extensions) that they make the project development process more challenging.

Other barriers that appear to be affecting the market include the lack of a REC tracking system, the cost of doing business in New York, limited availability of sites with strong development potential (i.e., a combination of resource potential, available land and a locality that is favorable to the project), and the expense associated with local property taxes and payments to host communities.

Factors related to the New York RPS program structure and funding were also reported as barriers by some interviewees. These factors are discussed below.

S.4.2.4 <u>RPS Program Influence on Large-Scale Renewable Energy Development in New York</u>. Findings indicate that the RPS program has played a critical role in driving the renewable energy development that has occurred in the State since the program was introduced. Responses from developers that have participated in the RPS program indicated that the development of biomass and large wind projects were most highly influenced by the program.

Wind and biomass projects are thought to be highly influenced by the program, because their project economics depend on securing a predictable REC revenue stream for at least some portion of the project output. For wind projects, this is largely due to the capital-intensive nature of development for this technology. For many biomass projects, uncertainty about future fuel costs makes the stable REC revenue stream more important. In contrast, hydro upgrade projects completed to date have tended to rely less heavily on REC revenues in order to be developed, and landfill gas projects in New York have been more successful selling RECs in the New England RPS compliance markets.

An additional indication of the influence of the New York RPS program is the high percentage of New York's wind potential that has been realized relative to other states that also possess relatively strong wind resources, but lack an RPS. The highly competitive nature of the New York RPS program (i.e., far more bidders participate in the solicitations than are selected for contracts), as well as the fact that winning REC prices are not insignificant,[18] are further indicators that the RPS program plays an important role in the New York market for large-scale renewable energy projects.

S.4.2.5 Comparison of New York's RPS with those in Other Key States. To provide some context, a review of the RPS policies employed by other neighboring or key states was conducted. States selected for comparison were: Massachusetts, Pennsylvania, New Jersey, and California. Interviews were also conducted with individuals familiar with the RPS policies in each of these states.

Key differences exist between New York's RPS and the RPSs in the states reviewed. New York's program uses a central procurement approach in which there is one primary buyer of RECs for RPS compliance. Funding for program operates within a pre-defined RPS budget. Also, program funds are not expended on compliance penalties in the event RPS interim targets go unmet. Eligibility in NY requires new projects or investments in upgrades, while other states allow pre-existing projects.

With the exception of California, each of the other comparison states has had or is introducing a set-aside RPS to support development of a certain category of resources and each state allows the sale of unbundled RECs (California is likely to allow unbundled sales soon). RPS eligible resources vary across states. In contrast to New York's definition of eligible Main Tier resources, waste-to-energy resources are eligible in some form in all states reviewed here. Each of the neighboring states of Massachusetts, New Jersey, and

[18] If REC income from the program were of little importance to developers in the State, they would bid extremely low REC values, or would avoid the program altogether and instead just sell into other more lucrative markets.

Pennsylvania are part of multi-state power control areas in the northeast,[19] and these states have the flexibility to draw on resources from anywhere in their power control area. The mix of technologies and fuel sources used for RPS compliance in each state differs due to a combination of eligibility requirements, delivery restrictions, and resource availability.

Barriers to development are similar across states. California, like New York, has identified federal tax incentive uncertainty as a top barrier. Transmission capacity was identified among the top barriers in California and Massachusetts. Permitting and local opposition are barriers in all states reviewed.

S.4.3 REC Pricing – The Market Signal

RECs are the renewable attributes produced by renewable generation.[20] NYSERDA pays renewable generators for RECs, and the associated electricity is sold in the New York Independent System Operator market or bilaterally. REC prices represent the key indicator from the market regarding the cost of renewable generation, since the electricity market clearing price is typically set by fossil fuel generators. The sections below summarize the prices seen in the RPS program, how these compare to other states, external factors affecting REC prices, and how program components affect REC prices.

[19] Massachusetts is in the ISO New England, and PA and NJ are in PJM Interconnection.

[20] Attributes include, but are not limited to, any direct or avoided emissions of pollutants to the air, soil, or water; such as sulfur oxides (SOx), nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter and other pollutants; any avoided emissions of carbon dioxide (CO_2), methane (CH_4), and other greenhouse gases (GHGs), all set-aside allowances and/or allocations from emissions trading programs made unnecessary for compliance as a result of performance under an RPS agreement and all credits, certificates, registrations, recordations, or other memorializations.

S.4.3.1 <u>NYSERDA RPS Program REC Pricing Summary</u>. Average prices for awarded RECs have declined overall in each of the three procurements. From $22.90 in RFP 916, average prices dropped to $15.31 and $14.94 in RFP 1037 and RFP 1168, respectively. This trend has been led by wind, which declined in average price from $22.51/MWh in RFP 916 to $14.53/MWh in RFP 1168. However, the weighted average prices for repowered hydro projects jumped from $2.48 MWh in RFP 916 to $17.16 in RFP 1168; and for biomass the weighted average prices went from $13.66 in RFP 1037 to $20.19 in RFP 1168.

S.4.3.2 <u>REC Price Comparisons.</u> New York REC prices have become less than those in most neighboring states' RPS compliance markets. The price differences are likely due to differences in levels of RPS goals, whether targets are adhered to strictly, resource potential, program design features, such as long term contracting, and resource eligibility requirements. Resource eligibility requirements include eligibility of different technologies, vintage requirements, and the ISO control area upon which each state can draw on resources without a facility needing to meet electricity import requirements.

Factors favoring lower prices in New York are the State's relatively abundant wind resource, the inclusion of incremental hydro in the eligibility requirement, the availability of long-term contracts, the competitive nature of the procurement process, and the fact that New York does not adhere to "hard targets" for RPS compliance, which maximizes the capacity to limit procurement expenditures to a pre-set price threshold, and the fact that the money available from fixed collections limits program expenditures).

Factors favoring higher prices include New York's 2003 vintage requirement (which is more stringent relative to the requirements of Maine and Maryland), and the limited geographic region upon which New York can draw without facilities needing to meet hourly delivery requirements for energy imports into the NYISO control area (which is a small area relative to states that can draw on resources within their multi-state electricity control area).

REC prices in the voluntary market are much lower than those in RPS compliance markets. This is due to the many fundamental differences that exist between the compliance and voluntary markets, particularly in the area of vintage and geographic eligibility requirements. For example, voluntary markets do not limit eligibility to new projects and may provide RECs from anywhere in the U.S.

S.4.3.3 External Factors Affecting REC Prices. REC prices are typically the last piece of a project's finances that are put into place. Accordingly, they are expected to "make up the difference" between the project's existing return on investment and the threshold return on investment established by the investor(s). On the cost side of the equation, the major external market factors driving REC prices include equipment costs and, for biomass projects, fuel costs. On the revenue side of the equation, the combination of the natural resource (e.g., wind) availability and wholesale electricity prices determine the revenues from energy sales, which are the major project revenues, followed closely by the PTC. From a macro-market perspective, the supply-demand balance for renewable energy in the market and the term (length) of the REC contract also affect REC prices. In the future, greenhouse gas regulatory policies are also anticipated to raise electricity market clearing prices. This would increase energy revenues for renewable energy as well, making project economics more attractive for renewable energy, resulting in a downward trend for REC prices because of the reduced need for this revenue stream.

S.4.3.4 Program Components that May be Affecting REC Prices. Components of the RPS program itself, such as contract length and the weighting of economic benefits, have the potential to influence REC prices bid into the program. To gain a better understanding of how design features of the RPS program may be affecting REC prices, developers were asked a series of questions on this topic. These features are listed on the following page:

- Weighting of economic development benefits in selection of winning bids;
- Contract duration;
- Bid percentages and partial bidding;
- Delivery requirements for facilities not located in the NYISO; and
- Allowing sale of energy through physical bilateral contracts.

These program components were found to have varying levels of impact on REC pricing, as discussed below. The program feature with the most favorable effect is the long term duration of REC contracts. The State's decision to allow projects to enter into physical bilateral contracts also appears to have had favorable effects on bid prices. Program design features, such as weighing economic development benefits and allowing partial bidding, appear to have no significant effects on REC pricing. Delivery requirements for facilities importing energy into the NYISO control area seem to have the effect of limiting program participation to in-state projects, due to the difficulty intermittent generators have with meeting hourly scheduling requirements.

Some additional program components may be limiting the number and type of projects that can effectively participate in the program, for example, the fact that all technologies compete with one another, based primarily on REC prices, for limited funds. Program REC prices are lower than they would likely be if the program had selection criteria that gave special allowances for projects offering other benefits, such as resource diversity.

Other design features, such as the requirement that facilities must have become operational on or after January 1, 2003 to qualify to participate in the Main Tier program, could result in higher RPS REC prices in New York compared to other states that allow older or pre-existing facilities to qualify. The purpose of this "vintage" requirement is to use RPS funds to drive the development of new or additional renewable generation and not to support pre-existing facilities. Consequently, New York's abundant baseline of existing renewables is not competing for RPS funds with lower REC prices. Furthermore, facilities that are using REC revenues to help secure financing to construct a new facility generally have higher REC revenue requirements than existing facilities.

S.4.4 Price Suppression Effects

The likely impact of the first three procurements on natural gas and electricity prices was examined. Increased generation by renewable sources could suppress the prices of both of these commodities. In the case of natural gas prices, the suppression may arise from a reduction in demand for the fuel used for electric generation. In the case of electricity prices, the suppression may arise through the increase in supply of a resource with variable costs at or near zero. These are two separate issues.

The gas price analysis indicates that the effect on natural gas prices in New York is likely to be modest. This is primarily because of the large geographic market for natural gas relative to the impacts of the program, and other attributes, such as natural gas's ability to be stored and transported.

The effects on electricity prices in New York are likely to be more significant, due to the more local nature of the electricity generation. A regression analysis conducted by Summit Blue estimates that the reduction in wholesale electricity prices in the year 2010 are likely to be approximately $2/MWh (0.2 cents/kWh). Each MWh of renewable energy added has the effect of lowering electricity costs by approximately $100 per MWh of renewable energy produced, significantly more than the weighted average of $15 paid per MWh for the REC in the third procurement. Price suppression is expected to be higher in the beginning years of the RPS than in its later years, as the first three procurements will avoid the highest cost resources on the electricity market supply curve.

S.5 CST RPS PROGRAM – RENEWABLE DISTRIBUTED GENERATION MARKET CONDITIONS

This section summarizes market prices for technologies receiving CST incentives, and compares New York's incentives with those offered by other key states. The effect that the CST program is having in improving the affordability of the technologies supported is also addressed, along with current market conditions for these technologies.

The CST was a secondary focus of the overall RPS market conditions assessment. As a result, a limited amount of primary data was collected. Data limitations for this assessment make it challenging to provide broad findings; however, the data do help illuminate some key issues related to the markets for small-scale renewable technologies in New York, as summarized herein.

S.5.1 Comparison of Technology Costs and Incentives Offered Across Markets

S.5.1.1 Installed Costs in Other Leading Markets. Summit Blue researched the market-based prices (i.e., installed cost/Watt with no incentives) for PV, small wind, fuel cells, and anaerobic digester gas (ADG) systems for the comparison states: Massachusetts, Pennsylvania, New Jersey, Wisconsin, California, and New York. Market-based prices for PV ranged from $6.50/W (LIPA) to $10/W (New York City, small residential systems in New Jersey, and some systems in Wisconsin). Small wind prices ranged from \$3/W to \$5/W. Insufficient data were available for comparing prices for fuel cells and ADG systems across markets. In general, market-based prices tend to vary more by project capacity than by location of the installation.

S.5.1.2 <u>Incentives Paid by Other Leading States</u>. A comparison of incentives offered by other states with leading customer-sited renewable energy programs for PV, small wind, fuel cell, and ADG technologies was completed. Comparison states included Massachusetts, Pennsylvania, New Jersey, Wisconsin, and California. LIPA's programs were also included in the comparison.

The value of NYSERDA's PV incentive level matches or exceeds those available in other states' programs, however, the total funds available for PV are less than some other leading states. NYSERDA's incentives for small wind are comparable to those offered in other states, but are less than those offered in New Jersey. In contrast, ADG programs in California, Wisconsin, and Vermont offer significantly more favorable incentives than those offered for ADG systems in New York. In addition, New York's fuel cell incentives for small systems rank behind those offered in New Jersey and California.

S.5.2 Extent to Which RPS Incentives Make CST Technologies Economically Feasible for Consumer Purchase

For all technologies supported by the CST programs, investment is still only attractive to niche groups. For residential technologies, participants must have the discretionary financial resources to pay the unfunded portion to install systems. Commercial sector consumers are also interested in being "green" for customer relations benefits or to improve the environment, or both. However, according to installers interviewed for this assessment, the NYSERDA incentives are increasing market activity. Installers of wind, PV, and ADG systems reported that less than 10% of the current volume of installations would be occurring in the absence of the incentives.

S.5.3 Current Market Conditions

Market demand can be measured by the number of applications to the program, as well as the capacity size of the projects. According to NYSERDA's Program Performance Report through June 30, 2008, the PV incentive program has received by far the highest number of contract applications (92% of total applications received across all CST programs), while ADG projects with pending contracts represent the largest portion of the total capacity (68% of total capacity represented by pending contracts across all CST programs).[21] The average capacity of the PV projects (approved, completed, or applications received by NYSERDA) is 7.7 kW, with residential systems averaging 5.1 kW, commercial averaging 22.1 kW, and industrial averaging 41.8 kW. ADG systems average 347 kW and small wind systems average 11 kW. Only three fuel cell projects are pending: two of which are relatively large (300 kW) and one of which is small (5 kW).

Installers report that customers choose to install a renewable energy technology for a variety of reasons and that there is rarely one single reason that drives the decision. The reasons vary across technologies, but some of the top reasons include:

- It serves as a hedge against rising electricity prices;
- Renewables are good for the environment and help prevent climate change; and
- Consumers are fascinated with the technology.

It appears that the companies that install customer-sited renewables in New York tend to focus all of their business on the renewable energy sector (i.e., they do not have other lines of business, though there is some overlap with other clean energy-related areas of business activity). In regards to project financing (beyond the RPS program), program staff believe that many ADG projects on farms receive funding from the USDA farm bill, and other state-level conservation programs, while WWTP ADG projects are often funded through municipal bonds. For small wind and PV projects, program staff believes that projects receive funding through the NYSERDA loan program, while commercial customers seem to be increasingly using third party ownership models. In addition, schools can receive funding through the state education department and, in the past, non-profits could turn to fundraising. Also in the past, many fuel cells received additional financing through a U.S. Department of Defense program that has since elapsed.

For all technologies except fuel cells (for which net metering is not applicable), program managers and

[21] NYSERDA. 2008. *New York State Renewable Portfolio Standard Performance Report Program Period Ending June 2008*. Albany, NY: NYSERDA.

installers believe recent expansion of the State's net metering law will substantially improve market conditions, making project economics more favorable by providing an additional funding stream for PV, small wind, and anaerobic digesters on farms.

The top barriers to CST technologies vary somewhat by technology. However, some key barriers cut across all the technologies, including:

- Project economics / upfront costs;
- Customer awareness / knowledge;
- Program application process; and
- Policy deficiencies, such as the difficult permitting and siting processes in New York, the current Environmental Quality Review process, and lack of federal and state tax incentive certainty.

S.6 VOLUNTARY GREEN POWER MARKET ACTIVITY

The voluntary renewable market exists in the context of a restructured (or competitive) retail electricity market in New York. In this market, electricity customers can voluntarily choose to pay a premium to purchase green power through competitive electricity supply companies or utility/distribution company programs.

New York's RPS goal calls for 1% of the State's electricity supply to come from renewable energy sold through the State's voluntary renewable energy market, and the RPS program includes components meant to support the voluntary market. For example, the Main Tier's solicitations have specified that the percentage of a facility's generation that is bid into the RPS program can be as low as 30% and as high as 95% of the expected annual production of the facility. This range allows developers to sell the retained portion of their generation to other markets, such as the voluntary market. Three wind projects with New

York RPS contracts are retaining 60% of eligible production for sale to other markets, which may include the New York voluntary green power market.[22] In addition, the program allows a contractor to suspend the RPS contract to sell the attributes (i.e., RECs) into New York's voluntary market.

In addition to the RPS program elements, Executive Order 111 provides support to the voluntary markets by requiring New York State agencies to procure 20% of their electricity from renewable sources by 2010. Records indicate that state agencies achieved just over 80% of the 2007 target level of green power procurement.[23]

New York's electricity customers can purchase green power through competitive electricity supply companies or through utility/distribution company programs. According to surveys conducted by the DPS, 59,603 customers were enrolled in green power programs in New York as of September 2007, representing approximately 64,000 MWh of consumption annually. The DPS has also identified 19 different green power providers that are currently active in the State. Five of these providers were interviewed for this assessment.

These respondents report that awareness and interest in green power has grown since the RPS was introduced. This increase in awareness is not attributed to the RPS program, but rather to other factors, including increasing concern about climate change and a desire to be "green." Local large-scale wind is the preferred green power resource for New York consumers. Voluntary green power marketers report that the RPS market in New York increases the price of RECs sold into the voluntary market, because the RPS demand puts pressure on supply. However, the markets are different (the voluntary market may include RECs from projects not eligible for the RPS) and this effect is countered to the extent (extent unclear) that the RPS is also increasing supply available to the voluntary market by driving development of new projects.

The most critical barriers to voluntary market growth identified by green power providers include the lack of an appropriate attribute tracking and trading system, high REC prices and low consumer willingness to pay a premium for electricity, a lack of customer awareness, policy deficiencies, and insufficient marketing and sales efforts by green power providers.

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[22] NYSERDA. 2008. *New York State Renewable Portfolio Standard Performance Report Program Period Ending June 2008*. Albany, NY: NYSERDA.

[23] Ibid.

Developers interviewed for the market assessment universally expressed that the voluntary REC market is insufficient to drive large scale project development. Developers explained that they cannot depend on this market to fulfill their revenue requirements, because REC prices and procurement volumes are generally relatively low both in the New York and in the national voluntary REC markets.[24] The voluntary markets also do not provide long-term contracts, a critical ingredient for financing.

S.7 EFFORTS TO SUPPORT RENEWABLE ENERGY MANUFACTURING AND RELATED BUSINESS DEVELOPMENT IN NEW YORK

Because underlying goals of the RPS include building renewable energy markets and delivering economic development benefits to the State, the assessment included a high-level review of New York's efforts to grow the renewable energy business sector in the State, beyond just activity by project developers. In addition, the assessment included exploration of activities by renewable energy manufacturers in the State to date, and what others would be looking for in deciding where to grow their business.

NYSERDA's sponsorship of research and development and economic development programs appear to have some beneficial impacts on New York States' ability to build renewable energy businesses and a qualified workforce. For example, programs have helped train the workforce for renewable energy technologies, assuring customers that the product they are purchasing will perform as expected, because the workforce installing the technologies is highly trained and skilled. Other programs have helped firms gain more financing to expand their operations and to develop new technologies for green power applications. There are also opportunities for NYSERDA to offer new programs, including support for emerging wind technologies and further training of the workforce for ADG and fuel cell technologies.

No large-scale renewable energy manufacturers have chosen to locate in New York thus far. Two key factors detract from New York's ability to attract renewable energy manufacturers and distributors: (1) location on the East Coast, and (2) proximity to markets of scale. Facility siting decisions in the United

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[24] The voluntary REC market discussed here refers to the wholesale market for RECs outside of RPS compliance markets. This voluntary REC market supplies RECs used in retail green power products. However, it is important to note that there is a distinction between the voluntary market for RECs at the wholesale level (discussed in this section), and the retail green power market.

States have tended to focus on the middle of the country, because that is an ideal location for serving many U.S. markets. In addition, New York's current market is considered too small to justify a wind manufacturing or PV distribution facility. New York has, however, been home to a few companies in the business of manufacturing components for renewable energy systems. At least three companies with facilities in New York are manufacturing or distributing components for wind turbines.

Moving forward, opportunity remains in New York to encourage more companies to expand their existing product lines to include renewable energy-related equipment. Over 450 companies in New York are active in industrial sectors that could also supply the components needed for clean energy technology.[25] There are fewer hurdles associated with convincing a company to remain or expand in New York State compared to recruiting a new one to locate in the State. Identifying strategies for encouraging the development of market-worthy renewable energy technologies is an opportunity that the State should consider.

S.8 STEPS TO TRANSITION NEW YORK'S RPS TO A MORE MARKET-BASED SYSTEM

The PSC has required that the 2009 review of the RPS program will address the topic of planning for a more market-based system and progress toward a self-sustaining market. The current system is market-based in the sense that it provides a place for buyers (represented by NYSERDA and green power marketers or ESCOs) and sellers to exchange goods (i.e., RECs). A more market based system would be one with less government participation as a buyer. A self-sustaining market would be one that did not require state mandates or incentives for renewable energy. This assessment described the elements necessary to build a successful market-based system, and explored the extent to which New York's renewable energy market currently possesses these elements. The assessment also addressed a variety of topics of interest to NYSERDA which have a bearing on the State's efforts to build a more market-based system, and to ultimately achieve self-sustaining renewable energy markets.

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[25] Blue Green Alliance and The Renewable Energy Policy Project, *New York's Road to Energy Independence*, Summary Report: New York, 2007, http://www.bluegreenalliance.org/site/c.enKIITNpEiG/b.3417259/k.BD27/Links.htm.

S.8.1 Elements Necessary for Achieving a More Market-Based System to Support Renewable Energy Growth

Based on interviews with stakeholders in the New York marketplace, as well as secondary research, the most fundamental elements necessary for achieving a more market-based system to support renewable energy development, and to ultimately foster a self-sustaining market for renewable energy in New York are:

- Long-term market certainty;
- Open, liquid markets, wherein there is a diversity of buyers and sellers, frequent occasions for transactions, and market participants have the flexibility to negotiate contract terms that suit the characteristics of each deal;
- Limited barriers to participation;
- The existence of market drivers (supply and demand) sufficient to achieve the target level of market activity; and
- Transparency of market data, such as winning bid prices.

These elements are key characteristics found in most any successful market-based system, and they are important for growing New York's renewable energy marketplace as well. It should be noted that there can be tension between the interests of developers and ratepayers. Increased transparency of market data can benefit developers at the expense of ratepayers, if it results in higher prices.

S.8.2 New York's Progress Toward Achieving Self-Sustaining Renewable Energy Markets

Research done for this assessment indicates that the New York renewable energy markets have made progress toward achieving self sustaining renewable energy markets. Some indicators of the State's progress to date include the fact that a substantial amount of renewable energy projects are getting built in New York in response to the RPS demand. The CST of the RPS is also achieving strong results, though the program is substantially limited by budget constraints. In addition, continued growth in New York's voluntary green power market is a favorable indicator for renewable energy market growth more broadly. NYSERDA's industry development efforts and the implementation of Regional Greenhouse Gas Initiative (RGGI) regulations will also help advance New York's renewable energy market.

While New York has made important progress in its efforts to lay the groundwork for self-sustaining renewable energy markets, the state still has a long way to go toward achieving a self-sustaining market. It should be recognized that these processes take time due to the length (18 to 24 months) it takes to build out projects, and NYSERDA is still in the early stages of its program. A number of factors currently limit the State's ability to realize its market growth potential over the long-term. Key elements of a market based system (summarized above) will help New York move closer to a self-sustaining market, but are not fully present in the market at this time. Interview results from the full range of stakeholders indicate that it is far too early for New York's renewable energy markets to sustain themselves in the absence of state level incentives. This is due to a variety of factors both within and outside the control of NYSERDA as the central procurement administrator and/or state government in general, or is beyond New York State.

S.8.3 Remaining Challenges and Opportunities

Some key issues that are likely to affect renewable energy market activity in New York going forward include:

- Potential for REC prices increases in the future – this is uncertain, but future budgets should reflect this possibility;
- Transmission capacity constraints;
- Siting and permitting;
- Lack of an appropriate attribute tracking and trading system;
- Interaction of RPS with RGGI and potential national carbon markets;
- Expanded net metering laws; and
- Complementary role of demand-side management and energy efficiency initiatives (e.g., Energy Efficiency Portfolio Standard).

S.9 KEY FINDINGS AND RECOMMENDATIONS

The Main Tier component of New York's RPS has played a critical role in facilitating large-scale renewable energy development in the State since the RPS was adopted in 2004. The CST of the RPS has made strides in developing the markets for small-scale renewables as well, though the impact of the CST programs has, to date, been limited by budget constraints and previously unfavorable net metering policies.

S.9.1 Key Findings and Recommendations for the Main Tier RPS Program

The greatest strengths of the Main Tier RPS program, with respect to building renewable energy markets, include:[26]

- Long-term contracts;
- New in-state project development;
- Ability to leverage non-funded capacity growth; and
- Optimal use of finite program funds.

The primary limitations of the Main Tier RPS program with respect to building renewable energy markets include:

- Uncertainty about the scale and timing of future RPS solicitations (reducing this uncertainty will help developers get established in the State);
- Uncertainty about the volume of RECs to be purchased in a given procurement;
- Lack of transparency related to REC pricing (i.e., limited of visibility of REC prices, other than average for a procurement);
- Uncertainty about long-term demand for renewables in New York;
- Lack of market liquidity;
- Lack of funding flexibility to respond to changing market conditions; and
- Poor conditions for fostering resource diversity – the program does not foster emerging technologies (this would likely entail higher cost).

[26] Program process-related issues are discussed in a separate report on program process and impacts.

Based on these key findings, some overarching factors for the PSC and NYSERDA to consider in decision-making related to the RPS program and renewable energy markets in the State more broadly include:

1. ***New York's competitiveness relative to other states*** that are also aggressively pursuing renewable energy market growth;
2. ***Market certainty;***
3. ***Conflicting interests of developers and ratepayers*** may mean that a better market for developers comes at higher cost to ratepayers; and
4. ***Potential future changes in market conditions***, specifically the potential for national greenhouse gas regulations and the effects of changing financial markets.

Table **1** links recommendations for advancing large-scale renewable energy development in the State with the list of key elements necessary to achieve a more market based system to support renewable energy growth.

Table 1. Summary of Key Elements for a Market Based System and Corresponding Recommendations

Key Elements	Recommendations
Long-Term Market Certainty	• Define State's long-term goals and objectives for the future of renewable energy growth, beyond those already in place for 2013. • Establish the funding and oversight mechanisms needed to achieve those targets. • Provide a schedule for future RPS procurements.
Open, Liquid Markets	• Consider options for facilitating the development of a robust secondary market for RECs in the State, with due consideration of ratepayer costs. For instance, allowing procurements for REC shortfalls on a short term basis between procurement cycles to make up contract shortfalls.. • Adopt an attribute tracking system that is compatible with those in place in the ISO-NE and PJM control areas.
Limited Barriers to Participation	• Implement strategies to address transmission capacity constraints, building on models in use in other states. • Address siting and permitting issues by adopting an Article X siting law, developing criteria for more objectively evaluating visual and noise impacts of wind projects, highlighting areas of the State that welcome renewable energy development, conducting community outreach, and monitoring approaches used in other states. • Develop attribute tracking system that is compatible with those in neighboring regions.
Market Drivers Sufficient to Achieve the Target Level of Market Activity	• Sustain demand for RECs by defining State's long term renewable energy goals and objectives, and establishing funding and oversight mechanisms to ensure those targets are met. • Encourage long-term policy stability at the federal level to provide a more favorable investment environment. • Encourage more companies to expand their existing product lines to include renewable energy-related equipment.
Transparency	• Provide market participants with information about the total funding available in a given solicitation. • Provide more data on past program outcomes, while weighting ratepayer interests to avoid potential for gaming • Register facilities as "RPS eligible in New York" and post lists of eligible facilities. • Foster development of a secondary market for RECs that would result in another source of data on REC transactions.

Source: Summit Blue Consulting

S.9.2 Key Findings and Recommendations for CST Programs

The greatest strengths of the CST programs are:

- Project-level incentives;
- Aspects of program design (training of PV installers and code officials and the performance based aspect of the ADG incentive); and
- Program marketing.

The greatest weaknesses of the CST RPS programs are:

- Program application process and approval; and
- Limits on capacity of systems eligible for incentives.

The most significant recommendations for advancing the CST programs relate to increasing program budgets and simplifying program procedures. Key topics addressed in recommendations for the CST programs include:

- Increase program budgets;
- Simplify and streamline program processes;
- Adjust format for some program incentives; and
- Improve permitting conditions for small wind systems.

Section 1

INTRODUCTION

NYSERDA is required to present the New York Public Service Commission (PSC) with an evaluation report addressing New York's RPS program results through the end of 2008. In support of this evaluation effort, Summit Blue Consulting and its affiliates performed a market conditions assessment to help NYSERDA and the State understand the current state of the market and the role the program has played in the market since its inception. This report presents findings from this market conditions assessment.

Findings from this assessment, together with a program impact evaluation being conducted simultaneously, will inform NYSERDA's March 2009 evaluation report to the PSC. The PSC will use the 2009 evaluation report to track program progress, and to determine what, if any, program changes are necessary to fulfill the 2013 RPS targets.

1.1 RESEARCH ISSUES

Research issues were identified through discussion with program staff. Refinements were made based on input from Summit Blue and through NYSERDA's efforts to clearly define the roles of the impact and market conditions evaluation contractors. Based on input from NYSERDA staff, the following high priority research topics were identified:

- Comparison of New York's renewable energy credit (REC)[27] prices to other states;
- External factors affecting REC prices (i.e., availability and cost of supplies and labor);
- Financial factors affecting REC prices (i.e., emerging energy hedging arrangements);
- The effect of program design elements on REC prices (i.e., requiring in-state delivery, weighting the local economic development benefits of a project at 30% in the selection process, etc.);
- Elements necessary to achieve a more market-based approach to support large-scale renewable energy project development; and
- Main Tier program influence on the development of large-scale projects in New York.

[27] RECs represent the environmental attributes of renewable energy. They have a value that can be separated from the electricity.

1.2 PROJECT APPROACH

Data gathered through interviews with program staff and market participants, as well as a review of available primary and secondary data sources, were used to assess the New York markets for large-scale and customer-sited renewable energy applications. The goal was to describe current market conditions, changes that have occurred in the marketplace since the program's inception, and the program's progress in facilitating the development of a more market-based system for supporting renewable energy development in the State. Key components of the approach to completing this market characterization and assessment included the following:

- A set of **market indicators** were established to guide the assessment process. The indicators consist of key data points that inform one's understanding of the status of the market. These indicators were used as the basis for developing interview guides, and findings related to these indicators are discussed throughout this report.
- To **assess New York's progress relative to "peer" RPS initiatives in other states**, comparison data were gathered for items such as REC pricing and incentives offered for customer-sited renewables, and reviewed the overall structure of RPS policies in a select set of states. Careful attention was paid to the selection and discussion of peer state comparisons, recognizing how different states' policies / market rules and geography can have substantial effects on REC market pricing, RPS compliance costs, project finance, etc.
- Input from market actors and secondary sources was used to analyze the **influence the RPS program and external forces are having on the marketplace**.
- To examine an effect the RPS Program may be having on the broader energy marketplace, **the extent to which Program-funded projects are suppressing market prices for natural gas and electricity was estimated**.

Summit Blue's assessment focused most heavily on the Main Tier component of the RPS and the market for large-scale renewable energy development in the State, because the Main Tier component comprises 81% of the program targets. The assessment also examined elements of the CST programs and the voluntary green power market in New York, though less emphasis was placed on these aspects of the evaluation.

1.3 ORGANIZATION OF THE REPORT

This report is organized as follows:

Section 1: Introduction provides an overview of the project approach and research issues addressed through the assessment. It also presents a brief summary of the RPS program.

Section 2: RPS Program Background describes the primary components of RPS program.

Section 3: Data Collection Sources and Methods summarizes primary and secondary data collection methods and activities.

Section 4: Main Tier RPS Program- Wholesale Renewable Energy Market Conditions focuses on the Main Tier component of the RPS, and topics related to the markets for large-scale renewables in New York. This section presents findings from the most substantial components of the work conducted for this assignment. The section discusses the history of renewable energy markets in New York, as well as current market conditions. The review of current market conditions provides summaries of: current sources of renewable energy supply in New York, the presence and level of market activity by various market participants, barriers to large-scale project development, the influence of the RPS program on large-scale project development, and summaries of RPS policies and experiences in other key states. Several topics related to REC prices are also discussed in this section.

Section 5: CST RPS Program- Renewable Distributed Generation Market Conditions presents findings from the assessment of the CST programs. It includes summaries of market prices for technologies receiving CST incentives, as well as a comparison of New York's incentives with those offered by other key states. The section discusses the role the Customer Site Tier programs are playing in improving the affordability of the technologies they support. The most substantial component of this section is the discussion of current market conditions.

Section 6: Voluntary Market Activity provides a summary of developments in the voluntary market since the RPS was introduced, and discusses the role of the voluntary market in driving the development of large-scale renewable energy projects in New York.

Section 7: Efforts to Support Renewable Energy Manufacturing and Related Business Development in New York discusses New York's efforts to attract clean energy businesses to the State, and examines the factors most important to renewable energy manufacturers when evaluating potential locations for expanding their operations.

Section 8: Steps to Transition the RPS to a More Market Based Approach discusses a variety of topics related to the future of renewable energy markets in the State and the ultimate long-term goals for the RPS. Topics include the elements necessary to achieve a more market-based system to support large-scale renewable energy development, New York's progress toward achieving self-sustaining renewable energy markets, and the potential for voluntary green power markets to support large-scale renewable energy development.

Section 9: Key Findings and Recommendations presents an overview of the major outcomes of the research.

Section 2

RPS PROGRAM BACKGROUND

In September 2004, the PSC issued an order calling for an increase in the portion of renewable energy included in the State's retail electricity mix from a baseline of 19% to 25% by 2013, including 1% from the voluntary renewable energy market. The 2004 Order set specific renewable energy supply targets for each year from 2006 through 2013. It also laid out a two-tier, central-procurement program structure to be administered by NYSERDA.

The 2004 Order also established a volume-based RPS surcharge to be paid by all retail customers that pay the System Benefits Charge (SBC). A schedule of surcharge collections was set for each utility, with a collection amount totaling $741 million from 2006-2013.[28]

An April 2005 order established an implementation plan and set forth procedures for future procurements, program monitoring, and determining eligibility. Subsequent orders have addressed a variety of related issues.

The RPS program consists of the following two tiers:

1. **Main Tier**: This program provides incentives for development of wholesale renewable energy supply. NYSERDA pays production incentives to renewable energy generators for the RECs associated with each MWh of delivered energy. Generators are selected through competitive procurements, and generally enter into ten year contracts. The first Main Tier solicitation was a fast-track effort conducted in 2004 to avoid the lost opportunity created by the expiration of the federal production tax credit for wind generators (all contracts were scheduled to begin January 1, 2006). The first solicitation, RFP 916, was issued in late 2004 and resulted in contract awards in early 2005. The second, RFP 1037, was issued in late 2006 and contract awards were made in early 2007. The third solicitation, RFP 1168, was issued in the fall of 2007 and contract awards were made in early 2008. Through these three solicitations, a total of 30 new renewable energy projects have secured contracts. Over half of these

[28] This budget reference excludes any LIPA collections. State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004.

projects are currently operating, and the remainder are under construction. These projects will collectively produce 3.5 million MWh of renewable energy annually.[29]

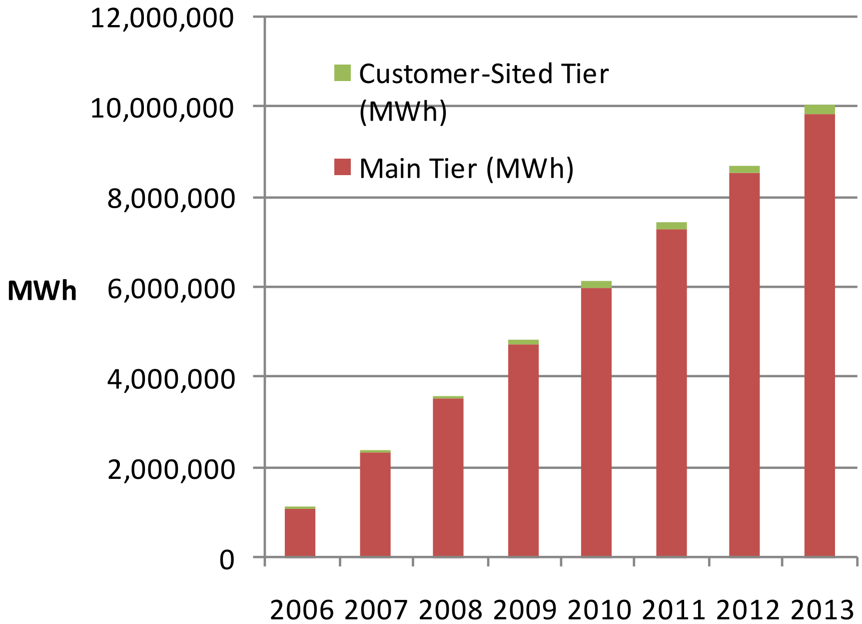
2. **CST**: An outgrowth of the **New York Energy $mart**[SM] Program, this program is intended to ensure that distributed sources of renewable energy continue to help diversify the State's energy mix and reduce the need for distribution system upgrades. Eligible technologies include fuel cells, photovoltaics (PV), small wind projects (300 kW or less), and anaerobic digestion of animal manure and food wastes. A complete implementation plan for the CST program was issued in February 2007, and full transition from the **New York Energy $mart**[SM] Program to the CST program took place in 2007. Incentives are provided to project owners in the form of rebates and production-based incentives, depending on the technology. Over 62,000 MWh of renewable energy will be produced from projects either under contract, or with contracts pending under the CST programs.[30]

Figure 3 shows cumulative RPS energy targets for the two Tiers, as specified by the September 24, 2004 Order.

[29] NYSERDA. 2008. "New York State Renewable Portfolio Standard Performance Report, Program Period Ending June 2008."

[30] Ibid.

Figure 3. NYSERDA RPS Energy Targets for 2006-2013 Period



Source: June 2006 NYSERDA Report.

In addition to the components of the RPS for which NYSERDA is responsible (Main Tier and CST), the PSC also set forth expectations for growth in renewable energy sales to occur through the voluntary market and, as a result of Executive Order 111,[31] related procurements by state agencies.[32] These targets are minimal in comparison to those associated with the Main Tier of the RPS. The RPS target for the voluntary market for 2013 is for sales through this market to equal 1% of the total retail sales in that year. The expectation for Executive Order 111 is for renewable energy sales to state agencies to equal approximately 0.2% of the total retail sales in 2013. Though not under the jurisdiction of the PSC, the Long Island Power

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[31] Executive Order 111 requires New York state agencies to procure 20% of their electricity from renewable sources by 2010.

[32] Expectations for growth in renewable energy sales through the voluntary market and through Executive Order 111 procurements are included in the 25% overall renewable energy target for 2013, but are not included in the "increment target" value in the Public Service Commission's RPS Order. State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004.

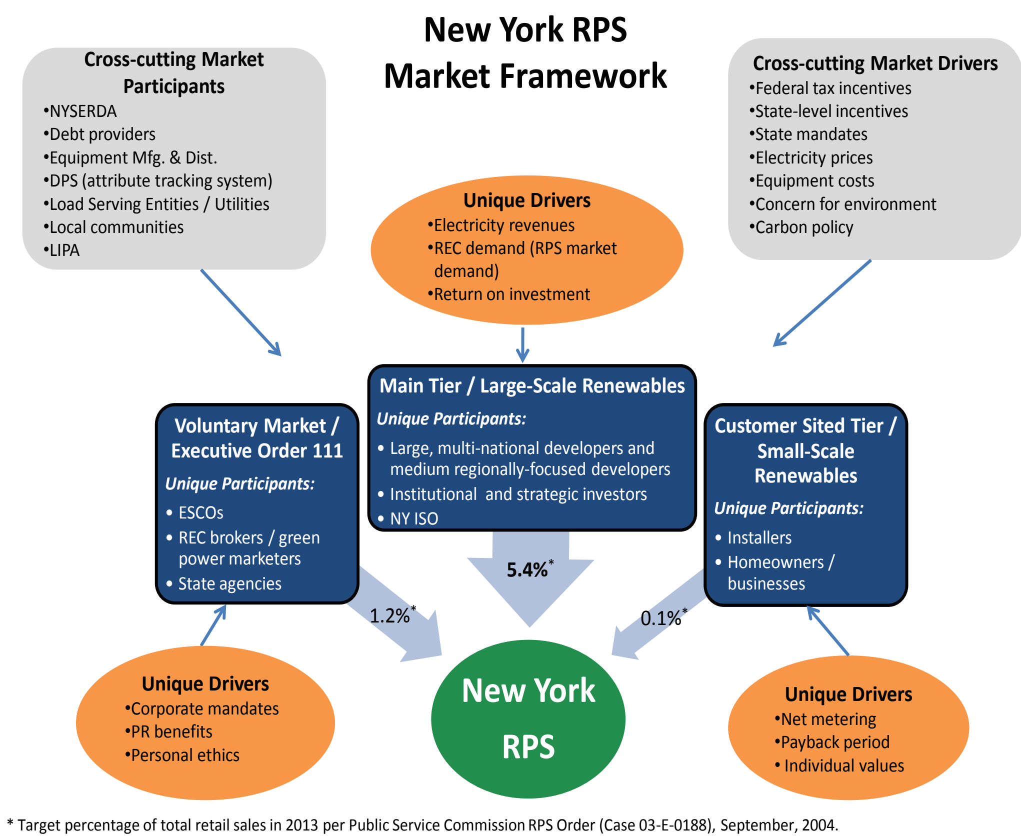
Authority (LIPA) and the New York Power Authority (NYPA) were also expected to take actions to increase renewable energy supply.[33]

To be considered eligible, a facility must have first commenced commercial operation on or after January 1, 2003. Customer-sited resources have to be installed on or after January 1, 2003. A limited vintage exception is provided for certain hydroelectric, wind, and biomass resources ("maintenance resources") that demonstrate the need to receive RPS financial support to continue operations.

Figure 4 provides an overview of the New York RPS market, showing the key market participants and market drivers associated with each of the three primary market components: the Main Tier RPS / large-scale renewables market, the CST RPS / small-scale renewables market, and the voluntary market. Discussion of the market participants and market drivers is included in later Sections 4, 5, and 6 of the report.

[33] State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004.

Figure 4. New York RPS Market Framework



Source: Summit Blue Consulting

Section 3

DATA COLLECTION SOURCES AND METHODS

Both primary and secondary data collection activities were conducted. Data collection activities were closely coordinated across the Summit Blue market conditions research team and the KEMA impact evaluation team that was working in parallel. The overarching goals for our primary data collection activities were to:

- Gather a diverse set of perspectives on the market;
- Learn from the experiences of actual market participants;
- Leverage existing data sources; and
- Conduct effective, efficient communications with market participants.

Primary data collection activities consisted of in-depth telephone interviews with a broad set of renewable energy market participants, as well as a review of NYSERDA program data, data from programs in other states, data on incentives available in other states, and trade association data on renewable energy development activity.

The focus of the interview effort was on market participants that have an existing or potential relationship with the Main Tier component of the RPS program or with utility-scale renewable energy development in the State more broadly. These players include wind, biomass, landfill gas and hydro project developers (both non-participating developers and program participants), the financial/investment community, equipment manufacturers and distributors, voluntary green power marketers, Load Serving Entities (LSEs), and NYSERDA program staff. Interviews were also conducted with representatives from the agencies administering RPS policies in other states to facilitate comparison of the New York RPS experience and policy structure to those in other states, with an emphasis on large-scale renewable energy development.

In-depth interviews were conducted with market participants closely related to the CST programs of the RPS as well. Because the CST was less of a focus for the evaluation, a more limited set of market participants related to these programs were interviewed. Interviews were conducted with a small sample of installers representing each of the technologies funded by the CST programs, as well as program staff for each of the CST programs.

Table 2. Summary of Surveys and Interviews

Market Actor	Targeted Completions	Actual Completions	Percent Complete	Comments on Completed Interviews
Participating developers	21	18	86%	Ten winning bidders and eight non-winning bidders
Non-participating developers	6	9	150%	Three onshore wind, two offshore wind, two biomass, one landfill gas, one tidal power
Representatives from the financial community	4	4	75%	One debt provider, two equity providers, one other
Equipment manufacturers and distributors	7	7	100%	Four wind, three solar
RPS administrators in other states	5	4	80%	California, Massachusetts, New Jersey, Pennsylvania
Installers of CST technologies	7	7	100%	Two ADG, two solar, two wind, one fuel cell
Voluntary green power marketers	7	7	100%	N/A
Distribution companies and NYISO	8	8	100%	Spoke with one representative from each major utility, and the NY-ISO
NYSERDA program staff	10	10	100%	Spoke with RPS Program staff (Main Tier and each of the CST technologies) and administrators of manufacturer/industry incentive programs
Representatives from municipalities hosting renewable energy projects, and citizen groups	9	11	122%	Five municipal representatives, one landowner, five citizen groups
Trade associations	5	6	120%	N/A
Total	89	91	102%	

Source: Summit Blue Consulting

In-depth interviews consisted of questions covering a diverse set of topics related to program design, project finance, key market drivers, changes in market conditions, barriers to project development, and market experience in other states. Interviews were typically one hour in length. Samples of three of the interview guides used for the assessment are included as Appendices A, B, and C.[34]

Secondary data sources were used to supplement the primary data collection efforts. Relevant policy studies, evaluation reports, and other key documents that provided necessary background for conducting the market assessment were reviewed.

The primary data collection effort was completed before the onset of the credit crisis at the end of September 2008. Available data from secondary sources regarding the effects of the crisis on renewable energy markets as of the date of this report have been considered.

[34] Fifteen different guides were used in the assessment. The questions included in each guide were based on a similar set of themes. The full set of guides has not be included in this report, but is available from NYSERDA upon request.

Section 4

MAIN TIER RPS PROGRAM- WHOLESALE RENEWABLE ENERGY MARKET CONDITIONS

This section focuses on the Main Tier component of the RPS and topics related to the markets for large-scale renewables in New York. It begins with the history of renewable energy markets in New York, as well as current market conditions.

4.1 HISTORY OF RENEWABLE MARKETS IN NEW YORK STATE

4.1.1 Baseline Pre-RPS Market Conditions

The PSC intended the New York RPS to build on what was already a strong renewable energy presence in New York. This section discusses the pre-RPS renewable energy development activity and installed capacity, pre-RPS level of activity by market actor and technology, and pre-RPS NYSERDA financial incentive programs for wholesale renewable energy.

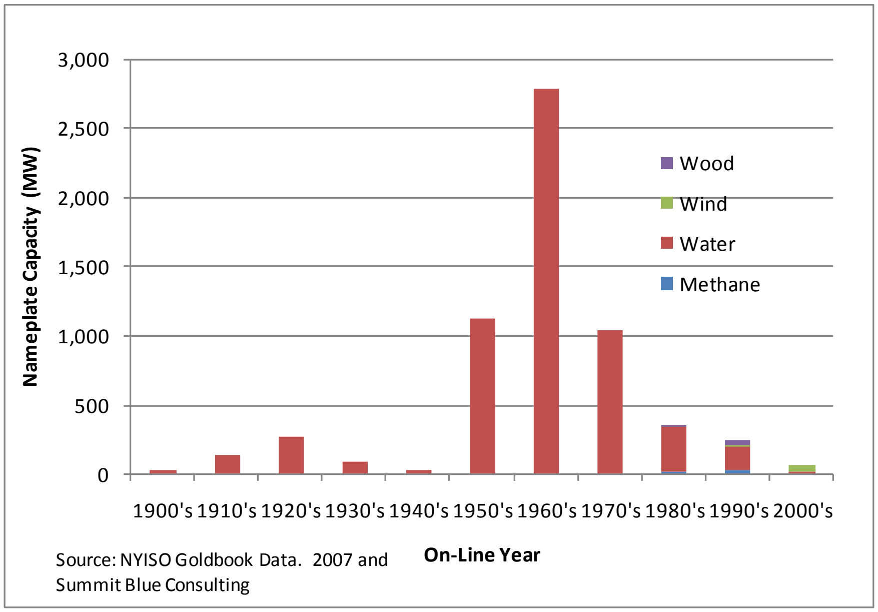
4.1.1.1 Pre-RPS Renewable Energy Development Activity and Installed Capacity. At the time of the PSC Order Regarding Retail Renewable Standard in 2004, about 19.3% of the electricity retailed in New York State was derived from renewable resources, reflected in the PSC's use of this value for renewable energy supply. There were nearly 400 renewable energy facilities, primarily hydro, representing approximately 6 GW of installed renewable energy capacity in New York and delivering over 29,000 GWh.[35]

The oldest operating renewable facility in the state is the Effley 1, a 0.4 MW hydro unit installed in 1902, early in the history of electric utilities (Thomas Edison's development of the long-lasting incandescent

[35] NY ISO *Goldbook.* 2007. Summit Blue Consulting analysis.

filament was in 1878). As can be seen in Figure 5, this began a long era of hydro development. Prompted by the rapid rise in electricity demand and the rich potential of hydro power in the state, renewable development reached an early peak in the 1920s. Development then subsided with the onset of the Great Depression and World War II. The 1950s to the 1970s were the second peak period of renewable development, thus far the greatest, with almost five GW of renewable capacity added.

Figure 5. Pre-RPS Renewable Energy by On-Line Year



The hydro development tapered off in the 1980s and 1990s as remaining, untapped watersheds became fewer and began being protected by wilderness designation and other land-use restrictions. Many of the small hydro projects built in this period came on-line with contracts signed following the Public Utility Regulatory Policy Act (PURPA) in 1978,[36] which required utilities to buy power from qualifying renewable generators.

The 1990s saw a small quantity of wood- and methane-fueled capacity added (41 and 21 MW, respectively). Many of these facilities were built with the help of long-term contracts signed in the 1980s after passage of PURPA. As these contracts expire, many of these existing sources of renewable energy

[36] State of New York Public Service Commission. Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard. Case No. 03-E-0188. Comments of Small Hydroelectric Facility Owners. September 26, 2003.

look to alternative sources of revenue to sustain ongoing operating and maintenance costs. Only a negligible amount of wind capacity was added (0.2 MW).

More recently—since 2000, but prior to the PSC's passage of the New York RPS in September 2004—wind began to be added. Three commercial-scale wind farms were built in New York before the RPS was in effect: the 6.6 MW Wethersfield project and the 11.6 MW Madison project came online in 2000, and the 30 MW Fenner project became operational in 2001.[37] All three were supported with public benefits funding (through Niagara Mohawk for Wethersfield, through NYSERDA for Madison and Fenner). A few additional projects were in the planning stages.

Renewable projects in place before the RPS were distributed around the State, as can be seen in Figure 6. A few projects, mostly small methane-fueled plants, were located in the New York City and Long Island region.

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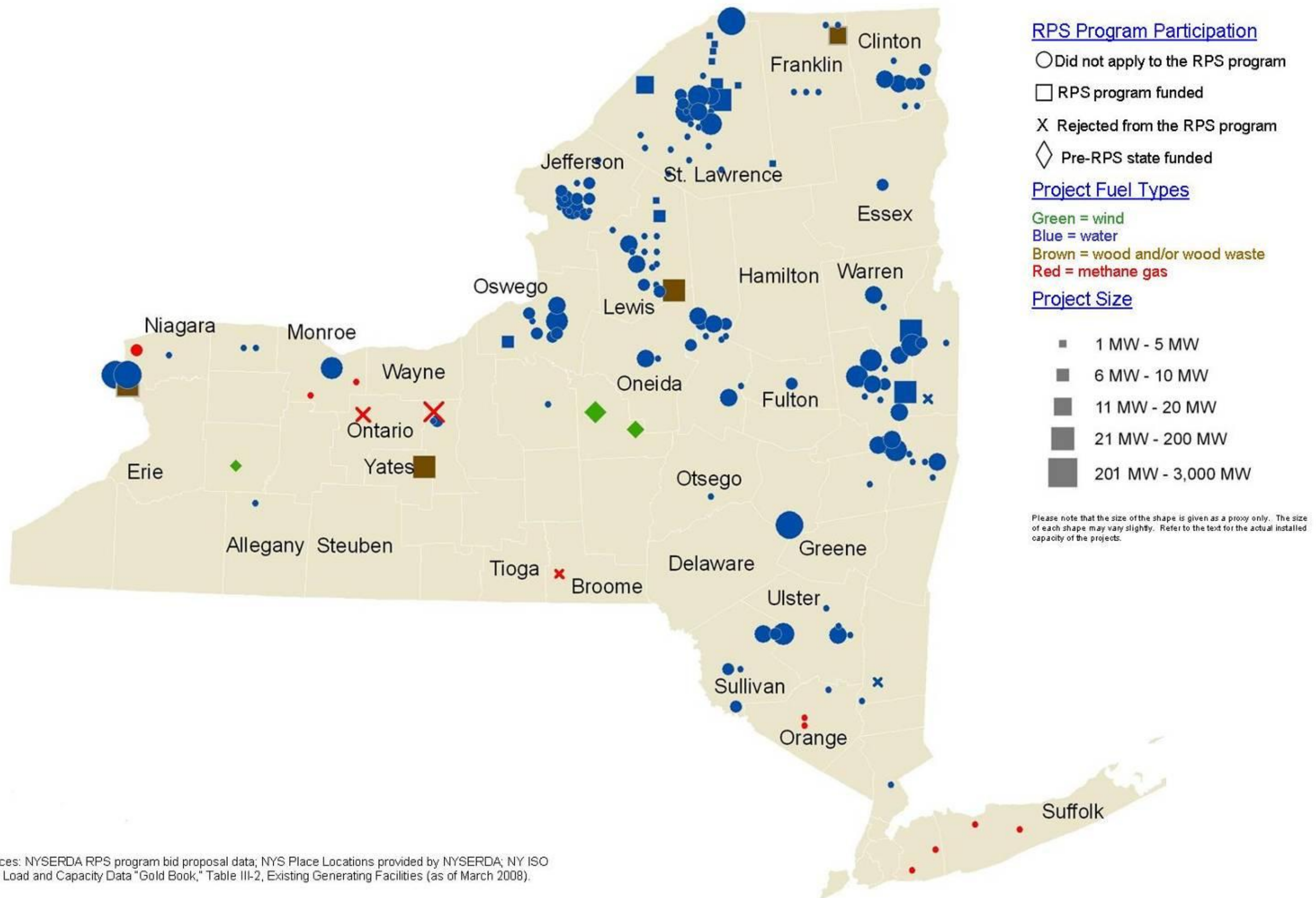
[37] American Wind Energy Association, "Resources: Projects", (http://www.awea.org/projects/projects.aspx?s=New+York)

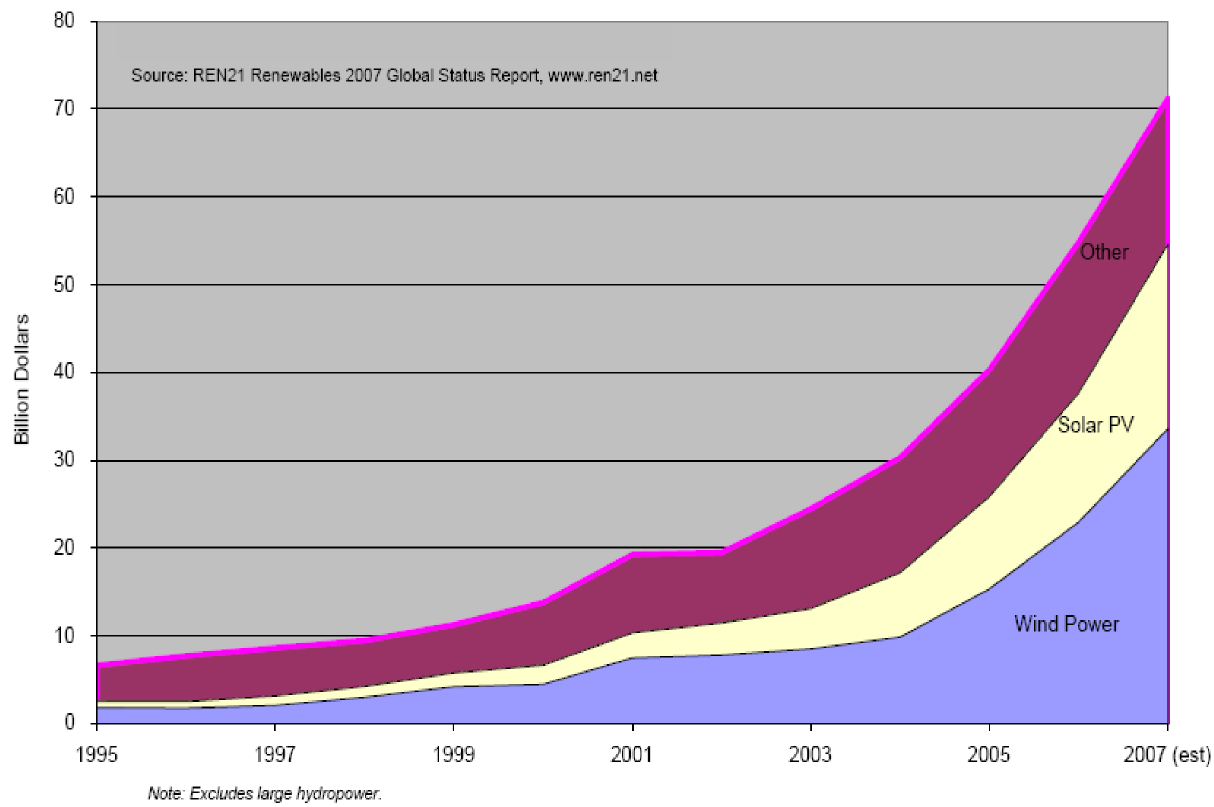
Figure 6. **Pre-2005 Renewable Energy Projects**



Source: NYSERDA and Summit Blue Consulting.

4.1.1.2 <u>Pre-RPS Level of Activity by Market Actor and Technology</u>. As was seen in Figure 5, before 2000, renewable development in New York was almost entirely hydro. During 2003 and 2004, the renewable energy market was in the midst of a rapid transition. Early in 2003, the renewable energy industry was using in-house financing structures. The market was fragmented; many small renewable energy developers dotted the landscape. As seen in Figure 7, the global investment in renewable energy changed trajectory in 2004; the industry was beginning to grow rapidly due in part to RPS. Spurred on by the recognition of this opportunity, many actors with opportunities in the renewable energy industry began to focus more attention on the market.

Figure 7. Global Annual Investment in New Renewable Energy Capacity, 1995-2007



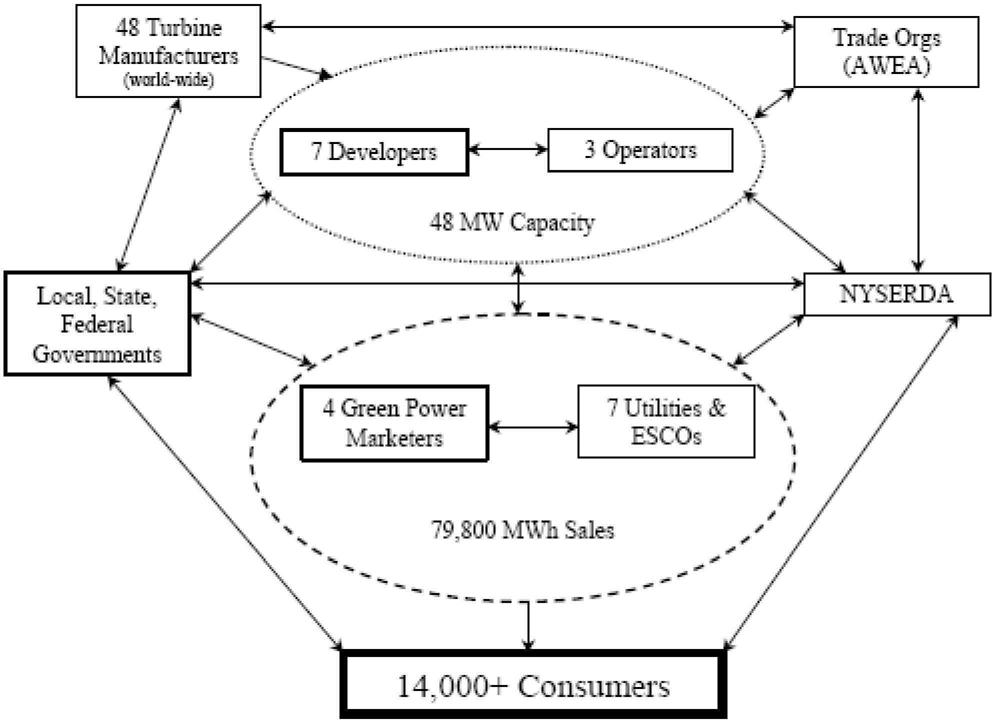
Source: Renewable Energy Policy Network for the 21st Century, *Renewables 2007: Global Status Report*, Paris: REN21 Secretariat and Washington, D.C.: Worldwatch Institute, 2008, www.ren21.net.

Most of the market growth in New York was focused on grid-scale wind development.[38] As a result, characterizing the market for grid-scale wind received more attention than efforts to characterize markets for biomass or hydro. The bulk of this discussion will focus on the market actors involved in the market for grid-scale wind.

Wind-Related Market Activity. Fewer than a dozen separate developers and operators were involved in the New York market prior to the adoption of the RPS. The operators focused on the three wind projects that were in operation prior to the RPS: Madison Wind Power, Weathersfield Wind Power, and Fenner Wind Power; together, these facilities accounted for 48 MW of capacity. Figure 8 summarizes the major segments in the wind industry in New York in 2003. Table 3 summarizes the characteristics of these players at the end of 2004.

[38] The best source of information about this timeframe is a market assessment by Summit Blue Consulting and Skumatz Economic Research Associates. The market assessment focused on the market for grid-scale wind resources during the year before the RPS was adopted by the PSC. The data were collected in 2003 and early 2004; the report was published in June 2004. Thus, the information about the *New York* market for grid-scale wind before the adoption of the RPS is taken from this report, although it did not cover all of 2004. Dan Violette et al., *Wholesale Renewable Energy Program Phase 1 Market Characterization, Assessment, and Causality (MCAC) Evaluation* (prepared by: Summit Blue Consulting and Skumatz Economic Research Associates, Inc., prepared for: NYSERDA, Project Number 7721, June 2004.

Figure 8. **Major Segments of the 2003 Wholesale Wind Energy Market**



Source: Dan Violette et al., Wholesale Renewable Energy Program Phase 1 Market Characterization, Assessment, and Causality (MCAC) Evaluation (prepared by: Summit Blue Consulting and Skumatz Economic Research Associates, Inc., prepared for: NYSERDA, Project Number 7721, June 2004.

Table 3. Wind Developers and Operators Active in New York During or Before 2004

Wind Developers and Operators	Parent Company (2004)	Location of Parent Company	Subsidiary U.S. Wind Portfolio (2004)
Atlantic Renewable Energy Corporation	None	U.S.	132 MW
Zilkha Renewable Energy	None	U.S.	85.25 MW
Jasper Energy	None	U.S.	0 MW
Global Winds Harvest	None	U.S.	0 MW
Enel North America	Enel S.p.A.	Italy	36.6 MW
Ontario Power Generation	None	Canada	0 MW
EHN Group-North American Renewables	EHN Group	Spain	74 MW
SeaWest Windpower	None	U.S.	647 MW*
Eurus Energy America	Eurus Energy Holdings Corporation	Japan	41 MW

*SeaWest's portfolio includes those projects that SeaWest has developed, owned, or operated. The company takes on a variety of roles from project to project.

** Figure 8 indicates that seven developers and three wind plant operators were active in the state of New York prior to the adoption of the RPS, and this table shows only nine firms. The Violette et al. report lists only nine firms that were active in the market at the time; presumably one of these was active in both developing and operating projects, but it is not clear which one it was.

Sources: Most project-related information can be found at www.awea.org/projects. Information about each company's structure was found on the companies' websites..

What is notable about these market actors, relative to today, is that the U.S. based companies are the majority, while the internationally-based companies are just beginning to get involved in the U.S. market. U.S. based developers were responsible for building the market momentum, taking advantage of their proximity to markets (and associated lower costs). Once the momentum had begun to build, international firms began to show interest in this market; these data show that the transformation had already begun by the end of 2004.

In addition to developers, some small manufacturers and distributors of wind equipment were also active in New York by the end of 2004. Five companies in New York manufactured or distributed components of turbines or entire turbines, as shown in Table 4. For the most part, the renewable energy products were additions to these companies' existing product lines and did not make up a significant amount of their business. None of these facilities had located in New York with the sole purpose of serving the State's renewable energy market, yet they were able to leverage existing facilities to serve the growing need for renewable energy.

Table 4. Manufacturers and Distributors of Wind Equipment Located in New York, 2004

Company Name	Location	Components Produced (2004)
Hilliard Corporation	Elmira, NY	Brakes, Complete Wind Turbine
Hitachi America, Ltd.	Tarrytown, NY	Generators, Power Electronics
Innovative Metal Products	Kenoza Lake, NY	Towers
Peerless Winsmith, Inc.	Springville, NY	Gear Boxes
Telecom and Energy Cables	Floral Park, NY	Balance of System

Source: G. Sterzinger and M. Svrcek, *Wind Turbine Development: Location of Manufacturing Activity,* Renewable Energy Policy Project Technical Report, September 2004.

Finally, the types of structures used to finance wind deals were in the midst of a sea change prior to the implementation of the RPS. In the U.S., 2003 marked a transition from a market dominated by strategic investors to one dominated by institutional investors.[39] From 1998-2002, most wind development was funded by corporate capital, and the deals were almost exclusively equity-based.[40] Few of these projects were larger than 100 MW.[41] Most of these projects were sold by the developer prior to construction, because the developers were not well-enough capitalized to fund the construction. As a result, the companies that bought these projects took on construction risk and sought returns on their investments commensurate with the (higher) risks that they accepted. These investors purchased the projects, because they had a strategic interest in the wind sector; thus, they are referred to as "strategic investors."

In 2003 and 2004, the market started to shift slightly as more projects approached and passed the 100 MW threshold. While most projects during this time still used capital from strategic investors, a broader spectrum of sponsors became interested in investing in wind energy. Capital from institutional investors (e.g., commercial banks and lenders) started to appear in some project capitalizations in the form of both equity and debt.[42] The equity component of these investments often took advantage of tax benefits, such as those provided through the production tax credit (PTC). These structures allowed the tax equity owner to monetize the PTC during the near-term and then transfer ownership to another party; these structures were called "partnership flips." Debt continued to be used sparingly, both because it had the tendency to delay

[39]John P. Harper et al., *Wind Project Financing Structures: A Review and Comparative Analysis,* Lawrence Berkeley National Laboratory, September 2007.

[40] Ibid.

[41] American Wind Energy Association, Project, www.awea.org/projects.

[42] John P. Harper et al., *Wind Project Financing Structures: A Review and Comparative Analysis,* Lawrence Berkeley National Laboratory, September 2007

transactions and because it added a level of complexity that could scare off investors. When it was used, the debt helped to bring project returns up to an acceptable level.

The fact that conservative institutional investors had already begun to consider investments in wind energy by 2003 and 2004 indicates that the wind industry was perceived as a lower risk than it had been in the past. Tax benefits are similar to bonds offered by the federal government; there is a near guarantee on that return, and tax equity investors used similar structures in other industries. Investors that had used tax equity to finance affordable housing, for example, had experience with the instrument and could translate that knowledge into a different industry.

In most cases, strategic and early institutional investors required at least one bankable revenue stream to justify the risk associated with construction. Thus, long term power purchase agreements (PPAs), or some equivalent hedge, were required for these early projects. Tax equity investors were guaranteed a rate of return, which was scheduled to be repaid at the end of the PTC term, but the repayment term could be extended if the desired threshold had not yet been achieved. Thus, PPA agreements lasted at least 15 years and possibly as long as 20 years in order to provide the tax equity investors with a cushion on their return.

In the pre-RPS New York market, however, PPAs were not available, and wind developers had to find an alternative form of guaranteed cash flow. For the Fenner wind project, for example, developer Atlantic Renewable Energy brought in strategic investor CHI Energy, the U.S. subsidiary of Enel. CHI provided most of the capital to build the project.[43] Although Fenner sold its power into the merchant market,[44] it had received funding through the New York Energy $mart^SM Wholesale Renewable Energy Market Development Program to help bring down up-front costs.[45] That revenue served as a guaranteed payment that secured the project's economics to a level that met the risk appetite of the strategic investor.

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[43] "The Fenner Wind Power Facility," http://text.nyserda.org/programs/pdfs/fennerbrchr.pdf, October 2002.

[44] "Erga's CHI Energy Subsidiary Completes Three Renewables Transactions in North America," Marketwire, December 18, 2001, http://www.marketwire.com/press-release/Erga-Spa-455599.html.

[45] Fenner Wind Power Facility Public Dedication," Atlantic Renewable Energy, Press Release, October 9, 2002, http://www.meridiantechgroup.com/ar/press_art_3.htm.

Other Technology Market Activity. Between 2001 and 2004, two new projects were completed in New York State; both of these used landfill gas as their fuels.[46] Additionally, one developer completed an upgrade of an existing hydropower facility.[47]

There is little other information on the marketplace for either hydro or biomass prior to the adoption of the RPS. It is not clear how many other developers were seeking out sites. At the time, there was no state incentive program for biomass or for hydropower, which meant that the project economics needed to make sense without any additional support in the form of rebates, REC payments, or other structures. Thus, it is possible that developers were not interested in the New York market because of insufficient returns, but there are no data on the market at that time.

4.1.1.5 Pre-RPS NYSERDA Financial Incentive Programs for Wholesale Renewable Energy. Much of the recent pre-RPS non-hydro capacity benefited in some way from the activities of NYSERDA's Systems Benefit Charge-funded Wholesale Renewable Energy (WR) Program, a financial incentive and market development program that was eventually replaced by the RPS program.[48] The Madison and Fenner projects (totaling 41.6 MW) received substantial direct incentives from NYSERDA's WR program in the form of production incentives, and the other projects benefited from wind prospecting and pre-development assistance offered under the same program.[49]

The WR program began in 2001 with the overarching goal of reducing the environmental impacts of energy use by promoting renewable energy and reducing emissions of criteria air pollutants and greenhouses gases. The program also aimed to improve system-wide reliability, reduce peak loads, facilitate competition to benefit end-use customers, and foster market changes that will sustain long-term.[50]

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[46] NY ISO *Goldbook*.2007.

[47] NY ISO *Goldbook*.2007.

[48] In addition to the projects referenced here, two smaller-scale wind projects were built without NYSERDA funding: a 250 kW wind project at the Harbeck Plastics facility near Rochester New York, and a 50 kW wind project in Calverton New York both came online in 2002. The Calverton project was developed and is owned by LIPA.

[49] Summit Blue Consulting and Skumatz Economic Research Associates, Inc, "Wholesale Renewable Energy Program Phase 1 Market Characterization, Assessment, and Causality (MCAC) Evaluation Final Report." Prepared for NYSERDA, June 2004.

[50] Ibid. 1-1 – 1-2.

The three primary program components included: 1) Green Power Supply Development Support; 2) Green Power Marketing Support; and 3) Information, Analysis, and Outreach. The majority of program activity and budget expenditures focused on wind project development, though additional broad market development activities aimed at supporting renewable energy growth in the State more broadly.

The **Green Power Supply Development Support** component of the program was the most substantive one in terms of direct project development support and is most directly comparable to the current RPS program in its focus. Expenditures for this program area were approximately $24.6 million from 2001 to 2003. Key activities that fell under this program component included:[51]

- **Wind power development.** The program made production-based payments to project owners/developers to reduce projects' revenue requirements.
- **Wind prospecting**. Developers received funding to assist with site identification, wind resource assessment, and research into grid interconnection cost/feasibility and potential environmental impacts of the project.
- **Community-based wind power prospect development/facilitating community support.** The program sponsored activities to foster community support for wind power development, including the identification of zones where wind development is encouraged as an acceptable land use, organizing land owners on promising tracts of land, and conducting general public education about wind development.

Through the **Green Power Marketing Incentives** component of the program, financial incentives were paid to green power marketers to help defray the costs of marketing and business development efforts of green power marketers. Expenditures for this program area were approximately $4 million from 2001 to 2003.

The **Information, Analysis, and Outreach** component of the program supported a variety of studies and analyses, and the dissemination of results. Topics for analysis included wind resource modeling, renewable energy attribute trading platform options, surveying developers to gain insight into local development barriers, the impacts of intermittent resources on the power grid, and various cross-border trading issues. Expenditures for this program component were $600,000 from 2001 to 2003.[52]

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[51] Ibid, 1-2 – 1-4. Alternative fuel power generation and storage was also addressed under this component of the program, but was not a primary focus of program activity and funding.

[52] All program expenditure information is based on figures reported in the 2004 Wholesale Renewable Energy Program MCAC Evaluation. Those figures were sourced from NYSERDA program staff and a February 2004 program logic model.

4.1.2 Market Conditions Warranting the RPS

The PSC developed the RPS in an effort to simultaneously pursue several different goals. In its decision to adopt the RPS, the PSC stated:

> We are committed to achieving the goals set forth in the 2002 State Energy Plan and realizing the fuel diversity, energy security, economic development, environmental, and other benefits associated with increased renewable use.[53]

The pursuit of renewable energy was an objective that could make progress towards all of these diverse goals. The RPS was a strategy that would help the State move toward the objective of increasing the amount of energy its residents consumed that was generated by renewable energy technologies.

The RPS was designed to address gaps in the renewable energy marketplace at the time. The PSC acknowledged that the cost of renewable resources was more expensive than traditional resources and that the differential needed to be closed in order for these resources to be developed.[54] Renewable resources tend to have higher capital and lower operating costs per unit output than conventional resources, which exacerbates the need for up-front capital to fund these projects.[55] Since few developers could provide all of the capital by themselves, most needed to find outside sources of capital.

In order to secure that capital, renewable energy projects needed guarantees of revenues of sufficient duration and amount to repay the investors.[56] As discussed in Section 4.1.1, the strategic investors active during this time were willing to take on construction risk, but they were not willing to take on the uncertainties of the market for energy. A sufficient level of certainty in the revenue from energy sales could be obtained through hedges with banks, but renewable energy projects would not reach completion if

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[53] State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004. Page 12.

[54] State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004. Page 3.

[55] John P. Harper et al., *Wind Project Financing Structures: A Review and Comparative Analysis,* Lawrence Berkeley National Laboratory, September 2007.

[56] State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004. Page 51.

the only revenue stream was from energy sales. The above-market costs of the technology needed to be repaid as well, and a nascent voluntary REC market had developed to fill that gap.[57]

Compared to other states, New York had relatively low levels of participation from consumers in green marketing programs.[58] A NREL report found only four green power marketers were active in New York compared to over 90 nationwide, a figure that was more than triple the amount that was present in 1999 (see Figure 9). However, the nationwide total of such programs includes green pricing programs administered by many utilities. In deregulated markets such as New York, the number of green power marketers would be expected to be small as such entities would face steeper business obstacles to market entry such as having to expend capital to market and acquire customers, develop separate customer billing systems, and establish power contracting and scheduling capabilities. Most projects that were able to sell RECs on the voluntary market in New York were sold through Community Energy or one of its affiliates.[59] These market actors credited NYSERDA's efforts with "being an important catalyst" to bringing this level of activity to the state.

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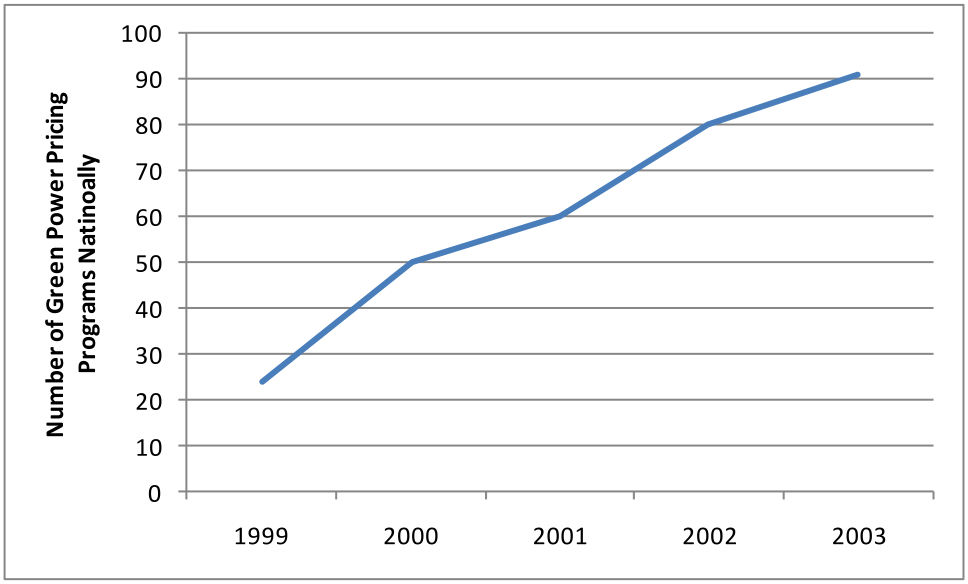
[57] L. Bird et al., *Policies and Market Factors Driving Wind Power Development in the United States*, National Renewable Energy Laboratory, Report TP-620-34599, July 2003, http://www.nrel.gov/docs/fy03osti/34599.pdf.

[58] Ibid.

[59] Ibid.

Figure 9. Growth in the Number of Green Pricing Programs Offered Nationwide (includes regulated and de-regulated programs)



Source: L. Bird et al., *Policies and Market Factors Driving Wind Power Development in the United States,* National Renewable Energy Laboratory, Report TP-620-34599, July 2003, http://www.nrel.gov/docs/fy03osti/34599.pdf.

Prices on this voluntary market for RECs were not sufficient to meet all of the above-market cost requirements for all projects, nor could they meet the long-term commitments required to secure project financing.[60] In the wind space, the earliest projects built had the best economics and could pursue development with energy sales revenues supplemented by voluntary REC purchases. To meet the renewable energy production goals established in the RPS, however, projects with less favorable economics would need to be pursued. With only 150,000 customers in competitive electricity markets nationwide purchasing RECs on the voluntary market in 2004, the voluntary market simply could not support the volume needed by developers to ramp up development.[61] With high levels of uncertainty associated with the demand for RECs in the future, REC marketers could not make long-term commitments to projects. Together, the insufficient demand and inability to make long-term commitments created a gap between the level of renewable energy development that could be sustained by the voluntary market and the level of renewable energy development sought by the framers of the RPS. Thus, the PSC developed the program which is currently being evaluated with the intent "to stimulate and complement voluntary/competitive renewable energy sales and purchases…so that these competitive markets, not government mandates,

[60] L. Bird et al., *Policies and Market Factors Driving Wind Power Development in the United States,* National Renewable Energy Laboratory, Report TP-620-34599, July 2003, http://www.nrel.gov/docs/fy03osti/34599.pdf.

[61] Ibid.

sustain renewable activity after the RPS program ends."[62] The PSC chose an approach in which long-term REC contracts were offered by a central procurement agent, NYSERDA, as a means of providing a secure revenue stream to help projects obtain financing.

4.2 CURRENT RENEWABLE ENERGY MARKETS IN NEW YORK STATE

This section describes current market conditions related to the development of large-scale renewable energy projects in New York. Topics discussed include: current sources of renewable energy supply in New York, the presence and level of market activity by various market participants, barriers to large-scale project development, the influence of the RPS program on large-scale project development, and summaries of RPS policies and experiences in other key states.

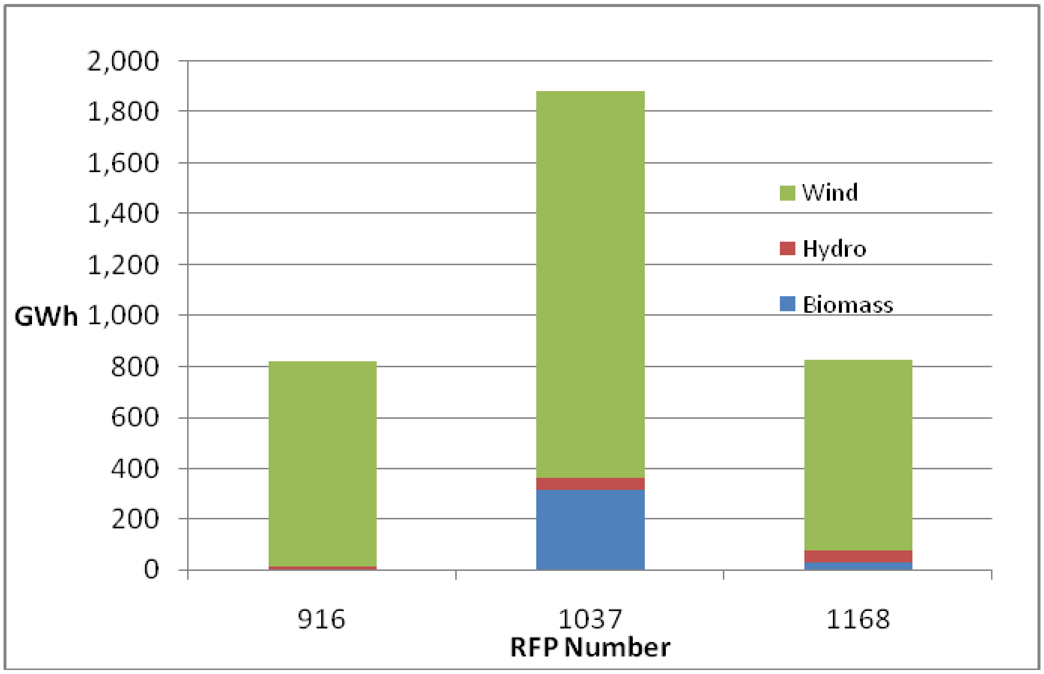
4.2.1 Renewable Generation Supply

This section describes the renewable generation received in response to the first three procurements. Overall, annual energy generation represented by awarded projects increased substantially from 8865.5 GWh/year with RFP 916 to 1,800 GWh RFP 1037, then dropped to 824.5 GWh in RFP 1168,[63] as can be seen in Figure 4-6. Wind has dominated in all three RFPs, as can be seen in Figure 10. Wind has comprised at least 80% of the awarded annual energy in all of the RFPs.

[62] State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004. Page 4.

[63] This decline was due to limitations on available funds.

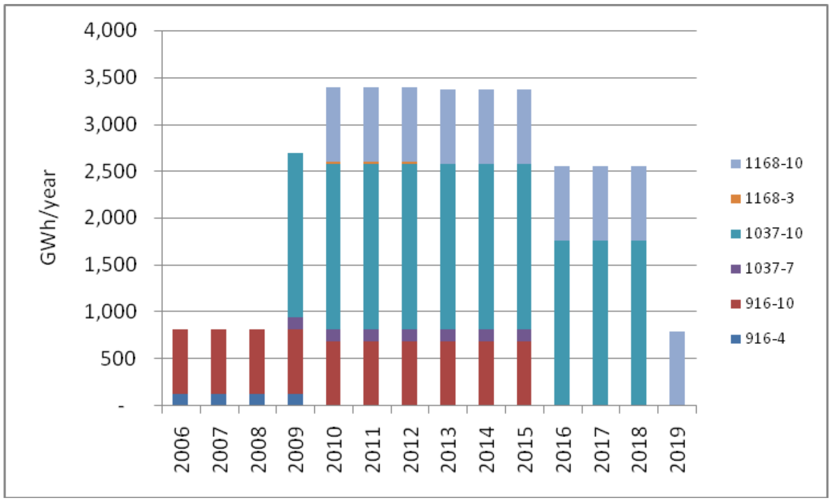
Figure 10. Wind Has Consistently Dominated the Procurements



Source: NYSERDA and Summit Blue Consulting.

Most of the awards have been for ten-year contracts, with a few for one, three, four, and seven years. Figure 11 illustrates how the bid quantities from the first three procurements stack up over time, based on expected in-service date. Annual energy reaches a peak in 2010 and drops to zero by 2020.

Figure 11. **Most of the Energy Awards Have Been for 10-year Contracts that Will Expire in the Later Years**

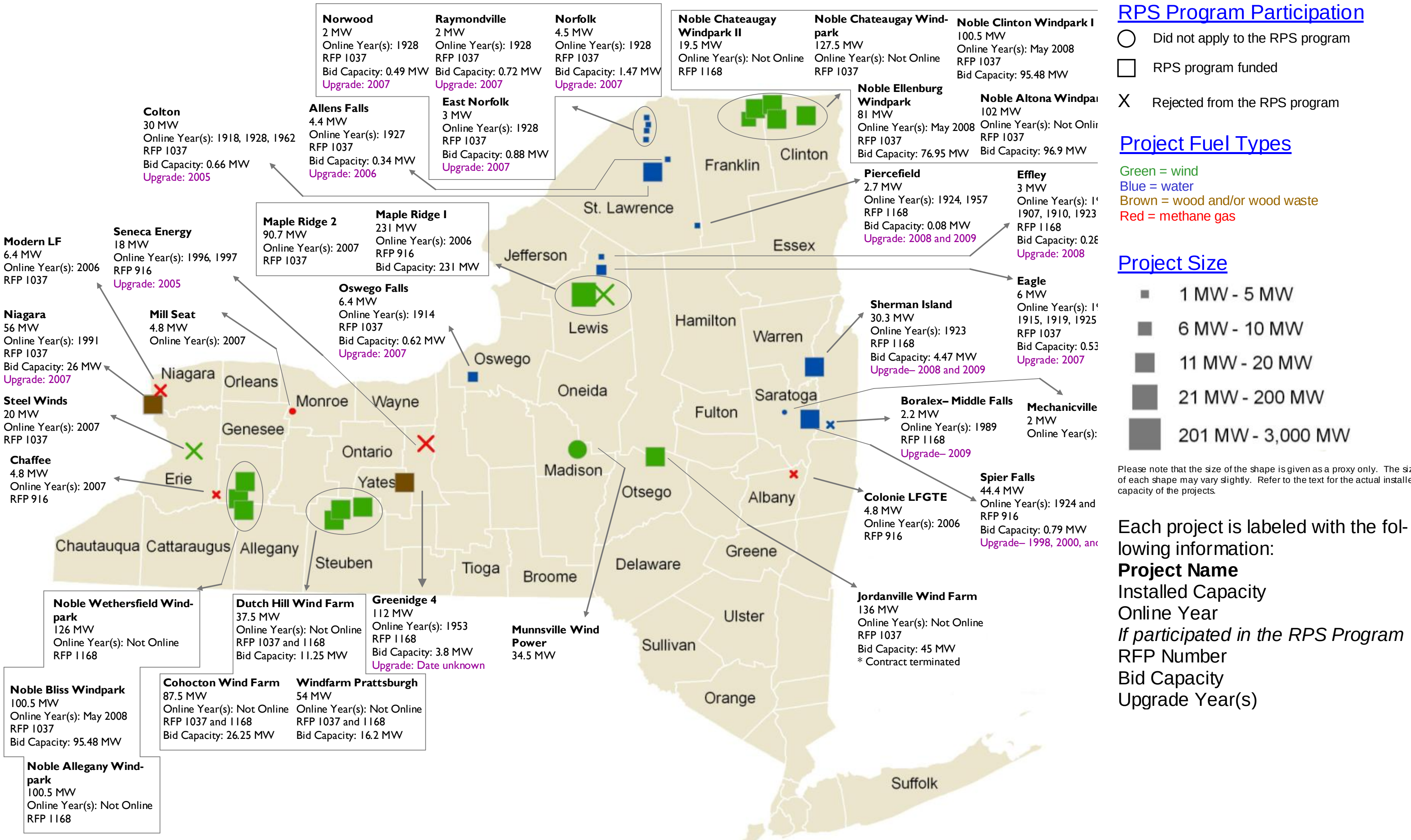


Source: NYSERDA and Summit Blue Consulting.

Most of the renewable energy projects built since the RPS Order are in the western and northern parts of the State, as can be seen in Figure 12. None have been built in the New York City area or surrounding region. Wind development appears to be in pockets. The pockets are dispersed across the State; however, they are organized according to developer. Of the three main clusters of new wind development, two are sets of Noble Environmental Power projects, and one is a set of UPC/First Wind projects. There is also a cluster of hydro upgrade projects developed by Erie Boulevard Hydropower in the northern part of the State.

Two projects located outside the NYISO control area are not shown on the maps: the Bear Creek project in Pennsylvania and the High Falls project in Quebec. The map also shows non-RPS funded projects, both those built without participating in the RPS program (i.e., the 34.5 MW Munnsville wind farm) as well as those that bid into the RPS program but did not win (i.e., the 20 MW Steel Winds project and the 90.7 MW Maple Ridge 2 project).

Figure 12. Location of Post-2004 Renewable Energy Project Activity



Sources: NYSERDA RPS program bid proposal data; NYS Place Locations provided by NYSERDA; NY ISO 2008 Load and Capacity Data "Gold Book," Table III-2, Existing Generating Facilities (as of March 2008).

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4.2.2 Presence and Level of Activity of Various Market Actors

This section is intended to provide an overview of the evolution of New York's market for renewable energy since 2004. After setting the national context in which renewable energy development was taking place, this section describes the technology-specific chages that occurred. The level of detail provided on each technology reflects the level of market interest in that technology in New York. Wind is discussed first, followed by biogas and biomass, and finally hydropower and emerging technologies. Unless otherwise noted, the material in this section is based on interviews conducted for this report or based on general knowledge of the state of the industry.

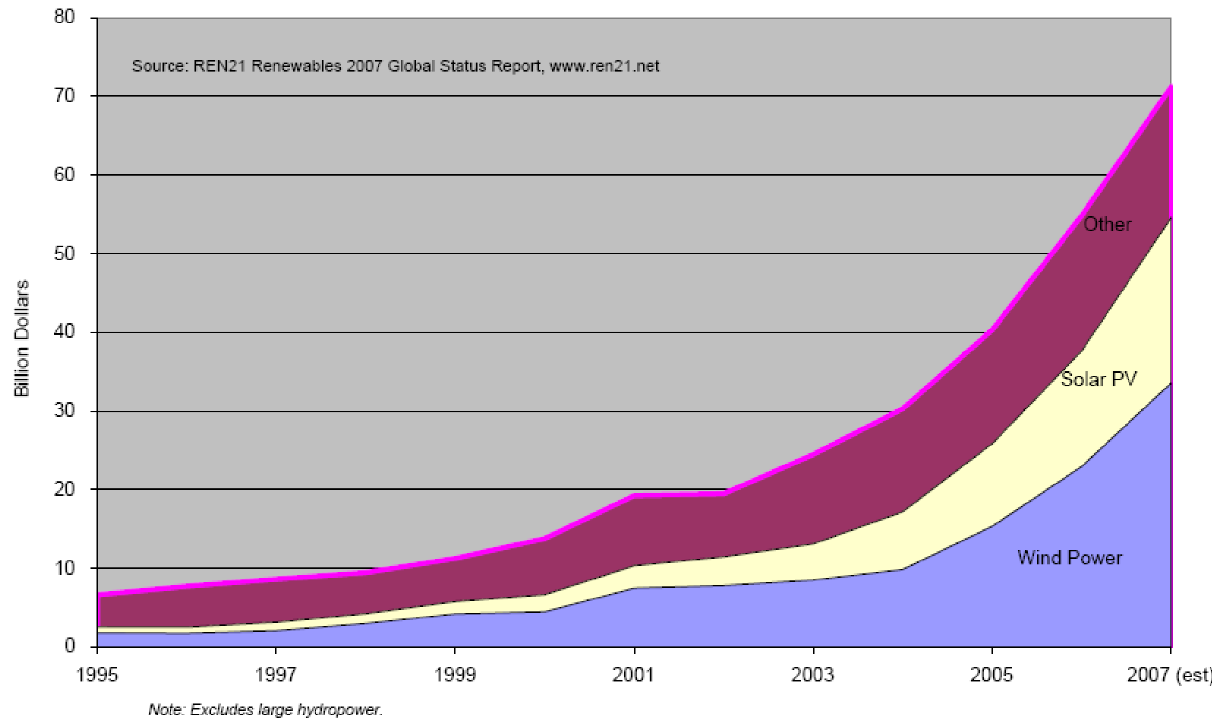
In the years since the RPS was adopted, the market for renewable energy has undergone a transformation in the state of New York and in the country as a whole. By the end of September 2008, 23 states and the District of Columbia had enacted a mandatory renewable portfolio standard, compared to only 13 (including New York) by the end of 2004.[64] Additionally, the federal PTC was extended for a two-year period at the end of 2006 (through December 31, 2008). These policies drove the market for renewable energy nationwide, creating economies of scale and increasing the level of certainty for investors.

The operational aspects of renewable energy became better understood, further decreasing the level of risk associated with renewable energy. As utilities and system operators became more familiar with integrating intermittent resources into the grid, the industry's resistance to new wind development decreased. The projects that had been operating since the early 2000s established a baseline for project economics. With a better understanding of project economics and a more established framework for development, investors started to perceive investments in renewable energy, especially wind energy, as lower risk.

At a national level, investor appetite for investment opportunities in wind energy flourished during 2005 to 2008. Deals became larger as economies of scale were realized. Institutional investors became major players, confidently securing tax equity investments as a result of the two-year extension of the PTC. As a result, investment in wind hit another inflection point (see Figure 13 below).

[64] Database of State Incentives for Renewables and Efficiency, "Rules, Regulations, and Policies," http://www.dsireusa.org/summarytables/reg1.cfm?&CurrentPageID=7&EE=0&RE=1.

Figure 13. Global Investment in Renewable Energy Surged in 2004-2007



Source: Renewable Energy Policy Network for the 21st Century, *Renewables 2007 Global Status Report*, Paris: REN21 Secretariat and Washington, D.C.: Worldwatch Institute, 2008, www.ren21.net.

New York State was no exception. All of the projects that pre-dated the RPS continued to operate, including large hydropower projects, and market interest continued to grow. Wind energy continued to dominate the implementation of new renewable energy projects; consequently, the primary focus of the remainder of this section will be on the players in the wind industry. Biomass projects, especially landfill gas, also increased during this time. Hydropower upgrades continued, mostly independent of the RPS program.

4.2.2.1 Actors in New York's Market for Wind Development. Continuing a trend that had begun in the years leading up to New York's RPS, larger investors became more active in developing the state's wind resources. Building on their experience developing projects in the European setting, the large corporations entered the U.S. market, typically by acquiring one or several smaller U.S. developers. Iberdrola Renovables, S.A., for example, purchased Pennsylvania-based Community Energy in May 2006, Iowa-based MREC Partners in October 2006, Maryland-based CPV Wind Ventures LLC in April 2007, and Oregon-based PPM Energy in May 2008.[65] Similarly, Energias de Portugal (EDP) purchased Houston-based Horizon Energy from Goldman Sachs in March 2007 for $2.2 billion;[66] subsequently, EDP spun off its renewable energy division (including Horizon Energy), Energias de Portugal Renovaveis, S.A., in a public offering on the Euronext Lisbon Exchange in June 4, 2008.[67]

Table 5 provides a summary of the ownership of each of the developers active in New York between 2005 and 2008. Note that only Horizon Energy (and its wholly owned subsidiary Atlantic Renewable Energy) was active in the state during the pre-RPS period.[68]

[65] Iberdrola Renewables, "Iberdrola Reaches Friendly Agreement to Acquire 100% of U.S. Utility Energy East," Press Release, June 25, 2007, http://www.newwindenergy.com/about-us/press-releases/press-release-detail/article/iberdrola-reaches-friendly-agreement-to-acquire-100-of-us-utility-energy-east/.

Iberdrola Renewables, "PPM Energy is Now Iberdrola Renewables," Press Release, May 1, 2008, http://www.ppmenergy.com/rel_08.05.01.html.

[66] Sergio Goncalves, "EDP to Buy $2.2bln U.S. Horizon Wind Energy," Reuters, March 27, 2007, http://www.reuters.com/article/businessNews/idUSL2715639720070327.

[67] NYSE Euronext, "EDP Renovaveis to List on NYSE Euronext as Largest European IPO Year-to-Date – Company's Stock to Commence Trading on Euronext Lisbon June 4," Press Release, June 2, 2008, http://www.nyse.com/press/1212403998254.html.

[68] Another of AES Corporation's subsidiaries, SeaWest Windpower, was also active during the pre-RPS period, but SeaWest's operations at the time of acquisition were exclusively in the Western United States. AES Corporation, "AES Completes SeaWest Acquisition; AES Expands Wind Footprint to 13 States," March 30, 2005, http://www.seawestwindpower.com/press_room/pr/mar_30_05.html.

Table 5. Wind Developers Active in New York in 2005, 2006, or 2007

Developer Active in New York	Parent Company	Parent Headquarters	Parent U.S. Wind Capacity *	Parent Global Capacity**
PPM Energy	Iberdrola Renovables, SA	Spain	807 MW	7,949 MW
Community Energy	Iberdrola Renovables, SA	Spain	807 MW	7,949 MW
Horizon Energy	EDP Renovaveis, S.A.	Portugal	1,554 MW	3,780 MW
Acciona Energy[69]	N/A	Spain	266 MW	3,140 MW
Babcock and Brown Wind Partners	N/A	Australia	920 MW	2,529 MW
E.ON	E.ON AG	Germany	918 MW	1,800 MW
AES Keystone Wind, LLC	AES Corporation[70]	Arlington, VA	958 MW	1,013.5 MW
Noble Environmental Power	Majority owned by JP Morgan Partners Fund	New York, NY	282 MW	282 MW
Invenergy Wind LLC	Invenergy LLC	Chicago, IL	836 MW	836 MW
Clipper Windpower Development	N/A	Carpinteria, CA	565.5 MW	565.5 MW
First Wind	N/A	Newton, MA	92 MW	92 MW
EcoGen Wind LLC	N/A	Wichita, KS	0 MW	0 MW
Windhorse Power	N/A	New York	0 MW	0 MW
Winergy Power, LLC (offshore)	N/A	Shirley, NY	0 MW	0 MW
Bluewater Wind (offshore)	Babcock and Brown	Australia	0 MW	0 MW (offshore)
* Installed U.S. wind capacity, including New York subsidiary **Installed global wind capacity, including U.S. operations.				

Sources: Company websites; full listing of company websites included in references.

The larger players have operations in multiple states around the country to diversify project risks. The challenge of this diversification for projects in the state of New York is that projects in the development stage in New York are competing for resources with projects in the development stage in Oregon and

[69] ACCIONA Energía, http://www.acciona-energia.com/default.asp?x=0002020101&lang=En.

[70] AES Corporation, "AES Completes SeaWest Acquisition; AES Expands Wind Footprint to 13 States," http://www.seawestwindpower.com/press_room/pr/mar_30_05.html.

Texas, for example. The markets with the best balance of risk and return on investment are pursued first to maximize shareholder benefit. Due to the barriers that will be discussed in section 2.2.3, other states rank higher in this regard than New York[71]. As a result, developers may be "active" in New York but are not constructing or operating any wind assets there.

These large players brought much-needed liquidity to the wind development market in New York. Equipment prices have increased by roughly 33% since 2005,[72] and the payment arrangements have also changed. Prior to 2004, it was possible to secure a wind turbine order with a security deposit that was a fraction of the price of the turbine. Today, however, most turbine manufacturers will take payment in full at the time of the order. With deliveries scheduled one to two years after the order is taken, this is a significant financial commitment for a developer. A critical risk is that there will not be a project ready when the turbine is ready. Larger developers can mitigate that risk, because they have larger development pipelines than small to mid-size developers and can allocate turbines across a wider array of project development opportunities. As a result, larger developers have begun to dominate the market.

These larger players have also reduced the cost of capital associated with project development. Larger corporations can raise debt at the corporate level, backed by the full corporate balance sheet, rather than at the project level and backed only by project assets. This reduces risk for the lender, which in turn reduces the cost of capital. In the post-credit crisis world, this ability will likely add to the competitive advantage of these larger developers to develop projects at lower costs than smaller developers.

Thus, consolidation has played a major role in the growth of the wind industry in New York and in the United States. Small and mid-size developers sought out partners with sizable and strong balance sheets to enable development to continue. Large corporations with global assets sought out developers in the United States to diversify their holdings and to break into the growing U.S. market.[73] Access to capital was traded for access to a development pipeline (i.e., developers were acquired), and the industry moved forward. Figure 14 and Figure 15 provide a snapshot of some of the major acquisitions in the wind industry since 2004.

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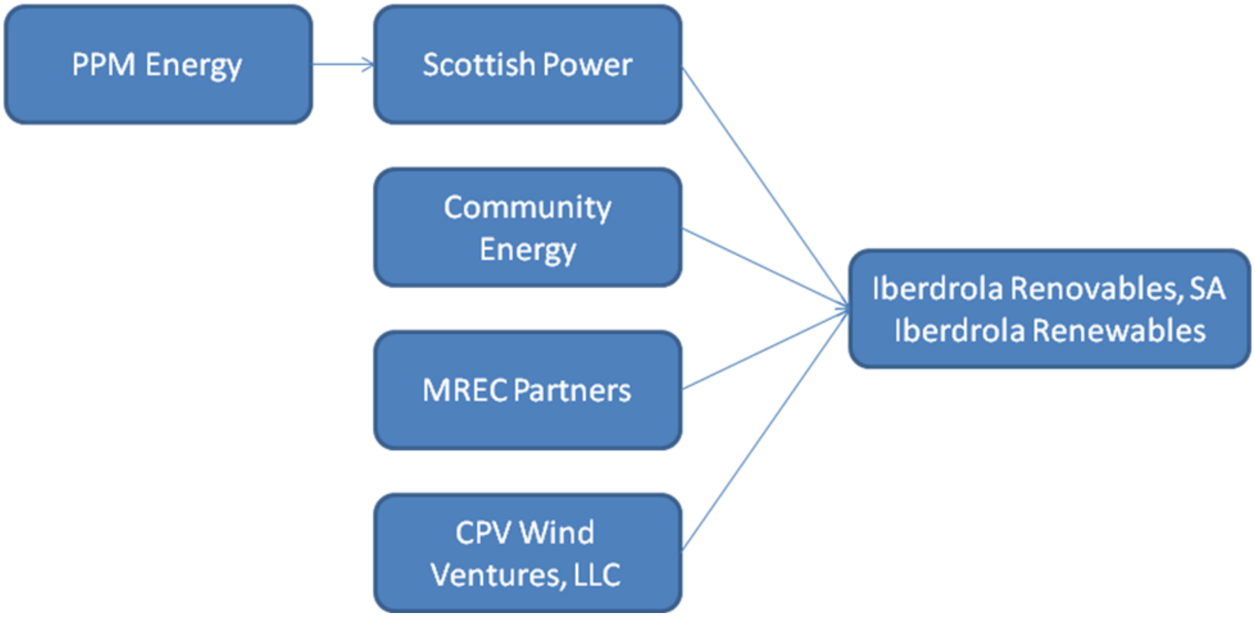
[71] New York ranked 3rd in projects under construction as of November 2008 with 589 MW, after Texas (2,470 MW) and Iowa (1,480 MW). The State ranks 9th in terms of existing wind capacity. AWEA, http://www.awea.org/projects/Default.aspx.

[72] R. Wiser and M. Bollinger, *Annual Report on U.S. Wind Power Installation, Cost, and Performance Trends: 2007*¸ U.S. Department of Energy, 2008.

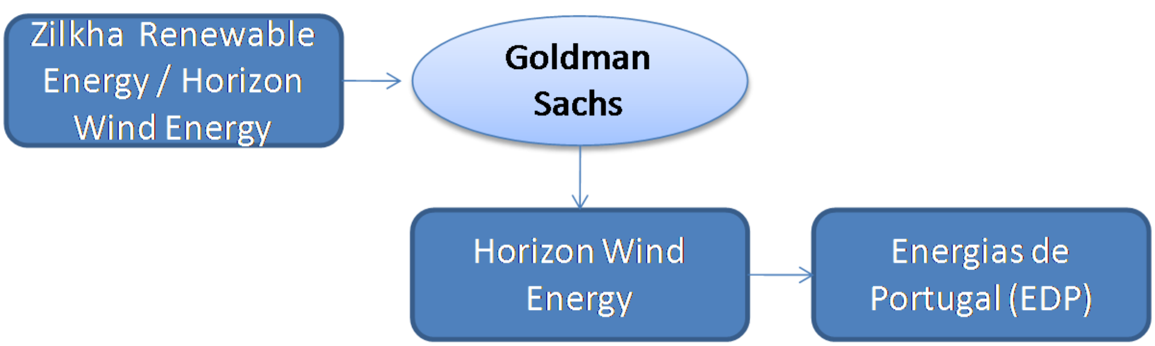
[73] While several individuals interviewed for this report made reference to this fact, a public source also documented this trend: Peter Maloney, "Foreign Firms Envision Wind Farms Dotting the U.S," *New York Times*, November 7, 2007, http://www.nytimes.com/2007/11/07/business/businessspecial3/07blow.html?fta=y.

Figure 14. Consolidation: Iberdrola Acquisitions



Iberdrola Renovables ,S.A., purchased Pennsylvania-based Community Energy in May 2006, Iowa-based MREC Partners in October 2006, Maryland-based CPV Wind Ventures LLC in April 2007, and Oregon-based PPM Energy in May 2008.Community Energy and PPM Energy were active in the New York market between 2005 and 2008.

Figure 15. Consolidation: Energias de Portugal Acquisitions

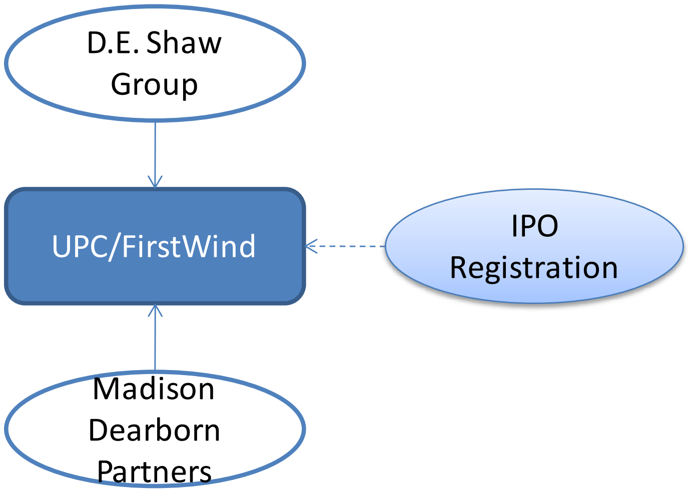


Houston-based Zilkha Renewable Energy changed its name to Horizon Energy, which was acquired by Goldman Sachs (a publicly held firm) in 2007. Goldman sold off Horizon Wind Energy to Energias de Portugal in 2008.

In addition to seeking capital from international players, wind developers in the United States have sought out private equity to weather growth spurts. The private equity players typically have shorter investment turnaround times – less than five years – than the large international corporations, which buy into these investments with a much longer term view. As a result, the private equity funding often serves as bridge capital. The private equity enables the developer to create a portfolio of assets large enough to demonstrate the ability to complete projects to the broader marketplace, generally leading to an initial public offering.

As seen in Figure 16 and Figure 17, two firms that are active in New York have gone this route in recent years. Both FirstWind and Noble Environmental Power (Noble) accepted private equity funding to complete their initial projects. Both FirstWind (July 31) and Noble (September 11) submitted registration documents for initial public offerings (IPOs) to raise additional capital during 2008. Whether these firms will complete the IPOs, while the markets are still suffering from the financial crisis, remains to be seen.

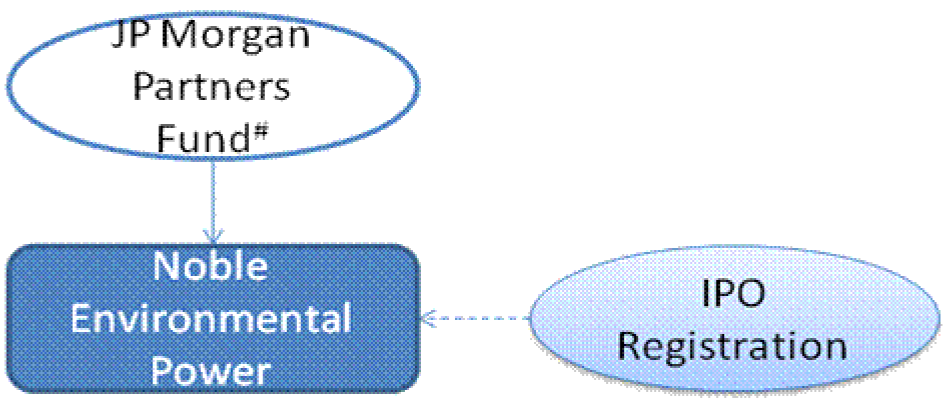
Figure 16. FirstWind's Approach to Raising Capital



FirstWind, which changed its name from UPC Wind in May 2008, brought in private equity investors D.E. Shaw Group and Madison Dearborn Partners in May 2006. In July 2008, FirstWind filed registration documentation for an IPO with the SEC; that IPO has not yet been placed as of October 2008.

Source: "Form S-1 Registration Statement Under The Securities Act of 1933: FirstWind Holdings, Inc." Filed with the United States Securities and Exchange Commission on July 31, 2008. Available: http://idea.sec.gov/Archives/edgar/data/1434804/000104746908008563/a2186834zs-1.htm

Figure 17. Noble Environmental Power's Approach to Raising Capital



Buyout and growth equity investment professionals from JP Morgan Partners Fund separated from JP Morgan Chase & Co. in 2006, forming CCMP Capital. The shares of Noble Environmental Power that were originally held by JP Morgan Partners Fund were transferred to this new entity.

Source: "Form S-1 Registration Statement Under The Securities Act of 1933: Noble Environmental Power, LLC." Filed with the United States Securities and Exchange Commission on May 8, 2008. Available: http://idea.sec.gov/Archives/edgar/data/1381415/000104746908006230/a2185451zs-1.htm

While private equity firms and global corporations can provide the capital needed to build projects, they typically lack the domestic tax appetite to take advantage of the tax benefits associated with renewable energy. Institutional investors with sufficient domestic tax appetite are brought into these projects to monetize the tax benefits created by the PTC and by the Modified Accelerated Cost Recovery System, or MACRS (accelerated depreciation). These institutional investors typically have low risk appetites; they are willing to accept a fairly low return on investment in exchange for a guaranteed return. Thus, these projects must have highly secure revenue streams, such as PPAs and contracts for RECs, secured before the tax equity investor will commit funds.

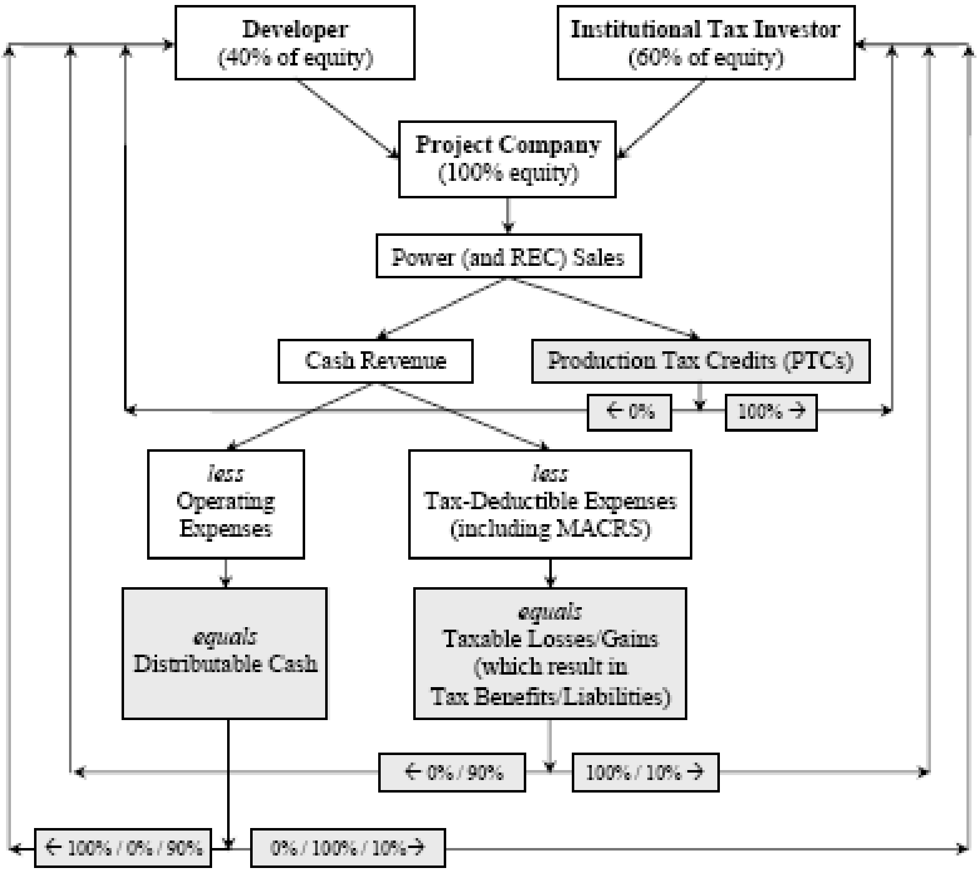
Specialized financing structures are used to integrate the tax equity investors into wind energy projects in which both the developer and tax equity provider contribute capital. Typically these "flip" structures provide the tax equity investor with a guaranteed return on investment, driven primarily by the tax benefits, and then transfer or "flip" the cash flows to the developer. Under this structure, the developer bears significant risk, because the return on its investment is delayed until after the tax equity investor receives its guaranteed return.

The mechanics of this structure can be summarized as follows:

- Initially, the tax equity investor receives the benefits of the tax breaks while the developer receives a return of its investment from project cash flows (i.e., profit from operating the facility).
- Once the developer's capital contribution has been returned, the cash flow from project profits also transfers to the tax equity investor. During this phase, the tax equity investor is receiving both the tax benefits and the project profits.
- When the tax equity investor achieves its required rate of return, all project cash flows flip to the developer; these include any residual tax benefits, as well as the profits from project operation. This is the developer's return on its investment.

One example of a flip structure in which both the developer and tax equity investor contribute significant amounts of capital is provided in Figure 18. The changes in cash flow distribution are noted in parentheses (x%/y%/z%), where x% is the initial cash flow distribution before the developer recoups its capital investment, y% is the cash flow distribution after that point until the flip takes place, and z% is the distribution of cash flows after the flip takes place.

Figure 18. Institutional Investor Flip Structure



Source: John P. Harper et al., *Wind Project Financing Structures: A Review and Comparative Analysis*, Lawrence Berkeley National Laboratory, September 2007.

In short, during the last few years, the wind development in New York and in the United States has been driven by large corporations. These well-capitalized firms can contribute the significant amounts of capital required to develop, construct, and operate wind facilities. Large international corporations with experience developing wind in Europe have emerged as important drivers in the market for wind, and institutional investors with domestic tax appetite have been willing partners in monetizing the tax benefits. Specialized financial structures have been developed to accommodate such partnerships, typically limiting capital contributions to equity rather than including debt.

During this time, it has been difficult for small- and medium-sized developers to compete in the market for wind development. Their size precludes them from taking advantage of economies of scale and the risk mitigation benefits that accrue to the larger players. The smaller players must work harder to access capital, increasing the overall project costs and reducing their return on investment. The marketplace has become less attractive to these smaller entities, though some continue to pursue niche opportunities, such as brownfield development.

4.2.2.2 Actors in New York's Market for Woody Biomass and Landfill Gas Development.

New York's current market for biogas and biomass can be divided into two main segments: landfill gas and woody biomass facilities. The actors in each segment are different and have unique characteristics. As a result, they are treated differently here.

The market for landfill gas is still dominated by smaller players. This space is fragmented, relying on entrepreneurs to identify and develop niche markets. This fragmentation is possible because development requires relatively low levels of capital and because it is fairly low risk. Capital costs for landfill gas are lower than for wind, and the projects are typically smaller than 10 MW. Additionally, these projects are fairly low risk because the fuel source is known and can be projected with fairly low levels of uncertainty. Together, these low capital costs and low levels of risk combine to create a situation that is comfortable for debt providers. As a result, landfill gas project owners typically work with a lender to leverage their equity contributions. In a small subset of cases, the local municipality or county government may also contribute equity to the project.

In addition to landfill gas, New York appears to have significant economic potential for other biogas resources (e.g., those from wastewater treatment plants) that are not currently being developed. The fragmented nature of the biogas industry may be at the root of this issue. Development opportunities are typically small, lacking the economies of scale that can be realized with other renewable resources in the State. Additionally, the number of project opportunities associated with any single resource is limited; there are only so many wastewater treatment plants and landfills in the State. As a result, attracting interest from the larger players with the wherewithal to develop these resources is difficult.

The most recent woody biomass projects, on the other hand, tend to be developed by large energy corporations. The most recent two woody biomass projects participating in the New York RPS program in New York are being developed at the site of existing coal facilities as a co-firing opportunity. Since these facilities only require a modification to an existing process, these projects can be carried out at fairly low cost.[74] As a result, these projects are typically developed using internal capital only. Another project under

[74] One estimate given was at $300/kW.

development in New York is converting a natural gas-fired cogeneration facility to run on biomass; this project has not applied for NYSERDA funding but may do so in the future.

Larger firms have the ability to withstand the higher levels of risk connected to the fuel supply. The market for woody biomass fuel is tied to the forestry industry in New York State; a booming forestry industry typically means high prices and scarcity of fuels for energy generation while a weak market for forestry products results in lower prices. In addition, the market prices are also tied to the cost of diesel fuel, which is used to chip and then to transport the fuel; recent volatility in diesel prices has added to the volatility in biomass fuel costs. In times of high prices, the larger facilities can easily switch back to coal in the absence of biomass fuels, reducing the exposure to market price risk.

4.2.2.3 Actors in New York's Market for Other Renewable Energy Development. Wind and biomass facilities have made up the bulk of renewable energy project development efforts in New York since the RPS was adopted in 2004, but a handful of other developers have also been engaged. Developers of emerging technologies, such as off-shore wind, tidal, and at least one waste gasification technology, have expressed some interest in developing resources in New York. The tidal power technology is being piloted in the East River, and the waste gasification technology has been piloted in a demonstration application; the others have yet to be implemented in the United States. Follow-up on these technologies may be warranted in the next review of New York's RPS.

Additionally, the market for new hydropower has been dominated by a single player since the RPS was adopted in 2004, but additional developers have become more involved recently. Erie Boulevard Hydropower LP, which was already operating existing hydropower facilities, has completed ten new hydropower upgrades[75] since the end of 2004, and all of these bid on and received RPS funding. Four previous upgrades have also received NYSERDA funding, and it is in the process of constructing two and developing one additional upgrades. The earlier projects built on highly economic resources; since this low-hanging fruit has been exhausted, more expensive installations have been pursued. As the upgrades build on less economic resources, the RPS funding becomes more important. A handful of other developers have become active in the New York market for hydropower upgrades in recent years as well. These developers have also been involved in the New York hydropower market as owners and operators of systems, and the upgrades are simply an extension of those interests.

[75] An upgrade adds new capacity at an existing facility.

Like the biogas resources, the market for hydropower upgrades is limited. Only so many existing hydropower systems are available for upgrades, and the upgrades that remain are less economically attractive than those that have already been developed.

4.2.2.3 <u>Summary of Current Market Activity.</u> The bulk of new renewable energy generation in New York is originating from wind-powered facilities. Since the onset of the RPS, the market for wind development has been marked by consolidation driven by the emergence of large, international corporations with overseas wind development experience entering the United States market. Along with these international players has come innovative approaches to project financing that rely heavily on large domestic corporations with sufficient tax appetite to take advantage of the federal Production Tax Credit.

Large energy corporations have also led the way with woody biomass and incremental hydropower development. In the case of woody biomass, this is largely due to the ability of the larger market actors to absorb the risk associated with volatile fuel prices. In the case of incremental hydropower, the owners of these facilities have typically played a significant role in the additions; these have historically been large energy corporations.

Conversely, the markets for landfill gas, biogas, and the emerging renewable technologies have been dominated by smaller, fragmented market players. These projects are typically so small that they lack the economies of scale that would create sufficient returns to attract larger market actors. These markets have limited development opportunities at this time.

4.2.3 Barriers to Wholesale RE Development

Understanding the challenges faced by participants in the marketplace provides important context for evaluating the effectiveness of the RPS program. While some of these barriers are outside the control of NYSERDA or the State, or beyond the scope of the RPS program, insight into development barriers can guide decision-making regarding potential future changes in the RPS program and the potential steps NYSERDA or the State may take to improve overall market conditions for renewable energy development in the State.

Ten different categories of interviewees were asked to comment on barriers to wholesale renewable energy development in New York. Interviewees were asked to assign a score to each in a set of potential barriers to indicate the magnitude of each. Many interviewees also provided additional commentary, including specific examples of how barriers had affected projects with which they are familiar or developments in the State that may affect the presence of barriers in the future. Direct input from the participants in the New York marketplace were supplemented by additional research, and the results are presented in this section. The section first presents a summary ranking of the barriers, and this is followed by discussion of each of the barriers identified as presenting the most significant challenges to renewable energy market development in the State.

The participating developer interview category had the largest number of respondents, and these respondents are the most familiar with development barriers due to their hands-on experience in the New York marketplace. Therefore, responses from participating developers are the focal point for the discussion here. Non-participating developers, trade associations, and staff comments were also robust in their content. Relevant insight gathered from these and other market participants who were interviewed is also included in the discussion.

4.2.3.1 Summary of Findings. The top barriers facing the participating developer community are uncertainty about federal tax incentives, cost of supplies and raw materials, transmission constraints, permitting process, local opposition, and interconnection costs and processes. A summary of participating developer input on development barriers is summarized in Table 6, and the data in this table are put forth as a representative summary of the input gathered across all interviewee categories.[76] Input from these interviewees was generally consistent with that of other categories.

The table shows the rank and average score associated with each barrier. Respondents scored each barrier on a scale of one to five with one meaning the barrier is "insignificant" and five meaning the barrier is a "critical threat to project development." Results presented in the table are ranked according to the percentage of all interviewees in the participating developer category who gave the barrier a score of three

[76] This category of interviewees is used the focus of data presented here because the participating developer interview category had the greatest number of respondents and has the most direct experience with development barriers in New York. It can be more readily summarized due to the larger number of respondents in this category.

or greater. The results represent input from the 18 participating developers interviewed as part of the RPS evaluation. However, as shown in the table, not every respondent commented on all barriers.[77]

Discussion of each of the barriers is presented in the sections that follow, with an emphasis on those barriers identified as most critical to project development. The section is organized so that barriers are discussed according to the rank order in which they appear in Table 6.

Table 6. Summary of barriers to development reported by participating developers

Barrier	Rank	Percentage of all participating developers scoring barrier ≥ 3	Average Score	Number of Responses
uncertainty about federal tax incentives	1	61%	3.5	14
cost of supplies and raw materials	2	50%	3.2	11
transmission constraints	3	44%	2.6	15
permitting process	4	39%	2.9	15
local opposition	4	39%	2.7	13
interconnection costs and processes	4	39%	2.6	13
incompatibility of NY's attribute tracking system with those of neighboring regions	7	33%	2.5	14
cost of doing business in NY	8	28%	2.4	13
availability of suitable sites with adequate renewable resources	8	28%	2.4	13
property taxes or payment in lieu of taxes	10	22%	2.0	13
other barriers	11	17%	3.4	5
availability of parts and supplies	11	17%	2.0	12

Source: Summit Blue interviews with participating developers.

4.2.3.2 <u>Uncertainty about Federal Tax Incentives</u>. Though not unique to New York, uncertainty about the future of federal tax incentives was cited by over 60% of participating developers interviewed as

[77] In addition, in cases where developers commented, but did not assign a score for a particular barrier, a score was estimated based on the input provided.

a significant barrier to project development. The average score for this barrier was a 3.5 on the five point scale (with five representing a "critical barrier to project development"). Non-participating developers, trade associations, manufacturers, and representatives from the financial community also recognized this as a fundamental barrier to development.

Federal tax incentives are a key driver in renewable energy project economics. Of the range of available federal incentives, the PTC has played the greatest role in large-scale renewable energy project development in New York to date. Under the PTC, corporate owners of an eligible project claim a credit based on the volume of energy produced by their renewable energy system. Most projects are eligible to claim the credit for the first ten years the project is operational.[78]

Originally introduced in 1992, the PTC temporarily expired in 1999, 2001, and 2003. The short-term and uncertain nature of the policy has resulted in a boom and bust development cycle. This has made it difficult for developers, manufacturers, and others to plan for the future of their businesses. In addition, the rush of development that occurs leading up to a PTC expiration can result in lower quality installations.

The PTC was set to expire again at the end of 2008 but was extended in October 2008 under H.R. 1424. Among the changes introduced under the new version of the PTC, marine and hydrokinetic projects are now eligible for the incentive, and a variety of different in-service deadlines have been set for different technologies. For wind, the PTC is now available to projects put in service through the end of 2009, and the incentive is currently two cents per kWh. For landfill gas and open-loop biomass projects, which are more common than closed loop,[79] the incentive is available to projects put in service through the end of 2010; projects will receive one cent per kWh of production.[80]

[78] For example, open-loop biomass facilities using cellulosic waste are only eligible to receive the credit for five years from the date they are placed in service.

[79] Open-loop biomass is biomass that can be used to produce energy and bioproducts even though it was not grown specifically for this purpose. Examples of open-loop biomass include agricultural livestock waste and residues from forest harvesting operations and crop harvesting. Closed-loop biomass refers to crops grown, in a sustainable manner, for the purpose of optimizing their value for bioenergy and bioproduct uses. This includes annual crops such as maize and wheat, and perennial crops such as trees, shrubs, and grasses such as switchgrass.
cta.ornl.gov/bedb/biopower/Major_Federal_Biomass_Power_Incentives.xls

[80] Database of State Incentives for Renewable Energy, www.dsireusa.org.

Table 7. Summary of PTC incentive by technology

Resource Type	In Service Deadline	Credit Amount
Wind	December 31, 2009	2.0¢/kWh
Closed-loop Biomass	December 31, 2010	2.0¢/kWh
Open-loop Biomass	December 31, 2010	1.0¢/kWh
Geothermal Energy	December 31, 2010	2.0¢/kWh
Landfill Gas	December 31, 2010	1.0¢/kWh
Municipal Solid Waste	December 31, 2010	1.0¢/kWh
Qualified Hydroelectric	December 31, 2010	1.0¢/kWh
Marine and Hydrokinetic (150 kW or larger)*	December 31, 2011	1.0¢/kWh
Refined Coal	December 31, 2009	$5.877/ton
Indian Coal	December 31, 2008	$1.544/ton

Source: Database of State Incentives for Renewable Energy, www.dsireusa.org

The State of New York has little control over the future of the PTC. However, the uncertainty around this policy makes it that much more critical for states to provide a long-term, stable, and predictable regulatory and incentive structure for the renewable energy industry.

4.2.3.3 <u>Cost of Supplies and Raw Materials</u>. The rising cost of supplies and raw materials is not unique to New York, nor is it unique to renewable energy generating facilities. Regardless of this, as discussed further in Section 4.3.3, the rising cost of materials and fuel, driven in part by the falling value of the U.S. dollar until the latter part of 2008, is making renewable energy projects more expensive to build; this is affecting project economics. The effect is particularly strong for capital-intensive wind projects and for biomass projects that are heavily dependent on fossil fuels for the processing and transport of their biomass supply.

Fifty percent of participating developers reported that the cost of supplies and raw materials is a significant barrier to project development (i.e., the barrier received a score of three or greater on a five-point scale). The average score for this barrier was 3.2. Non-participating developers and trade associations also found this to be a significant barrier to development.

A participating wind developer reported that all parts have gone up in cost more than 15% annually. A non-participating landfill gas developer reported, “Fuel and construction costs have seen double digit increases. Costs are escalating 20-25% between the planning phase and construction.” One participating developer reported that costs had increased dramatically during the last two years, but the developer expected that costs would level out in the near future as manufacturing capacity catches up with demand.

The rising cost of fossil fuel-based energy will drive higher energy revenues for renewable energy projects and should mitigate some of the effects of the higher project construction costs. However, it is not clear how these market dynamics will play out in the next few years. Unfortunately, this is a barrier that has the potential to raise New York RPS REC prices, and it is something over which NYSERDA and the State will have little control.

4.2.3.4 Transmission Constraints. Transmission constraints were cited as a significant barrier to development (i.e., the barrier received score of three or greater) by 44% of participating developers who were interviewed. The average score for this barrier was a 2.6. A significant amount of renewable energy development activity in New York (present and planned) is occurring at a distance from the State's most robust transmission capacity, and there are limitations on the total amount of wind generation the State's existing transmission capacity can accommodate. As shown in Figure 19, a great deal of New York's most substantial on-shore wind resource exists in Western New York, while the highest capacity transmission lines run north-south through the central part of the State.

In light of these conditions, it is not surprising that wind developers, trade associations, and some NYSERDA program staff members expressed concern about how transmission constraints will increase in the future in the State. Two biomass developers also commented that transmission capacity in New York constrains the ability of their projects to access other markets, such as New England, where REC prices are higher. Note that comments pertaining to the costs and processes interconnecting the power grid are addressed separately.

The New York Independent System Operator (NYISO) has taken several steps to address the issue of transmission capacity as it relates to renewable energy development. These efforts have focused on wind generation because of its intermittency and the fact that it accounts for the majority of new renewable generation proposed for New York's bulk power system. A study was prepared for NYSERDA and the

NYISO by GE Energy in 2005,[81] which explored the effects of wind generation on New York's bulk power system. The study focused on a scenario in which 3,300 MW of wind generation was installed at 33 locations throughout New York State. It found that the state's bulk power system could accommodate 3,300 MW of wind generation "with only minor adjustments to its existing planning, operation, and reliability practices."

According to the NYISO, 706 MW of wind plant capacity is currently interconnected to the New York bulk power system, and an additional 400-700 MW of wind capacity is expected to come online by the end of 2008.[82] In all, over 7,700 MW of proposed wind capacity was in the NYISO interconnection queue as of August 2008.[83] These figures include over 650 MW of wind capacity that has been awarded NYSERDA RPS REC contracts and is either in construction or under development.[84]

The NYISO has updated the 2005 GE wind study and issued a white paper in October, 2008, which analyzes the potential impacts that could result from the wind plant capacity currently proposed in the interconnection queue.[85] The study examined the effects of a clustering of wind projects in the northern and western parts of the State, as the earlier study assumed a more even distribution of wind plants across the State.[86]

The NYISO is also in the process of implementing a new wind forecasting system. Under this system, NYISO will forecast wind generation output by generator on a day-ahead and real-time basis. AWS Truewind will produce the wind forecasts using meteorological data provided by the wind plant operators. NYISO will input the data into its security constrained economic dispatch system, which will aid in balancing the supply of electricity with consumer demand.[87]

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[81] Piwko, R, X. Bai, K. Clark, G. Jordan, N. Miller, and J. Zimberlin. 2005. *The Effects of Integrating Wind Power on Transmission System Planning, Reliability, and Operations, Report on Phase 2: System Performance Evaluation*. Prepared by GE Energy for NYSERDA.

[82] NYISO comments to the NYSERDA RPS evaluation team, September 2008.

[83] NYISO Interconnection Queue, current through August 28, 2008. Obtained from http://www.nyiso.com/public/services/planning/interconnection_studies_process.jsp

[84] NYSERDA RPS program records, September 2008.

[85] The 2008 study, "Integration of Wind into System Dispatch" was released after this report's scoping framework.

[86] NYISO comments to the NYSERDA RPS evaluation team, September 2008.

[87] Ibid; and NYISO news release: "Wind forecasts to help green the grid", April 3, 2008.

Additional efforts to improve transmission capacity in New York are occurring as part of the NYISO's Comprehensive Reliability Planning Process. Reliability needs assessments completed as part of this process identify system upgrades necessary to ensure reliability. However, this process focuses on reliability alone and does not factor in the state's policy goals for renewable energy development. Several states have been proactive in facilitating transmission capacity expansion to support renewable energy development including California, Colorado, Idaho, Minnesota, Nevada, New Hampshire, New Mexico, and Texas. New York should further explore these models and consider the potential for replicating some concepts. Following are brief summaries of activities in some of the leading states:

- **Texas' Competitive Renewable Energy Zones**. Through legislation passed in 2005, Texas pioneered the concept of designating Competitive Renewable Energy Zones (CREZ). The Texas Public Utilities Commission (PUC), in consultation with ERCOT and the Southwest Power Pool, is responsible for designating CREZs in areas with the strongest renewable resource development potential. The PUC "shall develop a plan to construct transmission capacity necessary to deliver CREZ output to electric customers in a manner that is most beneficial and cost-effective to the customers."[88] The process enables the costs of transmission upgrades to be allocated across all ratepayers. In July 2008, the PUC selected one of several potential development scenarios that had been considered. This decision is one in a series of steps in a several year long process that will facilitate development of more than 11,550 MW of new wind capacity.[89]
- **California's Renewable Energy Transmission Initiative (RETI)**. This statewide initiative helps identify the transmission projects needed to accommodate California's renewable energy goals, support future energy policy, and facilitate transmission corridor designation and transmission and generation siting and permitting. RETI also will identify those zones that can be developed in the most cost effective and environmentally benign manner and will prepare detailed transmission plans for those zones identified for development.[90]
- **Colorado's Energy Resource Zones**. Colorado requires IOUs to designate "Energy Resource Zones" and to prepare detailed plans for transmission development that are consistent with the

[88] Woodfin, Dan. "Texas Competitive Renewable Energy Zones (CREZ): History, Recent Decisions and Upcoming Studies." Presented to National Wind Coordinating Committee, August 22, 2007.

[89] Wood, Elisa. "High Winds for Texas: Lone Star State is Stepping Up." *Renewable Energy World*. October 14, 2008.

[90] California Energy Commission website: http://www.energy.ca.gov/reti/index.html.

timing of renewable energy project development plans in a given area and that encourage local ownership of renewable energy facilities (SB 07-100).

- **New Hampshire's passage of legislation to facilitate transmission capacity expansion in its northern region**. While not as far along as other states summarized here, New Hampshire's efforts are of relevance since it is one of the only northeastern states to have initiated state-level efforts regarding transmission planning. Passage of Senate Bill 140 in 2007 required the New Hampshire Public Utilities Commission to file a report characterizing transmission capacity in the state and necessary improvements. The report was also to document efforts by other states to facilitate transmission capacity expansion to support renewable energy development. The report was completed in December 2007.[91] Since then, New Hampshire's Governor Stephen Lynch has met with other New England Governors to discuss the potential to share costs of transmission capacity in New Hampshire's northern region across the entire New England Independent System Operator region. The proposal to share the costs of opening up the renewable energy resource-rich, capacity constrained area of New Hampshire has not been favorably received by other New England states.[92]

In addition to these state-level efforts, the Western Governors' Association has spearheaded the designation of Western Renewable Energy Zones, and a bill has also been put forth in Congress to establish National Renewable Energy Zones (WREZ).[93] The WREZ initiative is aimed at coordinating transmission planning efforts in western states to leverage opportunities for renewable energy. Among other goals, the WREZ Initiative seeks to facilitate interstate collaboration on permitting and cost-allocation for new transmission.[94]

In summary, New York's renewable energy market stakeholders recognize transmission constraints as a critical barrier to the future expansion of renewable generation capacity in the State (Figure 19). NYISO is

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[91] New Hampshire Public Utilities Commission. "New Hampshire Public Utilities Commission Background Report on New Hampshire Transmission Infrastructure to the New Hampshire General Court." December, 2007.

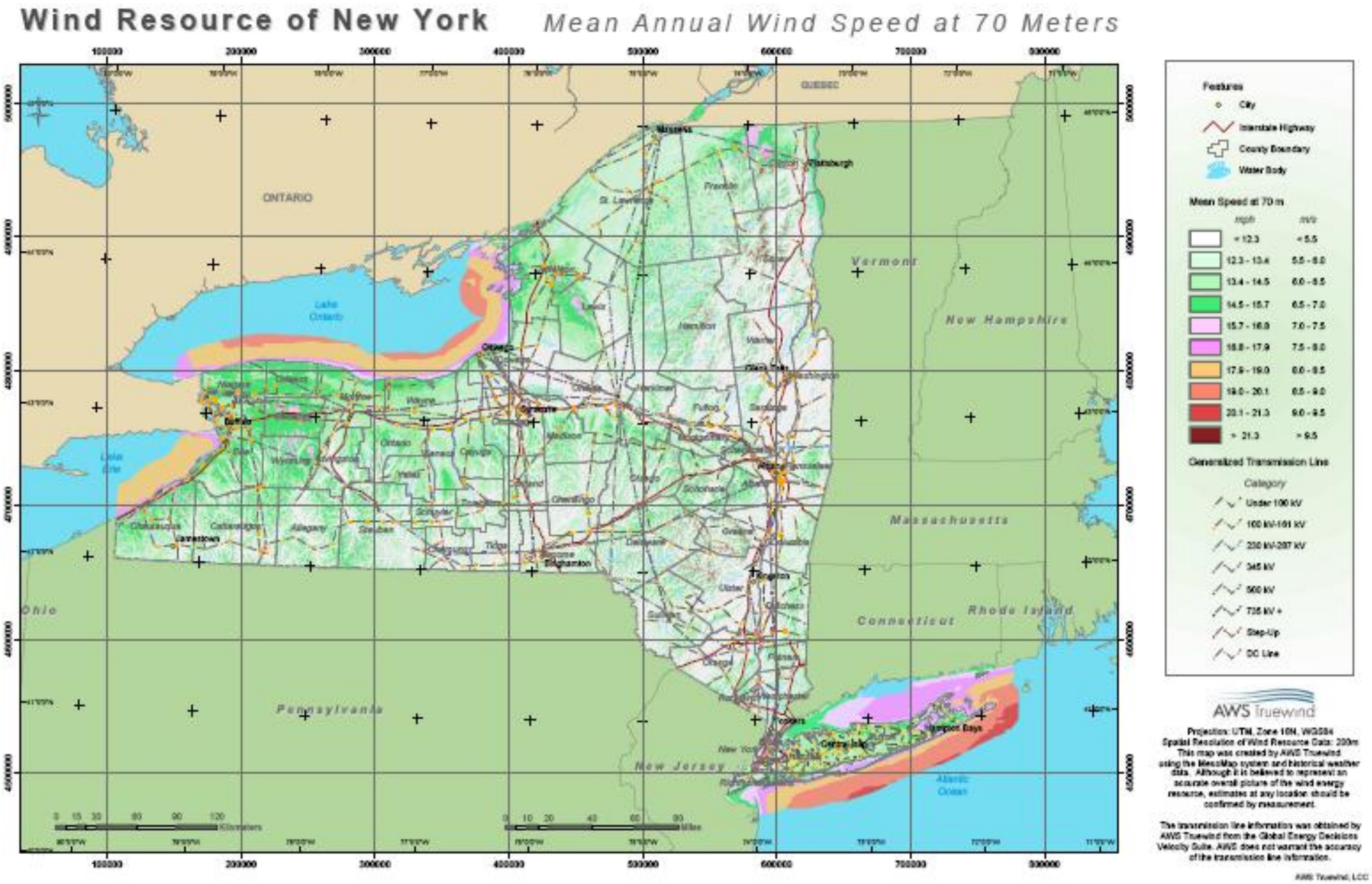
[92] Dornin, Chris. "Bigger states balk at chipping in for N.H. transmission lines." *New Hampshire Business Review*. August, 2008.

[93] Wood, Elisa. "High Winds for Texas: Lone Star State is Stepping Up." *Renewable Energy World*. October 14, 2008.

[94] Savage, John. "Western Renewable Energy Zone Initiative." (presentation) Oregon Public Utility Commission, July 22, 2008. Additional information available at Western Governors' Association website: http://www.westgov.org/wga/initiatives/wrez/index.htm.

taking steps to address this barrier through studies and forecasting. However, New York should also look to other states for examples of innovative strategies for facilitating transmission capacity expansion to advance renewable energy policy development goals.

Figure 19. New York Transmission Capacity and Wind Resource



Source: AWS Truewind, http://www.awstruewind.com/files/NY_spd70m.pdf

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4.2.3.5 Siting and Permitting

The permitting process that renewable energy projects go through in New York is unique compared to other states, and a broad range of stakeholders in New York point to streamlining of the permitting process as a key opportunity to advance renewables development in the State. This section first summarizes interview comments regarding the current permitting process in New York, then provides background on the permitting process to provide factual context for the comments. Finally, the section ends with discussion of efforts underway in the State to introduce a more streamlined permitting process for energy facilities.

***Summary of Interviewee Comments*.** Several developers cited New York's home rule permitting process, falling under the purview of the State Environmental Quality Review Act (SEQR), as cumbersome, time consuming, and uncertain. These sentiments were echoed by some non-participating developers and trade associations. Five participating developers and one non-participating developer reported that the permitting process in New York is significantly more challenging than in other states. One developer explained that his company regretted having made significant investments in project development in New York for this reason.

A key area of concern about the SEQR process (described further below) is that local officials, often volunteer members of town boards, are put in the position of making decisions about large-scale, complex renewable energy projects. These local officials often lack experience evaluating large development projects and knowledge of electric generating technologies. Furthermore, if a local election occurs during the development process, the previous set of town officials who may have approached the project favorably could be replaced with new officials who view the project differently.

Another area of concern expressed by some developers, trade associations, and environmental groups was that a small group of vocal opponents can cause significant delays in the process. One developer noted that a small group of opponents had delayed the approval process by one and a half years. Another developer explained, "the appeals process has no real framework that allows you to come to a resolution in a reasonable amount of time." This developer advocated adopting an alternative approach in which the public has opportunities to express their concerns, and the full range of potential environmental impacts are explored, but that this happens as part of "a prescribed, orderly process with predictable timing."

Representatives from five municipalities that have dealt with wind project proposals were interviewed as part of the RPS evaluation. These representatives' comments confirm what developers described; the majority of townspeople in the rural communities often support wind development for the economic development it will bring to the community and the ways in which it can benefit individual landowners. However, a vocal minority that opposes the project can significantly slow down the approval process, and in some cases, stop project development activity from proceeding.

One way the permitting process can be slowed down or reversed is through "Article 78" lawsuits. Under Article 78 of the New York Civil Practice Laws and Rules, members of the public can challenge the actions of local or state government and put their case before the New York Supreme Court.[95] The Court can take a variety of different steps, such as deciding to reverse a decision, putting deadlines on a decision-making process, or calling for activity to be stopped.

The SEQR process' reliance on local decision-making can also present conflicts of interest, which can affect the outcome of project decision-making and can strain relations in small communities. An organization interviewed for the evaluation explained that when landowners sign leases or lease option agreements with some wind developers, they are prohibited from commenting publicly on the proposed project for a number of years. This limits landowners' ability to express their views on a project, either positive or negative, as their views may evolve over time. In addition, if a town board member is also a landowner who stands to benefit from the project, the individual will have to recuse him/herself from decision-making related to a project. Under a process that depends heavily on participation by the local community, a lack of participation by some key individuals can sway outcomes. The media has also highlighted how the local politics of wind project siting in New York has led to serious conflicts within some small communities.[96] Further discussion of local opposition to project development is included in a later section focusing specifically on this topic.

A final area of concern expressed by a developer, a trade association, and a land conservation organization is that there are inconsistent standards being applied to different projects. For example, different land-use policies and differing levels of knowledge about large-scale project siting from one community to the next

[95] New York Laws: Civil Practice Law and Rules: (7801-7806) Proceeding Against Body or Officer

[96] The Associated Press. 2008. "Windmills split town and families." *The New York Times*. August 16. Confessore, N. 2008. "In Rural New York, Windmills Can Bring Whiff of Corruption." *The New York Times*. August 18, 2008.

can significantly affect outcomes. Furthermore, local officials in different towns may apply different interpretations of what impacts are acceptable.

Attention is often focused on problems with permitting wind projects, and wind project developers did, in fact, express more concern about the permitting process than did developers of other technologies. However, it should be noted that two biomass developers ranked permitting as a four on the five point scale.

Not surprisingly, those developers that have encountered fewer obstacles were less critical of the process. Two participating developers complained about the process being long and cumbersome but recognized that permitting is a necessary part of building a new facility and explained that the process is something they factor into their planning.

***New York's current permitting process – SEQR*.** The previous section discussed interviewee comments regarding the permitting process in New York. This section provides factual background on the process to help put those comments in perspective.

In addition to local and federal siting and permitting requirements, construction of new electric generating facilities in New York is currently subject to review under SEQR.[97] Unlike the Article X siting law, which previously governed power plant siting in the State (discussed further below), the SEQR process lacks elements specific to the electric generating sector. The New York State Department of Environmental Conservation (DEC) issues regulations and provides guidance regarding the SEQR process. However, the actual SEQR review process is carried out and key decisions are made by the local or state agency which assumes the "lead agency" role under the process.[98] The lead agency overseeing renewable energy project permitting under SEQR is often the local municipality's town board.

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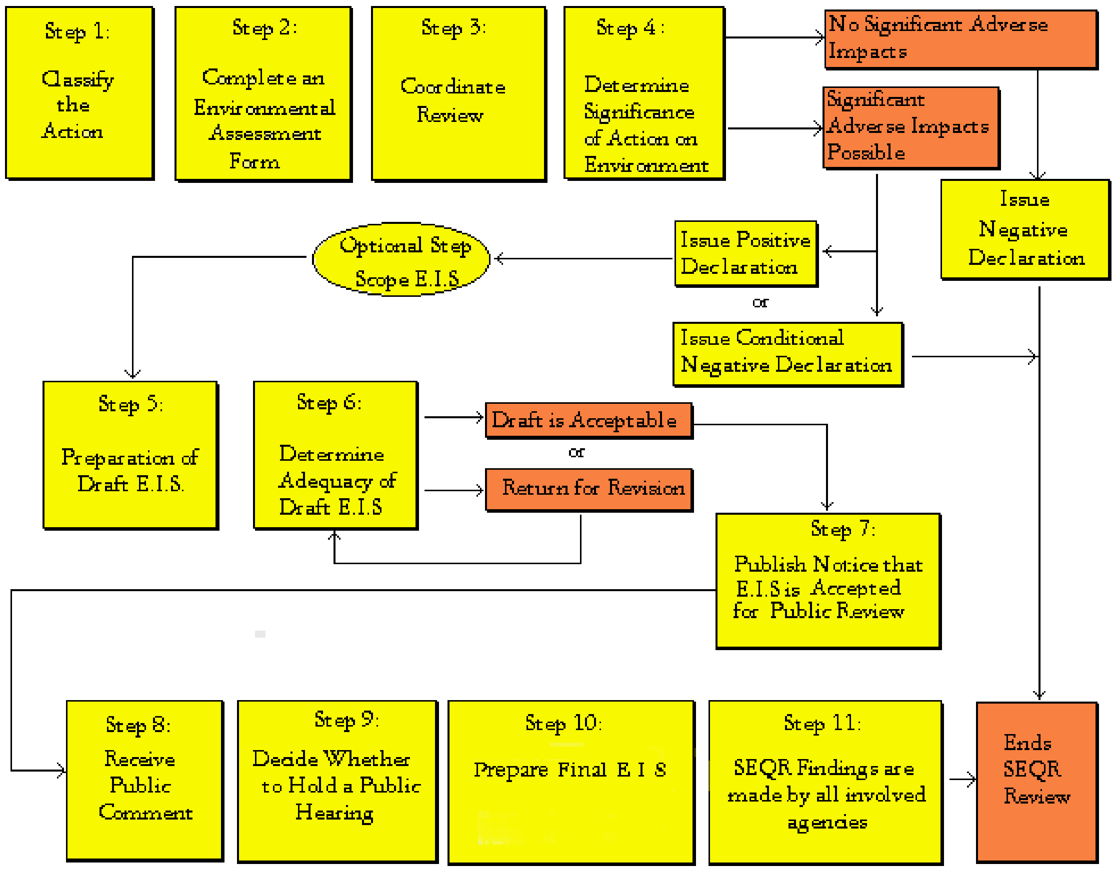
[97] Statutory authority: Environmental Conservation Law Sections 3-0301(1)(b), 3-0301(2)(m) and 8-0113.

[98] According to SEQR regulations, the lead agency must be an agency that has a discretionary decision to fund, approve, or directly undertake the activity under review. The agency that first receives an application typically assumes the lead agency role. However, there are cases in which different agencies dispute over which should assume the lead agency role. For example, in the case of the proposed Hounsfield Wind Farm the Hounsfield Planning Board and the DEC both expressed desire to be lead agency. In these cases, the Commissioner of the DEC determines which agency should be designated the "lead agency.")

In addition to the lead agency, other agencies, organizations, and the public can become closely involved in the process. Other agencies in a position to make official discretionary decisions (i.e., permit approvals) related to the project can be designated "involved agencies." These agencies will take on specific responsibilities related to the process, including issuing findings on the Environmental Impact Statements. Agencies that lack decisional authority over the project, but can provide valuable information, can become involved as "interested agencies." Private organizations, interest groups, and individuals can also engage in the process. They can contribute scoping topics and participate in scoping sessions at the beginning of the process and then can submit written and oral comments during the draft Environmental Impact Statement comment period and at public hearings.

Figure 20 summarizes the steps involved in the SEQR process. If a project is subject to review under SEQR, then the first key step in the process is for the applicant to complete an Environmental Assessment Form (EAF) summarizing key project characteristics and potential environmental impacts. If, based on a review of the EAF, the lead agency determines the project is likely to result in significant adverse environmental impacts, the applicant must prepare a full draft environmental impact statement (DEIS). Once the lead agency deems the DEIS acceptable, it undergoes public review and comment.

Figure 20. Overview of SEQR process



Source: New York State Department of Environmental Conservation, http://www.dec.ny.gov/public/32521.html

A number of interviewees complained about the lengthiness of the SEQR process. Based on a review of the SEQR process timeline prepared by DEC (Figure 21) it appears that delays in the process are possible if the applicant is required to make substantial or multiple revisions to a DEIS before it is deemed adequate for public review by the lead agency, or if the lead agency or involved agencies are slow to issue decisions on the final EIS.99 In addition, delays can occur if citizens file Article 78 lawsuits, as noted earlier.

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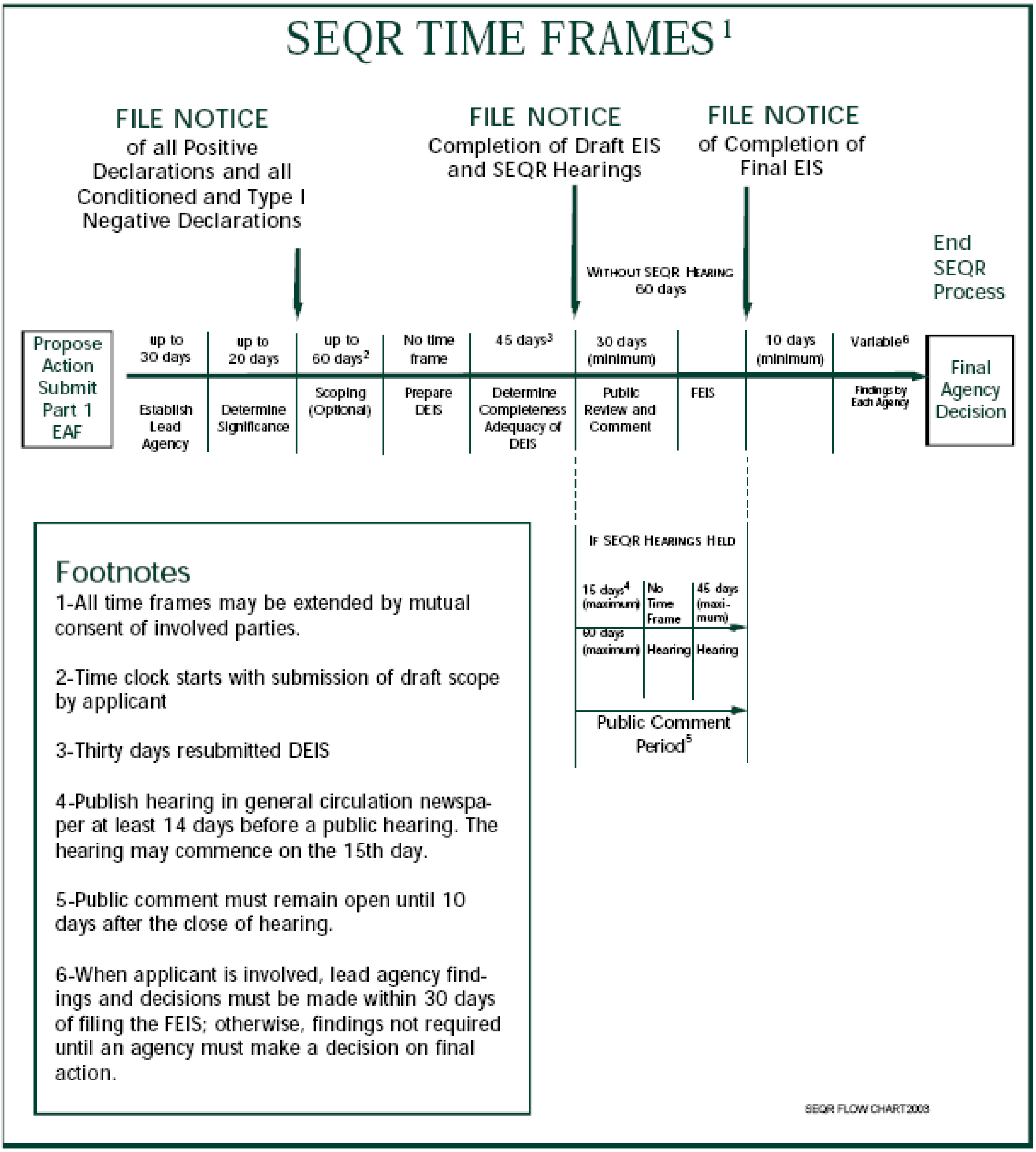
[99] In addition, there are no timeframes specified for the applicant's preparation of the draft and final EIS documents. Therefore, any delays in the applicant's own efforts to prepare these documents would contribute to the lengthy permitting process.

Figure 21. SEQR Timeline



Source: New York State Department of Environmental Conservation, http://www.dec.ny.gov/docs/permits_ej_operations_pdf/seqrflow2003.pdf

An important feature of the SEQR regulations is that they are self-enforcing; DEC has no authority to review the implementation of SEQR by other agencies. If an agency makes an improper decision, it is up to citizens and affected parties to seek legal remedy through the New York State court system.[100]

In addition to completing the SEQR process, renewable energy projects built in New York must obtain all necessary permits and approvals from local, state, and federal agencies. For example, if the project will affect streams, wetlands, or air quality, the developer will need to file for permits and certifications with the DEC (i.e., Freshwater Wetlands Permit, Use and Protection of Waters Permit, Federal Clean Water Act Certificate, and storm water discharge permit). If the project site includes any historically significant features protected under the National Historic Preservation Act, the developer would also need to seek approval from the New York State Office of Parks, Recreation and Historic Preservation. An example of the range of state and federal agencies that may become involved in permitting a renewable energy project in New York is provided in Table 8.

[100] New York State Department of Environmental Conservation, Draft SEQR Handbook, Chapter 1, Agencies Subject to SEQR: The Who, What and When, Item 10. http://www.dec.ny.gov/public/6473.html

Table 8. Agency involvement in Windfarm Prattsburgh

Agency	Involvement in WindFarm Prattsburgh environmental review process*
NYS Department of Environmental Conservation	Interested agency; may be Involved agency if NYSDEC permits are required (e.g., state regulated wetlands or stream permits); has broad responsibilities to consider impact of projects on natural resources, including birds, bats and their habitats.
NYS Department of Agriculture and Markets	Interested agency; focus on ensuring that soils and farming operations are not adversely affected by construction activities
NYS Public Service Commission	Interested agency; oversees issues relating to energy interconnection and transmission
NYS Office of Parks, Recreation and Historic Preservation	Interested agency; state administrators of National Historic Preservation Act
U.S. Fish and Wildlife Service	Interested agency; focus on ensuring that no adverse impacts occur to sensitive wildlife habitat or species; has responsibilities under Migratory Bird Act and Threatened and Endangered Species Act.
USDA Animal Plant Health Inspection Service	Interested agency; responsible for plant protection and quarantine program
U.S. Army Corps of Engineers	Interested agency; likely to issue permits in compliance with Section 404 of the Federal Clean Water Act
Federal Aviation Administration	Interested agency; provides obstruction lighting recommendations to minimize aviation risks

* An "involved agency" typically has some form of discretionary authority relating to a specific aspect of a proposed action (e.g., the granting of a required permit). An "interested agency" lacks this discretionary authority but still chooses to participate in the review process because of specific expertise and/or concerns.
Source: http://www.windfarmprattsburgh.org/table4.html

Source: Daniels, Katherine. 2005. *The Role of Government Agencies in the Approval Process*. NYSERDA, New York Planning Federation and New York Department of Environmental Conservation.

Efforts to streamline permitting process – Article X Siting Law. Many interviewees commented about the importance of adopting a more streamlined siting and permitting process that includes clear timelines, treats projects consistently across the State, and is tailored specifically to electric generating facilities. In fact, adoption of a power plant siting law is favored by a diverse set of stakeholders across the State, and a number of proposals have been considered by the New York State Assembly during the past few years. The legislative proposals focus on reinstating a version of Article X of the New York State Public Service Law, which expired on January 1, 2003.

While it was in effect, Article X provided a review process for considering applications to build and operate electric generating facilities of 80 MW or more.[101] Under Article X, a New York State Board on Electric Generation Siting and the Environment (Siting Board) presided over power plant siting decisions. The seven member Board comprised representatives from the New York State PSC, who served as Chair of the Board, commissioners of the departments of environmental conservation, health, economic development, the Chair of NYSERDA, and two public board members. If the Board is reconstituted, New York may want to consider adding the commissioners of Agricultural & Markets and the Office of Parks, Recreation, and Historic Preservation, due to their agencies' evolving interest in renewable development.

Applications to the Siting Board were required to include:[102]

- A description of the proposed facility and site, including all applicable environmental characteristics;
- Studies of impacts on air, water, visual resources, land use, noise levels, health, and other matters;
- Proof that the proposed facility will meet state and federal health, safety, and environmental regulations;
- Applications for air and water permits (permit applications to be reviewed, and permits to be issued separately by the DEC); and
- A complete report of the applicant's public involvement program activities and its plans to encourage citizen participation.

Applicants under Article X were also required to pay a fee of $1,000 per MW up to $300,000 to support an intervenor fund. These funds were awarded to municipal and local parties to defray expenses related to hiring expert witnesses and consultants.

Applicants were expected to involve the public in the process by holding public hearings, making presentations to the local community, and disseminating information to the local community through mailings and the local media. In addition, the Siting Board would conduct public hearings and receive

[101] Article X replaced Article VIII of the NYS Public Service Law, an earlier power plant siting law which was in effect from 1972 until it sunset in 1988. Suchman, G. 2007. "Power Plant Siting: Efforts to Amend Article X Fail." *New York Law Journal* Volume 238 – No. 27.

[102] New York State Public Service Commission, Guide to the Certification Review Process for Major Electric Generating Facilities Under Article X of the New York State Public Service Law. W:\Projects\NYSERDA RPS\Background Docs\Siting Permitting Policy\Old Article X Process Guide.mht

public comment. However, one of the most common concerns cited about the old Article X siting law was a lack of public input in the process.

The Siting Board would evaluate projects based on a set of criteria centered on determining whether the project is in the public interest, and whether it is compatible with state rules related to the environment, health, and safety. If certain local legal provisions were deemed too restrictive by the applicant, the applicant could request that the Board refuse to apply those provisions in reviewing the project. Projects gaining the Board's approval would receive a Certificate of Environmental Compatibility and Public Need (Certificate). The goal of the Siting Board was to certify projects within 14 months of an application's filing (two to four months to determine compliance, plus a 10 to 12 month review process).[103]

Since Article X sunset at the end of 2002 and was replaced by the SEQR process described above, a wide range of stakeholders have supported the reinstatement of some revised form of the siting law. These diverse stakeholders include the New York League of Conservation Voters,[104] the Business Council of New York State,[105] the NYISO[106] and CURE (Communities United for Responsible Energy), a group of community-based environmental justice organizations.[107] Enacting an Article X power plant siting law is also referenced by the Governor's Task on Renewable Energy as a key strategy for realizing New York's abundant wind energy development potential.[108]

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[103] Ibid.

[104] New York League of Conservation Voters website: W:\Projects\NYSERDA RPS\Background Docs\Siting Permitting Policy\Article X (Power Plant Siting) NYLCV - New York League of Conservation Voters.mht.

[105] Business Council of New York State website: http://www.bcnys.org/priorityissues/2005/vfjarticlex.htm .

[106] The NYISO notes support for an Article X siting law in its 2008 Power Trends report. New York Independent System Operator. 2008. *Power Trends 2008*. Rensselaer, NY.

[107] Suchman, G. 2007. "Power Plant Siting: Efforts to Amend Article X Fail." *New York Law Journal* Volume 238 – No. 27.

[108] Renewable Energy Task Force to Lieutenant Governor David A. Patterson. *Clean, Secure Energy and Economic Growth: A Commitment to Renewable Energy and Enhanced Energy Independence*. The First Report of the Renewable Energy Task Force to Lieutenant Governor David A. Patterson. February 2008

The New York State Business Council highlights that, in a restructured electric industry, electric generating facilities assume much greater development risk than under the previous regulatory structure. The group states, "By allowing [Article X] to expire, the State sent a clear message to the generation and development community – New York's legislative / regulatory atmosphere [is] not conducive to investment in generation."[109]

Opponents to an Article X siting law include local officials and citizen groups that are concerned that an Article X law would circumvent public participation in the siting process. However, two representatives of municipalities interviewed as part of this evaluation supported the possibility of an Article X siting law as long as it incorporates ample opportunity for public participation and does not limit municipalities' opportunity to derive revenue from the development process.

Since 2007, at least eight bills have been put before the New York State Legislature to reinstate a new electric generating facility siting law. Some key differences among the proposed bills have been the size threshold to which the law should apply (ranging from five to 80 MW), as well as the fuel sources to which the law should apply. A 2007 governor's program bill focused on expediting the siting of natural gas and wind projects; however, it has not been enacted.

The two bills that have made the most progress toward passage are Assembly Bill 8697, passed by the Assembly in May 2007, and Senate Bill 5908, passed by the Senate in May 2007. Both bills were similar to the former Article X in that a statewide siting board would review and approve electric generating facility proposals, and similar materials would be required of the applicants as under the earlier statute. Both bills would also have provided opportunity for public involvement, first at the pre-pre-application phase, when they can have input on the scope of the application to be filed, then through public hearings and through filing of written statements after a decision is recommended by a hearing officer. Like the original Article X law, both bills would have enabled the siting board to override local legal provisions that are deemed overly restrictive. Finally, the two bills would have also called for completion of all proceedings related to an application within 12 months of the application being deemed complete, with a potential six month extension. The two bills differed in their definitions of the threshold capacity level at

[109] Business Council of New York State website: http://www.bcnys.org/priorityissues/2005/vfjarticlex.htm.

which projects would be subject to Article X, the amount of intervenor funds an applicant would be required to submit, and in some of the other components they address.

In summary, New York's current SEQR permitting process is viewed by many as a serious impediment to fulfilling the state's renewable energy development potential. Key concerns related to the current system expressed by interviewees include its reliance on local officials for decision-making and uncertainty regarding the timeline for the project decision-making. A diverse set of stakeholders supports re-enactment of the state's former Article X power plant siting law. However, there is opposition by some who are concerned that the public will lose their authority to make decisions about projects that will affect their communities. A number of bills have been proposed to re-introduce an Article X law, but none has gained full approval by the New York State Legislature thus far. New York's permitting barrier will have more significant impacts on New York's renewable energy development activities in the coming years. RPS mandates will ramp up in other states with substantial wind resources and these states will increasingly compete with New York to attract wind development activity. New York should look to other states for examples of effective permitting regulations. Several developers cite Pennsylvania as a much easier place to build wind projects. A brief summary of efforts to address siting and permitting challenges in that state is provided in Appendix D: Pennsylvania Wind Siting Initiatives.

4.2.3.6 <u>Local Opposition to Project Development</u>. While some see wind farms as a symbol of clean, abundant, local energy, others view them as noisy, industrial encroachments on rural and historic landscapes. Wind farms are the focus of most local opposition to renewable energy facility siting. While this is partially due to their visibility and large footprint, it is also likely due to the fact that they are so much more prevalent than other types of new renewable energy facilities (see Figure 2-6). However, local opposition, sometimes referred to as "NIMBYism" ("Not In My Backyard"), can mount against any renewable energy technology. Whether power plant permitting continues under the SEQR process described earlier, or whether an Article X siting law is reinstated, the public will continue to play an important role in determining the fate of renewable energy project development in their communities, and local opposition will remain a central issue in project development.

Thirty-nine percent of participating developers ranked local opposition as a significant barrier to project development (i.e., gave it a score of three or higher on the five point scale). To capture a range of perspectives on the issue, five municipalities that have dealt with wind farm development in New York were interviewed as part of this evaluation, along with representatives from citizen groups, non-profit organizations, and land preservation organizations that have made renewable energy issues a focus of their activities.

Developers' of wind, biomass, and landfill gas projects all reported having encountered local opposition to their projects. Some developers expressed concern that problems associated with local opposition may increase in the future as new project sites are proposed.

For wind projects, key concerns that have been raised by local opponents include:

- Visual and noise impacts;
- Loss of property values;
- Ecosystem and wildlife impacts;
- Ice throw from turbine blades;
- Health effects from exposure to low frequency noise and infrasound;
- Wind developers reaping large profits; and
- Lack of maintenance and decommissioning planning.

Much information on these potential impacts of wind projects can be found on the websites of citizen groups that have organized around the issue of wind farm development. These organizations include Citizens for Responsible Energy Development, Save Western New York, We Oppose Windfarms, Industrial Wind Action Group, National Wind Watch, Cohocton Wind Watch, and Otsego 2000. As the names indicate, these groups vary in their focus. Some have a national scope, while others carry out only very local, project-specific activities. The websites of these organizations serve as tools for sharing stories, articles, and studies about the consequences of wind development that surface through experiences at projects located around the world.

For biomass projects, air quality and truck traffic are often the focus of local opposition. Landfill gas projects see less opposition than other technologies in general. However, some express concern that the technology can promote the practice of disposing of organic waste in landfills, rather than reducing waste and/or composting, by making it more financially viable.

Developers and other interviewees believed that some local opposition could be effectively addressed through increased efforts to educate the public about the facts and benefits associated with renewable energy technologies, and about New York State's commitment to increased renewable energy development. However, some developers recognized that the most powerful opposition is rooted in more subjective concerns about the way wind farms can change the aesthetics and character of a community. Therefore, education and outreach, as well as changes in the permitting process, are warranted.

A broad spectrum of opinion was expressed from representatives of the municipalities and public interest organizations. Municipal representatives almost universally reported that the majority of the people in their communities support wind farm development, but that a minority of citizens, sometimes from neighboring towns, had vocally opposed development. Municipal groups, trade associations, and others explained that long-time local residents often support the projects, while the greatest opposition often comes from those who own second homes in the area. Those opposing the projects generally have more financial resources at their disposal to fund studies and legal counsel that can be used to challenge the project.

A conservation group believes that many of the NIMBY concerns and local political turmoil around wind projects in New York could be avoided if the State takes a decisive, proactive approach to project siting. The group expressed support for renewable energy project development in general, but explained that, because wind projects are so large in scale, they result in unique impacts on the landscape. Therefore, they warrant a unique siting process. The group advocates that the State direct the location of wind farm development through statutory standards, not just voluntary guidelines. They suggest that the State designate certain areas as exempt from wind farm development due to historic or environmental significance, and meanwhile clearly identify areas where wind development is encouraged. In addition, the group advocates a permitting process that adequately addresses visual impacts, and requires developers to put forth plans for decommissioning projects and repairing inoperable turbines. The group explains that these steps would help facilitate project development in appropriate locations while avoiding messy debates about wind farm development in historic or otherwise sensitive locations.

A representative from a group that opposes large wind project development across the country spoke about the fact that wind projects are now being used by politicians as a universal symbol for clean energy and energy independence. Meanwhile, insufficient attention is given to the importance of building clean power plants that can produce energy during periods of peak demand and can be located closer to load centers. The organization advocates boosting incentives for biomass and other renewable energy technologies that are less popular than wind, but can offer grid reliability, as well as environmental and economic benefits. Whether such an additional premium is warranted, however, is questionable as the power market already offers a premium for on-peak power.

Some states have seen less local opposition to renewables—most notably Texas. Texas surpassed California in 2007 as the state with the most wind capacity and, as of June 30, 2008, had 5,604 MW, double California's capacity, eight times New York's, and a quarter of the nation's.[110] While the state has seen some local opposition, it has been limited and has done little to slow the growth.[111] Reasons for differences with New York may include more sparsely populated areas and citizens that are conditioned to energy production. "Texas has been looking at oil and gas rigs for 100 years, and frankly, wind turbines look a little nicer," said Jerry Patterson, the Texas land commissioner.[112] Texas has higher quality wind resources than New York, which may enable greater royalties and other payments to local residences. A Texas resident who has 154 wind turbines on or on the way to his ranch, for which he receives $500 per month each ($924,000 per year), reports that the sound of the wind turbines is ". . .just money you're hearing."[113]

Texas offers a stark contrast to the situation in New York. Experience from eastern states, where land area is more limited, population density is greater, and citizens are more actively engaged in protecting the character of their rural landscapes, is more applicable to New York. Many of the New England states have experienced local opposition that is comparable to that in New York, and this remains a challenge to future development in that region. As noted earlier, Pennsylvania is referenced by several developers as an easier place to build wind projects than New York. Pennsylvania and New York share some similarities in their geography and in the role that local communities play in wind permitting. New York should follow efforts underway in Pennsylvania (summarized in Appendix D: Pennsylvania Wind-Siting Initatives) and look for potential strategies for replication in New York.

Much of New York's best land-based wind resources exist in rural parts of the State. Therefore, the debate is likely to continue between those who see wind development as an opportunity for local economic growth and those who see it as a disturbance to the rural, historic character of the landscape. Since the barrier is

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[110] American Wind Energy Association. "Another Record Year for Wind. http://www.awea.org/pubs/factsheets/Market_Update.pdf. Downloaded October 17, 2008.

[111] New York Times. "Move Over, Oil, There's Money in Texas Wind". February 23, 2008.

[112] Ibid.

[113] Ibid.

likely to continue, and potentially increase in the future, the State should take proactive steps to address the problem. A key strategy is to facilitate increased education, outreach and knowledge-sharing about renewable energy development experiences in the State, and about New York's commitment to renewable energy development. In addition, it will be important for the State to take more decisive steps, such as clearly identifying and communicating areas of the State where wind and/or other renewable energy project development is encouraged.

Another strategy could be to address the problem through economic solutions. If the State were to provide added incentives for projects offering a range of benefits, this would create favorable economics for a wider range of project development opportunities. This could help drive project development in less controversial locations and enable more residents to reap the economic benefits of renewable energy development in their communities. This approach could serve other goals as well by increasing the geographic and technological diversity of renewable energy project development in the State.

4.2.3.7 Interconnection Costs and Processes.

This section first provides a summary of interviewee comments on the topic of interconnection costs and processes. This is followed by a summary of the processes in place to provide factual context for the interviewee comments.

Summary of Interview Comments. Interconnection costs and processes were cited as a significant barrier to development (i.e., barrier received score of three or greater) by 39% of participating developers who were interviewed. The average score for this barrier was a 2.6.

Developers expressed greatest concern about timing issues associated with the interconnection process and explained that delays in the process can have serious consequences for the project development cycle and overall project costs. Two developers explained that the process can delay project development by a year to two years. A developer and a representative from a trade association explained that the NYISO was overwhelmed with applications to interconnect during the "land rush of wind development" that occurred after the RPS was announced in New York. According to these interviewees, the NYISO lacked sufficient resources to manage the volume of interconnection studies at that time, but has since adapted to better accommodate demand.

A non-participating developer cited the interconnection queue process and timing as barriers. The developer noted, "I don't like the single class year process – it makes the queue kind of lumpy. You're either in March 1 or the next class year." This developer also explained that coordinating the timing of entry into the queue with timing of filing a draft Environmental Impact Statement under the SEQR process can be a challenge.

Of the two developers that compared the interconnection experience in New York with that in other regions, there were mixed reviews. One developer described the NYISO as much slower than ISOs in other regions, while another developer explained that interconnection in the NYISO is much less cumbersome than in other parts of the country, such as the Midwest ISO.

Two participating developers and one non-participating developer explained that involving both the NYISO and the transmission owners (utilities) in the interconnection process complicates things, requiring too many communications with too many parties and resulting in delays. One developer voiced concern about having to incur the long study process without any certainty about the outcomes (i.e., costs that will ultimately be levied on the developer). Two participating developers and one non-participating developer also explained that there can be inconsistency between the requirements imposed in one utility territory versus the next.

Costs were only cited by one developer as a significant barrier. It appears that, overall, developers are more concerned about the costs associated with delays to project development that may result from the interconnection process than the actual interconnection costs they are incurring.

Some developers' concerns about interconnection delays and inconsistencies may be the result of changes in rules that have occurred over time. Some developers' poor experiences may be due to their project entering the interconnection process at a time when the NYISO was overwhelmed with wind project applications after the RPS was introduced. And some developers' concerns may be the product of normal NYISO procedures. To put the developers' concerns in context, an overview of the NYISO interconnection procedures pertaining to large facilities is provided in the next section.

***Summary of NYISO Interconnection Procedures*.** Costs and procedures associated with interconnecting large generating facilities to the New York State Transmission System are governed by Attachments S, X, and Z to the NYISO's Open Access Transmission Tariff (OATT). The procedures are in compliance with FERC requirements. Attachment S, "Rules to Allocate Responsibility for the Cost of New Interconnection Facilities," is applicable to projects larger than 20 MW and was most recently updated in August 2008.[114] Attachment X, "Standard Large Facility Interconnection Procedures," is also applicable to generating facilities that exceed 20 MW and to merchant transmission facilities. The procedures in this attachment were updated in August 2008. Attachment Z sets forth interconnection procedures for small generators, or those less than 20 MW. This attachment was last updated in 2007. The attachments of most relevance to RPS Main Tier projects are Attachments S and X.

Attachment X outlines the interconnection procedures each large generating facility must follow. Shortly after a developer files an interconnection request, a scoping meeting is held in which the NYISO and the relevant transmission owner discuss alternative interconnection options for the project. NYISO then conducts an Interconnection Feasibility Study, a preliminary evaluation of the feasibility of interconnecting the proposed project to the State transmission system. The NYISO is expected to make reasonable efforts to complete this study within 45 days, and completion of the study is followed with a study report meeting involving the developer, the transmission owner, and the NYISO. Next, the NYISO conducts a more detailed Interconnection System Reliability Impact Study. This study determines the interconnection facilities that are required to ensure reliable interconnection of the project, along with preliminary estimates of the cost and length of time it would take to construct the facilities. The NYISO is expected to make reasonable efforts to complete this study within 90 days. Completion of this study is also followed by a study report meeting. The NYISO then completes an Interconnection Facilities Study for all projects in the Class Year.[115] The study outlines the system upgrades and costs associated with reliable interconnection of all projects proposed for that Class Year.

The premise for the cost allocation provisions described in Attachment S is that a developer is "held responsible for the cost of the interconnection facilities that are required by its project, [and] any facilities that would not be required but for its project."[116] Determination of the incremental system requirements

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[114] Projects smaller than 20 MW are also subject to procedures set forth in Attachment S if an interconnection study conducted in accordance with the rules for Small Generating Facilities (Attachment Z) find that the facility requires a System Upgrade Facility to interconnect.

[115] The proposed projects studied in a given Annual Reliability Assessment, conducted as part of the procedures outlined in Attachment S described below, are grouped into a given "Class Year".

[116] NYISO OATT Attachment S, Section I A.

and costs associated with each proposed project is made through a series of engineering studies conducted by the NYISO in coordination with market participants, including both the transmission owners (utilities) and the developers.

An Annual Transmission Baseline Assessment determines the system improvements that would be needed in that year if no new projects were brought online. Using the baseline study as a benchmark, and drawing on data from the Interconnection Facilities Study, the NYISO conducts an Annual Transmission Reliability Assessment. This Assessment determines the system upgrades required of each proposed project in order to comply with the applicable reliability requirements and the NYISO Minimum Interconnection Standard. A Class Year Deliverability Study is also conducted to determine the upgrades necessary to accommodate proposed projects seeking to meet the NYISO Deliverability Interconnection Standard. This applies to projects seeking to become qualified Installed Capacity Suppliers.

The NYISO develops a set of "generic solutions" and associated costs for each proposed project. System upgrades benefiting multiple developers are split proportionally across the developers. These proposed solutions take into account both the benefits and the costs associated with each proposed project relative to the baseline system conditions (i.e., any system benefits resulting from a project are netted against the total incremental costs associated with interconnecting the project). The NYISO proposed solutions are reviewed by an independent expert. Based on the results of these and related studies detailed in Attachment S, proposed projects are notified of the costs that the NYISO will expect the project to pay to interconnect with the transmission system. If a transmission owner or a developer decides to install equipment that is more extensive than the minimum amount identified by the NYISO, the party that elects to construct the additional upgrade will be responsible for paying the incremental expense.[117]

The schedules associated with the interconnection and cost allocation procedures have a significant bearing on the timing of a project's interconnection. The studies required for each interconnecting project can take over five months. In addition, all project developers that fall into a given Class Year must wait until the completion of the annual studies to learn the costs associated with their project. The Annual Transmission Reliability Assessment begins on March 1 of each year and is planned to be completed within six months. The proposed projects studied in that Assessment are those listed in the Interconnection Queue at that time. If a project does not make it into a given year's Annual Transmission Reliability Study commences, it will

[117] NYISO OATT Attachment S, Sections VI A, and VII, K, 7.

be placed in the following Class Year and may have to wait almost a year to learn of its interconnection costs.[118]

Similarly, the interconnection costs incurred by each project are, in part, a function of the other projects in that Class Year. For example, if multiple projects wish to interconnect in the same area in a given year, they would benefit from the ability to share the costs of system upgrades required in that part of the transmission system.[119]

Clear schedules and checks and balances are built into the processes described in Attachments S and X. However, there are opportunities for delays, and there do appear to be some areas where utilities and the NYISO could affect the process in ways that may be disagreeable to developers. For example, delays can occur if the NYISO does not complete interconnection studies within the specified timeframes. When this happens, the NYISO is only required to notify the developers and provide an estimated completion date and documentation.[120] In addition, there can be delays associated with the construction of system upgrades specified in the NYISO studies. Utilities, as transmission owners, contribute information and recommendations throughout the interconnection study processes. In some cases, the NYISO may call on the transmission owner to actually perform interconnection studies.[121] However, the NYISO does ultimately have control over all decisions regarding upgrade requirements, and their decisions are subject to review by an independent expert.[122] In addition, it should be noted again that all procedures set forth by the NYISO are in compliance with FERC requirements.

In summary, developers voiced concern about the lengthy interconnection procedures followed by the NYISO, and noted some inconsistencies in requirements from one utility territory to the next. It is outside the scope of this evaluation to research the specific circumstances associated with these developers' projects. A review of the NYISO interconnection and cost allocation procedures indicates that standardized

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[118] In addition, if any project declines to pay the costs identified by the NYISO, a revised study must be prepared, though this is only scheduled to take two weeks.

[119] Developers are responsible for all study costs associated with their project(s).

[120] NYISO OATT Attachment X, Section 6.3.

[121] NYISO OATT Attachment X, Section 13.4. In addition, input by the transmission owners may lead the ISO to require that a developer pay for an upgrade that provides the system with "headroom" or extra capacity, however the developer would be compensated in the future by developers who ultimately make use of this upgraded capacity (NYISO OATT Attachment S, Section VII. B.1.).

[122] NYISO OATT Attachment S, Section VI. A.2.f.

requirements are in place across the State, but that delays are still possible under certain circumstances, and that utilities and the NYISO may affect the process and produce results that may thwart developers.

4.2.3.8 <u>Lack of an Appropriate Attribute Tracking and Trading System</u>. The Department of Public Service (DPS) currently tracks the attributes for electricity generated in New York State as part of its Environmental Disclosure Label Program. The DPS uses an accounting approach that is not appropriate for REC tracking and trading, and this presents a barrier for many market participants. Thirty-three percent of participating developers identified this as a barrier to the development of large scale renewable energy in the State. Non-participating developers and trade associations also recognize the incompatibility of New York's system with those of neighboring regions as a significant barrier. However, these market participants identify this more as a barrier to market liquidity and voluntary market activity than a direct barrier to project development. The challenges that this barrier places on voluntary green power market participants ("ESCOs") were reflected in the comments from those interviewees. Those voluntary market issues are discussed in Chapter 6.

Under New York's Environmental Disclosure Label Program, the DPS draws on data provided by the NYISO, the DEC, the U.S. Energy Information Administration, and market participants to calculate a statewide average fuel mix and air emissions profile, as well as individualized profiles for all retail electricity products sold in the State. All energy traded through the NYISO spot market is assigned the characteristics of the statewide average fuel mix. Load Serving Entities (energy service companies or utilities) that wish to differentiate their Label to reflect purchases from renewable energy generators must complete a "conversion transaction." The DPS describes the conversion transaction process as follows:

> A ***Conversion Transaction*** occurs when an entity (generating facilities) that sold energy into the Spot Market, and an entity (known as a Load Serving Entity or LSE) that purchased a like amount of energy out of the Spot Market during the same six-month settlement period, jointly identify for the Label Administrator such packet of energy such that it can be disaggregated, for environmental disclosure purposes, from the residual pool of Spot Market energy.[123]

[123] New York State Department of Public Service, Environmental Disclosure Rules and Procedures for Conversion Transactions. http://www.dps.state.ny.us/Final_Rules_and_ProceduresCTnov5.htm

In contrast to the New York system, the neighboring ISO-NE and PJM[124] control areas use sophisticated, but more transparent, attribute tracking systems that are managed in close coordination with the regions' ISOs. Under these two tracking systems, every MWh of energy produced in each region is assigned an electronic certificate stating its characteristics (fuel source, state-specific RPS eligibility, location, vintage, air emissions, etc.). These characteristics are determined in coordination with environmental regulatory agencies from the states in which the generators are located. Environmental disclosure labels issued in those regions are based on these certificates, which are traded and then settled with load serving entities at the end of each quarterly trading period.

Some developers reported that the conversion transaction accounting process takes well over a year to confirm the creation of attributes. The inconsistency of the New York system's timing with the timing of tracking and trading systems in neighboring regions significantly limits market liquidity and is not adequate for facilitating market transactions that are done and based on monthly production of electricity. For example, a wind generator finds it difficult to sell its attributes due the fact that the DPS does not recognize their creation until at least six months the power is generated.

Developers reported that they do not view the New York voluntary green power market as a significant source of demand for new renewable generation. This, coupled with the fact that the tracking system puts constraints on attribute trade across regions, makes renewable energy generators in New York more dependent on participation in the New York RPS program as a critical source of attribute/REC revenue. While this might tend to increase supply and put downward pressure on prices in the compliance market, it makes the New York renewable market less sustainable as a whole.

Concerns about the potential for double counting of attributes were also raised by some interviewees. Because of the manual nature of the program, one trade association explained that the system administrators and market participants must be diligent about avoiding any double counting of attributes. A developer noted that New York counts generation from existing renewable energy generators toward its 25% RPS target, but does not actually take title to the attributes from those existing generators. Nothing limits those older renewable energy generators from selling their attributes into voluntary green power

[124] ISO-NE is the ISO for New England. PJM the regional transmission organization in 13 states and the District of Columbia

markets outside New York, and this is resulting in a double counting of attributes (i.e., they are being counted both toward New York's RPS target and through voluntary green power markets in other states).

While it appears that New York's conversion transaction system is not a critical barrier to project development in the State, it is limiting market liquidity. Based on feedback from a wide range of stakeholders, it appears New York's market participants strongly favor a transition to an attribute tracking system, which is more conducive for commercial transactions and compatible with those in place in neighboring regions and tracks at or near the time the monthly production can be verified. NYSERDA and the State are already exploring options for transitioning to a new attribute tracking system, and it appears this is a barrier that can be readily addressed through efforts that are already underway.

4.2.3.9 Cost of Doing Business in New York. Less than 30% of participating developers identified the cost of doing business in New York as a significant barrier to large scale project development in the State. This was consistent with feedback from other stakeholders.

Developers generally described the cost of doing business in New York as "above average" relative to other states, but explained that it is not keeping them from doing business in the State. Some developers explained that the potential for a lengthy permitting process in New York, as well as added layers of bureaucracy from local government involvement, do make it more expensive to build a project in New York relative to other states. Two developers also reported that the cost of labor in New York is higher than in other states.

4.2.3.10 Availability of Suitable Sites with Adequate Renewable Resources. Five wind developers scored this barrier as a four or higher on the five-point scale, as did one landfill gas developer.[125] However, only 28% of participating developers overall recognized this as a significant barrier to development in New York.

[125] This includes four participating wind developers and one non-participating developer.

Biomass developers expressed that there is ample sustainable, recoverable, fuel-grade wood resource available to develop in the State. One biomass developer quoted that there is 2 GW of economic potential and that this could be developed at sites distributed across the State.

Wind developers were less optimistic. One developer explained, “Most of the good sites have already been picked over.” Others explained that, because New York has a “below average” wind resource relative to many of the other states developers are eying for new development, future projects in New York will likely need higher REC prices than are being paid to current projects.

A landfill gas developer explained that many of the best landfill gas sites have already been developed and that there are a limited number of remaining developable sites.

Based on this feedback, it appears that “availability of suitable sites” represents a barrier for wind and landfill gas projects, but an opportunity for biomass. While there is little NYSERDA or the State can do to make more resources available, this information can help NYSERDA and the State anticipate potential trends in New York’s renewable energy market and plan accordingly. For example, there could be a shift in the relative attribute prices different technologies bid into the RPS program in the future. This may result in an increase in average REC prices, as wind prices could go up, while biomass REC prices will still face the same fuel supply uncertainties that currently affect their REC pricing. The State may want to adapt its budget to reflect a potential increase in REC prices. In addition, the State could help mitigate the effects of this barrier by addressing some of the other barriers that could limit future development (i.e., siting and permitting). New York might want to look into developing “permit-ready” sites.

4.2.3.11 Property Taxes or Payment in Lieu of Taxes. Twenty-two percent of participating developers reported that these payments are a significant barrier to project development in the state (i.e., the barrier received a score of three or higher on the five point scale). Some developers reported that taxes and Payments in Lieu of Taxes (PILOTs) are a major expense for their projects, though most developers dismissed this as a relatively minor barrier compared to others they face.

Themes that emerged from stakeholder input on this issue are that there has been a great deal of variability in the way towns have dealt with PILOTs in the past, but this seems to have diminished somewhat in the last year. In addition, communities appear to be becoming more aggressive in negotiating for higher payments from developers.

Two interviewees referenced Empire Zones, an economic development incentive program available to businesses focusing on certain industries, or located in certain designated areas. The interviewees reported that renewable energy projects can qualify for special tax benefits under this program but that there have been limited instances in which developers have actually been able to take advantage of these benefits.

Property taxes and PILOTs are not a critical barrier to development in New York. However, NYSERDA or the State could further reduce burdens on municipalities and developers by helping to facilitate a transfer of information from communities that have already dealt with development issues, to those that are facing future project development. New York could establish a project information clearinghouse if the information is not proprietary.

4.2.3.12 Availability of Parts and Supplies. Only 17% of participating developers indicated that this is a significant barrier, and the effects of the barrier appear to be limited to small wind developers. One wind developer noted that availability has become a somewhat more critical issue lately, as lead times are longer and domestic turbine supply is limited. Given the high global demand for wind turbines, turbine supply agreements are very important for wind developers. Larger developers that have these agreements in place reported fewer problems with availability than small developers that are unable to secure these agreements.

4.2.3.13 Other Barriers. In addition to the potential barriers about which interviewees were specifically asked to comment, interviewees were given an opportunity to discuss additional barriers they have experienced, or expect to encounter in the future. These additional barriers are summarized here. Only five participating developers provided comments on additional barriers. Therefore, these "other barriers" do not come across as significant. However, for those developers who highlighted these barriers, the scores they assigned were generally high, averaging 3.4 on the five point scale. These barriers reflect the review of only one set of stakeholders and do not represent the views, and may be in conflict with the interests, of ratepayers and other stakeholders.

- Uncertainty regarding the timing of New York RPS solicitations and the amount of generation NYSERDA will purchase in a given year;
- Insufficient funding for the New York RPS program and uncertainty about future program funding;
- Lack of multiple large REC buyers in the State;
- More competition to serve RPS demand than in other states;
- REC prices too low in New York;
- Undisclosed REC bid ceiling price constrains market forces by making the process less attractive;
- Difficulty for small projects to compete with larger, more sophisticated players (i.e., they have more difficulty accessing letters of credit, etc.);
- Non-mainstream technologies have trouble competing with mainstream technologies that dominate under the RPS program structure;
- Risk in the attribute pricing biomass developers bid into the program, due to uncertainty around future operating costs at biomass plants (i.e., volatile fuel prices for the truck transport);
- Regulatory uncertainty (i.e., changes in rules in any one state in the region can significantly affect supply and demand balance); and
- Inconsistency in RPS rules across states.

4.2.3.14 Summary and Potential Opportunities to Address Barriers. The top five barriers to large scale renewable energy development in New York are uncertainty about federal tax incentives, cost of supplies and raw materials, transmission constraints, permitting process, local opposition to development, and interconnection costs and processes. Other barriers that appear to be affecting the market include the incompatibility of New York's attribute tracking system with those in neighboring regions, the cost of doing business in New York, limited availability of sites with strong development potential, and local property tax and payments to host communities. Factors related to the New York RPS program structure and funding, as well as general market risks were also reported as barriers by some interviewees.

Some barriers are beyond the control of program administrators, policy makers and the State in general, while others can be more readily addressed. Potential opportunities for program administrators and policy makers to address those barriers are summarized here.

Facilitate Growth in Transmission Capacity

- Identify areas of the State in greatest need of transmission capacity expansion to facilitate renewable energy project development.
- Recognizing that increased transmission capacity is needed to meet New York's renewable energy development goals, consider innovative cost allocation approaches for transmission expansion in the most favorable renewable energy development zones.
- Monitor efforts by other leading states to facilitate transmission capacity expansion in support of renewable energy development. Consider options for replicating these models.

Facilitate More Efficient Siting and Permitting of Renewable Energy Projects

- Adopt a revised Article X siting law that allows for ample public participation and a thorough review of project impacts, but also sets forth a clear timeline and process for resolving disputes.
- Develop a set of criteria for more objectively evaluating the conditions within which visual, noise, and other impacts associated with wind projects should be deemed "reasonable." This should be carried out through a stakeholder process with representation from diverse set of interests.
- Establish maps that indicate which areas of the State are most suitable for development based both on resource availability, local ordinances and the local community's expressed interest in welcoming renewable energy development.
- Conduct outreach to communities to inform them of the State's renewable energy development targets, the benefits and drawbacks of hosting renewable energy development in their community, and steps they can take to facilitate development in their community.
- NYSERDA and the State should look at approaches being used in other states (i.e., Pennsylvania) for permitting and environmental review of proposed renewable energy projects.

Increase Market Liquidity and Certainty

- Adopt an attribute tracking and trading system that is compatible with those in place in the ISO-NE and PJM control areas and that can facilitate monthly or near production verification transactions.
- Set a schedule for future RPS procurements that extends three to five years into the future to facilitate planning by market participants.
- To complement a set schedule of procurements, provide program flexibility so that the RPS program can make short term purchases to fulfill annual targets and meet spot supply needs.
- Communicate plans for the future of New York RPS beyond 2013 (i.e., program structure, compliance mechanisms, entities responsible for procuring attributes, etc.).

Help Reduce Costs and Risks of Doing Business in New York

- Given the highly competitive nature of the New York RPS program, along with its uncertain timing, providing pre-development financial support to projects will help New York remain competitive with other states in attracting new renewable energy development.

Conduct Targeted Public Education and Outreach Activities

- In communities where renewable energy projects are being proposed, make presentations communicating the State's commitment to renewable energy development and provide information kits that can be distributed to interested residents. The content of this education and outreach can be focused on communicating facts and directly addressing the most common concerns about renewable energy development. NYSERDA can play a valuable role as a source of unbiased information.
- Facilitate the transfer of information and knowledge across communities that are considering present or future renewable energy development (i.e., information on PILOTs, model ordinances, etc.) and working with stakeholders.

4.2.4 RPS Program Influence on Renewable Energy Development in New York

A key question in the RPS program evaluation was to determine the extent to which new renewable generation capacity in the state can be attributed to the RPS program. Some of the new renewable capacity added since the RPS was adopted in 2004 might have occurred in the absence of the program, and some new capacity not supported directly by the program may be attributable to the program.

This section of the report presents Summit Blue's analysis of program influence. The section starts with an explanation of the methods used, the challenges encountered, and the reasons why a traditional attribution analysis was not completed. A discussion of the results of the analysis follows.

4.2.4.1 Methods and Challenges. When evaluating an energy program, the goal of attribution analysis is to estimate the amount of total program impacts (in this case, generation counted toward RPS compliance) that have resulted from the program. The method for estimating these net impacts is to calculate a net to gross (NTG) ratio. The two main components accounted for in the NTG ratio are free ridership and spillover.

Free ridership is the share of new generation that would have occurred in the absence of the program. Since renewable energy projects are developed as "whole" projects, it is difficult to attribute portions of that whole project to different decision-making factors. For the purposes of attribution analysis, the intent of estimating free ridership would be to reflect that other factors, aside from the presence of the program, could have contributed to participating developers' decisions to build projects or build larger capacity sized facilities in New York.

Spillover accounts for generation over and above the amount counted toward RPS compliance that has occurred as a result of the program. Energy program attribution evaluations often account for various types of spillover, including additional actions by program participants that occur as a result of the program, as well as actions by non-participants that occur as a result of the program.

This attribution analysis is unique for several reasons. To the knowledge of Summit Blue and NYSERDA, New York is the first state to evaluate its RPS program and attempt to estimate attribution for such a program. In addition, New York's RPS program design is unlike other RPS states in that a public agency (i.e., NYSERDA) is the central procurement agent for RPS compliance RECs and is the main buyer of RECs for RPS compliance in the State. As a result, there is little precedent on which to base the definitions of free ridership and spillover for this analysis.

This analysis is also limited by the amount and depth of data collected. Attribution analysis is typically based on survey or interview responses to a full battery of questions focusing on the topic. However, due to the length and broad scope of the interviews conducted with developers for the RPS evaluation, a comprehensive set of questions that would be necessary to complete a rigorous attribution analysis could not be included.

Finally, this type of program, which is designed to influence stakeholders that are, in many cases, large corporations, imposes challenges different than many program evaluations. The multi-million dollar renewable energy project development decisions are, in general, more complex than decision-making related to installing energy efficiency measures, which is the focus of most energy program attribution analyses. The long and involved renewable energy project development timeline is another key factor that makes it difficult to analyze the decision-making of large renewable energy project developers. In addition, it would be impractical to expect large renewable energy project developers to reveal to interviewers the full strategy and circumstances behind their decision making.

Because of the unique factors associated with this analysis, it was deemed most appropriate to broadly discuss "program influence," rather than specify a NTG ratio. However, a sound approach for estimating program spillover was identified. Therefore, a spillover estimate has been included in this analysis.

Analyzing Program Influence. For the purposes of analyzing program influence, responses to the following three questions from in-depth interviews with both winning and non-winning developers who have bid into the RPS program were considered:

1. How valuable were the NYSERDA REC contracts in getting your project(s) financed? (Answer choices: critical; of significant value; of little or no value; and an obstacle to project finance.)
2. In the absence of the NYSERDA REC contract, how would your development plan have been different (examples: would the project have been developed in another state, same size project, timing of construction, etc.)?
3. Does the NYSERDA program affect the renewable energy market in New York as a whole (i.e., REC prices, making New York more favorable for development relative to other states, or in other ways)?

"Program influence" scores were estimated for all of these participating developers based on responses to the set of program influence questions presented earlier.[126] These scores were grouped into ranges that

[126] The questions were modified somewhat when asked of non-winning bidders.

reflect high, medium, and low levels of program influence. Analysis of program influence was also informed by input from a broad range of other market stakeholders, including non-participating developers, trade associations, and utilities.

Estimating Spillover. For the purposes of this analysis, spillover includes all the generation output from RPS supported projects that was not sold to the RPS. The rationale is that developers participating in the RPS are required to set aside a minimum of 5% of generation for sale to other markets. In several cases, their set aside for sale to other markets was greater than 5% and even as high as 90%. In addition, the majority of developers selling project output to NYSERDA explained that the voluntary REC market alone would have provided insufficient demand on which to base their development decision. This indicates that the program was the key driver behind construction of the entire project, though only the bid quantity is sold to the RPS program.

Project development occurring in New York without NYSERDA REC contracts was considered for inclusion in the spillover definition. In part because of the complex and uncertain project development timeline, some renewable energy projects have been built in New York without first securing a NYSERDA contract. These developers may have built the projects in hopes of securing a NYSERDA contract in the future, or they may have developed the project because they had a good site secured in New York, but wish to sell into the more lucrative New England RPS compliance markets. In either case, the existence of the New York RPS program may have played a role in attracting the developer to pursue project development activity in the State in the first place. In addition, systems benefit charge-funded incentive programs, which preceded the RPS, may have provided the project with pre-development assistance that facilitated the developers' initial activities in the State. If that was the case, it would have disqualified them from the RPS program.

Because insufficient data were available on which to determine the role of the RPS program in the development of new facilities in the state that do not hold RPS contracts, these facilities were excluded from the spillover definition used for this analysis. As a result, the spillover value estimated here is conservative.

Summary of Data Used to Inform Analysis of Program Influence. As described in Chapter 3, in-depth telephone interviews were conducted with nearly 90 New York renewable energy market stakeholders. As noted above, these interviews were structured to gather data on a wide range of topics and included three questions related to program attribution. Interviews were conducted with 18 participating developers, ten of which have secured contracts with NYSERDA through the RPS program.

For the purpose of estimating spillover, the analysis factored in only responses from participating projects that have won NYSERDA contracts. This is appropriate given that spillover is defined as the portion of generation from RPS-contracted projects that is not actually sold to the RPS. In addition, as noted earlier for the purposes of discussing program influence, responses from all participating developers (both winning and non-winning) were considered.

Input from non-participating developers (those that have not bid into any of the RPS solicitations) and other market stakeholders (trade associations, utilities, program staff, etc.) was used for context and for purposes of comparing with responses from participating developers. It was determined that, because these other market participants have, to date, had more limited experience working to get projects built in New York, the focus of the program influence analysis should be on participating developers.[127] Many of the other interviewees also expressed that the participating developers were in the best position to make informed statements on program influence.

The program influence analysis was also placed in context by examining how project development activity in New York compares to that which is occurring in other states with comparable amounts of wind resources, but which lack an RPS.

4.2.4.2 Results and Discussion. This section discusses results from the spillover analysis and the broader program influence analysis.

Spillover Analysis Results. Based on our analysis of projects holding REC contracts with NYSERDA, a spillover value of 19% was estimated. This result is influenced by the fact that some of the largest projects participating in the program have a large amount of generation that will be sold to markets other than the New York RPS compliance market. As shown in Table 9, the average project that secured an RPS contract

[127] While a few of the eight non-participating developers interviewed have actually built a renewable energy project in New York, the majority of interviewees in this category have yet to complete a project in New York.

only bid 85% of its output for sale to the New York RPS, and the weighted average percentage of spillover across projects holding RPS contracts is 19%.[128]

Table 9. Summary of Bid Percentages and Spillover Percentages

	Bid Percentage	Spillover Percentage
Average (bid %) / Weighted Average (spillover %)	85%	19%[129]
Median	95%	5%
Mode	95%	0%

Source: NYSERDA RPS program data

This analysis indicates that the RPS is a fundamental driver for renewable energy development activity in the State, and that the RPS program is responsible for additional renewable energy generation over and above that which is counted toward RPS compliance. These results are consistent with input collected from respondents across several different categories of market participants, including trade associations, utilities, manufacturers, the financial community, and program staff, all of whom indicated that little project activity would have occurred or would be occurring in the State in the absence of the RPS program.

Program Influence Analysis Results. This section discusses the RPS program's influence on the market for large-scale renewable energy in New York, and how program influence has varied and may vary in the future according to resource technology type. Finally, there is a comparison of New York's wind energy development activity to other non-RPS states to provide another indicator of the influence New York's RPS program has had on renewable energy development in the State.

Interviews with renewable energy market stakeholders in New York indicate that the RPS is a fundamental driver for renewable energy development activity in the State. Nearly all developers that have participated in the New York RPS program, both winning and non-winning bidders, indicated that the REC contract either had played or would play a key role in helping them secure financing for their project. The key benefits of the NYSERDA REC contract are that its long-term nature helps mitigate revenue risk, and that

[128] This includes projects from all three procurements. Note that, in the first procurement (RFP 916), projects were allowed to bid up to 100% of their project output, though in the later two solicitations, there was a maximum bid percentage limit of 95%.

[129] This represents a weighted average in which the percentage of output over and above that sold to NYSERDA is weighted by the bid quantity (MWh) represented by the projects.

NYSERDA is a creditworthy entity. Both of these factors hold great value for project finance purposes. In addition, other market stakeholders explained that very little project development activity would be taking place in the State in the absence of the RPS program. As discussed in this section, Summit Blue's analysis did, however, find some variation in the way the program influenced different types of projects and developers.

The next subsection describes the level of influence by respondent type. This is followed by discussion of the role of New York's market structure, type of program influence, and other program influences.

Level of program influence by respondent type. Table 10 presents program influence by category, breaking the categories down into large and medium scale wind, and then across each of the other relevant technologies. To protect the confidentiality of respondents, program influence is discussed in terms of the *amount of generation* associated with respondents' projects which fall into each technology category, rather than in terms of the *number* of projects represented within each category.

Among ***winning bidders***, for the category representing the largest amount of generation, large wind, 100% of generation was found to be highly influenced by the program. One hundred percent of generation in the biomass category was found to be highly influenced by the program as well. In the category of medium scale wind, the program was found to have a high level of influence on 93% of generation. A low level of program influence was found for only 7% of the generation in the medium-scale wind category. A medium level of program influence was found for all of the hydro projects associated with winning bidders.

For ***non-winning bidders***, the large wind category again represented the largest amount of generation. One hundred percent of generation in this category was found to be highly influenced by the program. The program also had a high level of influence on medium-scale wind generation (43%) and biomass generation (41%). A medium level of program influence was found for the majority of landfill gas (88%) and hydro (87%) generation, and for a significant amount of the medium scale wind generation (34%) associated with non-winning developers. Low levels of program influence were found for a substantial amount of biomass (59%) generation[130], as well as moderate amounts of medium scale wind (24%), landfill gas (12%), and hydro (13%) generation.

Table 10. Program Influence by Category

Technology	Level of Program Influence	Winning Bidders		Non-Winning Bidders	
		MWh Represented (total project output when completed)	% of generation in technology category	MWh Represented (total project output when completed)	% of generation in technology category
Large Wind (>100 MW)	High	2,808,694	100%	744,506	100%
	Medium	0	0%	0	0%
	Low	0	0%	0	0%
Medium Wind (<100 MW)	High	763,951	93%	306,950	43%
	Medium	0	0%	243,747	34%
	Low	59,743	7%	171,467	24%
Biomass	High	220,000	100%	67,200	41%
	Medium	0	0%	0	0%
	Low	0	0%	96,798	59%
Landfill Gas	High	0	N/A	0	0%
	Medium	0	N/A	363,154	88%
	Low	0	N/A	51,315	12%
Hydro	High	0	0%	0	0%
	Medium	104,326	100%	14,998	87%
	Low	0	0%	2,331	13%
Total Generation		**3,956,714**		**2,062,466**	
Total Projects Represented		**35**		**23**	

Source: Developer interviews.

These findings show that the majority of wind and biomass project development in the State has been highly influenced by the presence of the program, whether the project is a winning bidder or not. This is

[130] Some may influenced by the RPS program in Massachusetts.

consistent with findings related to project finance needs for most renewable energy projects. Even though large developers have the ability to fund projects on their balance sheet, it is important to mitigate some portion of revenue risk in order to gain internal approval to pursue a project. For medium and small-scale project developers, a long-term REC contract typically plays a critical role in securing project financing, where debt is more likely to be part of the finance package and banks require a high degree of revenue certainty from creditworthy sources. Several developers of projects that have not secured REC contracts with NYSERDA explain that the presence of the program in and of itself played a key role in their company's decision to pursue development activity in New York. Many of these companies either have developed or will develop their project with the intent to secure an RPS contract at some point in the future.

The following sections discuss program influence on wind, biomass, hydro, and landfill gas projects specifically.

Wind and biomass projects. In the few cases where a wind or biomass developer reported that the RPS program was of medium or low importance, this generally pertained to the unique circumstances of a few specific projects that had managed to obtain REC contracts with other entities for a substantial portion of the project's REC output. For example, a project may have been developed prior to the launch of the New York RPS program. Alternatively, it may have been able to take advantage of early-mover advantages, such as an ability to select a site with exceptional wind resources, or to lock in a turbine supply agreement when equipment prices were much lower than they have been in the past few years. However, in most cases, these developers still expressed that the RPS program as a whole is of great importance to the New York renewable energy market and that little development activity would be occurring in the State in the absence of the program.

There is some indication that, for a limited number of wind and biomass projects, development is feasible in New York without RPS contracts. This is based purely on the development success of a few recent wind and biomass projects in the State that do not hold RPS REC contracts. For example, three wind plants built after the launch of the New York RPS lack NYSERDA REC contracts and are registered to sell RECs into the Massachusetts RPS. These include Maple Ridge II, Munnsville Wind Farm, and the Steel Winds Energy Project.[131] In addition, one biomass project, Laidlaw Energy and Environmental, is registered to

[131] In addition, the West Hill wind project, expected to come online in the fall of 2008, is registered as an eligible facility for the Massachusetts RPS.

sell RECs into the Massachusetts RPS market, though it did not apply for a REC contract under the New York RPS program. The project is expected to become operational in early 2009.[132]

While they may signal that some wind and biomass projects can succeed on their own, these data do not undermine the overall finding that the RPS program has a high level of influence on renewable energy development in the State. Both the Maple Ridge II and Steel Winds projects attempted, though unsuccessfully, to secure REC contracts through the New York RPS program in the NYSERDA RPS solicitation (RFP 1037) for which awards were made in 2007, the same year in which the two projects came online. In addition, these projects may choose to sell to New York if they are able to secure NYSERDA REC contracts in the future. Furthermore, responses from all wind developers interviewed indicate that virtually all wind project development completed in the State is built with the expectation that the projects will, at some point, secure RECs through the NYSERDA RPS program. However, due to the competitive nature and timing of the RPS program, developers cannot wait to receive a REC contract before initiating project development.

This input from the market, coupled with a likelihood that project finance will become more difficult with increasing instability in the financial markets, overshadows the ability of a few projects to be developed in New York without RPS contracts. Further, it supports the finding that, overall, the program is still a critical driver for project development.

In fact, an important theme which came through in the wind developers' comments was that the RPS program, or some alternative form of strong, consistent demand for RECs, will take on greater importance in the market in the coming years. This is primarily because project sites with the best resources will have already been developed. Project revenues are directly linked to a project's power production, and this output is highly sensitive to the amount of available wind resource. Therefore, as more projects are developed and the "low hanging fruit" is picked, project economics will become weaker and projects will become more dependent on REC revenue. Volatility in the U.S. and global financial markets also introduces a great deal of uncertainty around future equipment costs and costs of capital. For capital-intensive wind projects, increases in project costs would further weaken project economics. These effects may be countered by increases in energy prices over time and associated project revenues. However, many

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[132] Commonwealth of Massachusetts Division of Energy Resources. *Massachusetts RPS Compliance Report for 2006*. February 15, 2008.

developers and other market participants expressed that the value of the REC contracts for project financing will only increase in the future.

Hydro projects. Developers of participating hydro projects expressed lower levels of program influence on their project activity; however, they considered the RPS program as significantly valuable in helping to get projects financed in general. It was reported that some of the earliest projects that secured RPS REC contracts had highly favorable economics and may have been developed without the RPS REC contract. Demonstrating consistency with comments from wind developers, it was noted that, as project sites with the most favorable characteristics are developed first, the remaining sites will have less favorable project economics. Therefore, development of these future projects will be more dependent on an ability to secure a stable, predictable REC income.

Landfill gas projects. No landfill gas projects have secured RPS contracts in New York. However, according to NYISO records, 16 landfill gas projects are producing electricity in the State.[133] Landfill gas projects have been heavily influenced by REC markets in neighboring regions. At present, these projects can command much more favorable REC prices in the New England RPS markets. Therefore, the REC prices bid into the New York RPS market, which presumably reflect competitive prices they can secure in other markets less any export costs, have been uncompetitive.

For example, 14% of Massachusetts' 2006 RPS compliance RECs came from renewable energy plants in New York, including output from five landfill gas plants.[134] Only one New York wind project, and no New York biomass or hydro projects sold RECs to the Massachusetts RPS market in that timeframe.[135]

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[133] New York Independent System Operator. *2008 Load and Capacity Data "Gold Book."* April, 2008.

[134] This included output from the following landfill gas plants: Colonie LF/Innovative Energy (Cohoes), Ontario LFG/Seneca Energy II (Stanley), Model City Energy Facility (Lewiston), Modern LFG (Youngston), and Seneca Falls Landfill Gas (Waterloo). In addition, this included output from the Fenner windfarm, which was built prior to the launch of the New York RPS program. Source: Commonwealth of Massachusetts Division of Energy Resources. *Massachusetts RPS Compliance Report for 2006*. February 15, 2008.

[135] As noted above, a handful of additional New York wind projects are registering to sell RECs into Massachusetts' RPS market, as well as one New York biomass project. However, these projects may choose to avoid the export costs and sell to NYSERDA if given the opportunity.

Seven additional New York landfill gas generators were registered to provide RECs for RPS compliance in Massachusetts as of fall 2008.[136]

The fact that many landfill gas plants are built in-state without New York RPS REC contracts likely reflects that dispatchable renewables face a lower economic hurdle for selling RECs into neighboring RPS REC markets than do intermittent resources. One key factor is that Massachusetts has an hourly matching requirement for delivery of energy into the ISO-NE control area. Since non-intermittent generators can better predict their project output, they can more cost-effectively schedule transmission for delivery of energy into the neighboring region. For landfill gas generators, the margin on REC prices in Massachusetts is, apparently, high enough to support their costs.[137] Biomass projects, the other key non-intermittent renewable resource, may not comply with Massachusetts' eligibility rules regarding pollution control, or the margins may not be sufficient for biomass projects, due to biomass projects' higher costs of fuel and equipment. The superior export conditions for landfill gas projects appear to be evidenced by the substantial role New York landfill gas projects have had in Massachusetts' 2006 RPS compliance market, noted above.[138] The success of New York landfill gas projects in the absence of New York RPS REC contracts likely also reflects the differences between the project economics of landfill gas projects and other types of renewable energy projects. First, landfill gas projects are currently more cost-competitive with conventional fossil fuel generation than are other renewable technologies. An RPS cost study prepared in 2008 for NYSERDA indicates that most new landfill gas projects brought online in New York in the future will require no levelized cost premium (REC revenue stream) under a long-term contract scenario. [139]

As corroborated from interviews with the landfill gas community, landfill gas project economics are less driven by upfront capital costs than are the economics of wind projects. Further, the fuel supply for landfills is more stable and predictable than for most biomass projects. For wind projects, the initial finance and

[136] This includes six facilities referenced in the Massachusetts Department of Energy Resource's (DOER) *Massachusetts RPS Compliance Report for 2006* (February, 2008), as well as one additional facility noted on DOER's website as approved in July, 2008.

[137] Massachusetts Department of Energy Resources is currently reviewing potential changes to the import rules it applies to generators in neighboring regions to become eligible to sell into the Massachusetts RPS market. These new rules, proposed as part of the Green Communities Act, would require external generators to participate in the New England capacity market and to "net" any brown power exports from the region from their green power imports (Chapter 169 of the Acts of 2008, Section 105).

[138] 2006 is the most recent year for which Massachusetts RPS compliance data are available.

[139] La Capra Associates and Sustainable Energy Advantage. 2008. *New York Renewable Portfolio Standard Cost Study Update: Main Tier Target and Resources*. NYSERDA.

construction decisions may be more dependent on the developers' ability to prove that the high capital costs can be recovered over time. And for biomass projects, given the uncertainty around their fuel supply and operating costs, it seems logical that project decision-making would be more dependent on a stable REC revenue stream than for a landfill gas project.

The Role of New York's Market Structure.

NYSERDA's REC contract is influential in the marketplace because it offers a much sought after source of long-term, stable-priced, credit-worthy REC off take. However, it is important to note that the structure of New York's renewable energy markets and that of neighboring markets also have a significant bearing on respondents' comments with regard to program influence. With only one really large scale REC buyer in the New York market (NYSERDA), market participants are, by default, highly dependent on the RPS contracts.

Without a NYSERDA REC contract, developers look to REC markets in neighboring regions for REC buyers, including the Long Island Power Authority (LIPA).[140] Developers consistently remarked that the voluntary REC market in New York was too small to serve as a driver for project development on its own. Given the uncertainty and constraints around rules for deliverability into neighboring regions, selling to neighboring regions has strong limitations for many market participants in New York, despite the fact that REC values are much higher in other northeast states.

Type of Program Influence

Input from market participants indicates that the RPS program primarily affects whether a developer chooses to locate a project in New York as opposed to another state with similar or better resources and/or REC market potential. The program can also affect the timing or size of project development.

When winning bidders were asked how their project would have been different in the absence of the NYSERDA REC contract, four of the nine respondents stated that the program affected the timing of their

[140] LIPA also purchases a substantial scale of RECs; however, LIPA's RPS targets are voluntary and are approximately equal to their proportionate share of statewide load served in New York.

project's development, and one commented that it affected the size of their project. Of those reporting that the program influenced their project's timing, most were biomass developers. However, all technologies were represented.

In responses to other questions by both participating and non-participating developers, as well as by other market participants, a number of respondents noted that the RPS program's timing has a significant influence on the timing of project development. Several respondents across a number of interview categories commented that the program's schedule was poorly suited to the renewable energy project development cycle, or had a detrimental effect on projects' development schedules. These comments pertained to the infrequent occurrence of the RPS solicitations, the uncertainty around when future solicitations will occur, as well as the program's policies regarding in-service dates for winning projects.

It is important to recognize that the RPS program is only one of many factors that can influence the development timeline. Other factors include the expiration of the federal PTC, a project's placement in the NYISO's interconnection queue, availability of parts and supplies, and seasonal issues.

The timing elements of NYSERDA's REC procurements reflect the State's interest in balancing a variety of priorities. The program is designed to select non-speculative projects and to result in cost-effective RPS compliance for New York's ratepayers. While NYSERDA program design protects ratepayers against speculation by not paying unless energy is generated, terminating for failure to deliver or enter service on schedule or by reducing contract quantities in response to project under-performance (and thereby making funding available for subsequent procurement cycles for other new projects), such corrective strategies may not materialize as frequently as preferred by the development community. While developers expressed concerns about requirements to post additional refundable security if a project's in-service date is delayed, contractual arrangement for delivery of energy or RECs with parties other than NYSERDA would also carry penalties or liquidated damages for failure to deliver.

Regardless of the timing of a solicitation, there will always be projects that are ill-prepared to participate. However, the infrequent nature of the solicitations does not make it any easier on developers to manage the complex timing issues in the project development cycle. Greater certainty regarding the future of the RPS program would help reduce the timing-related challenges facing developers; developers could plan to submit a bid under a future RFP, the timing of which may be better suited to their projects' development schedules.

Other Indicators of Program Influence

Another compelling indicator of the influence the RPS program has had on the New York renewable market can be found by comparing the level of renewable energy development activity in New York to the level of activity in other states with substantial resources, but no accessible RPS compliance market.[141] In the case of wind power, the resource with the greatest level of activity in New York since the RPS went into effect, states with substantial wind development potential,[142] but no RPS (i.e., Idaho, Kansas, Nebraska, Oklahoma, and Wyoming) have seen far lower realization of their development potential than New York, as shown in Table 11. New York is also ranked ninth in the nation for installed wind capacity, ahead of Kansas and Oklahoma, both of which possess far greater development potential than New York.[143]

Table 11. Realization of wind development potential, New York v. non-RPS states

	New York	**Kansas**	**Nebraska**	**Wyoming**	**Oklahoma**	**Idaho**
Rank in US for development potential	15	3	6	7	8	13
Development potential (MW)	7,080	121,900	99,100	85,200	82,700	8,290
Wind capacity (MW existing)	707	465	73	349	689	75
Wind capacity (MW under construction)	589	549	81	109	19	71
Realization of development potential (*ratio of development potential to capacity, both existing + under construction*)	**18%**	**1%**	**0%**	**1%**	**1%**	**2%**

Source: AWEA.

[141] West Virginia has significant wind and does not have an RPS, however, projects in that state can sell into the Pennsylvania and New Jersey compliance markets.

[142] As measured by annual energy potential, factoring in environmental and land use exclusions for wind class of 3 and higher. http://www.awea.org/pubs/factsheets/Top_20_States.pdf.

[143] AWEA project data, current through June 30, 2008. http://www.awea.org/projects/Default.aspx.

Further indicators of the fact that the RPS program plays an important role in the New York renewable energy market are that the RPS program is highly competitive, and REC prices bid into the program are not zero. If REC income from the program were of little importance to developers in the State, they would bid extremely low REC values, or would avoid the program altogether and instead just sell into other more lucrative markets. In addition, as noted earlier, our research found that several developers of renewable energy projects that are currently operational in New York, but lack NYSERDA REC contracts, do plan to bid into future RPS solicitations.

4.2.4.3 Summary. A traditional program attribution analysis was not conducted for the RPS program due to unique factors related to this evaluation. However, a more general analysis of program influence was completed, and program spillover effects were estimated. Based on results from interviews with nearly 20 developers, as well as input from a broad spectrum of other market participants, it was found that the RPS program is the key driver behind large-scale renewable energy development in the State. The effects of the program varied by resource technology, with the program having the greatest level of influence on wind and biomass projects.

4.2.5 Comparison of New York's RPS with Other States

To put New York's RPS program experience in context, and to provide readers with some background on the RPS approaches employed by other comparison states, Summit Blue conducted research on RPS policies in place in Massachusetts, Pennsylvania, New Jersey, and California. Interviews were also conducted with individuals familiar with the RPS policies in place in each of these states.

The comparison states were selected in collaboration with NYSERDA's evaluation staff. The goal was to select a small set of leading clean energy states, focusing on those states that share similarities with New York in terms of their energy market structure and geographic location (i.e., Massachusetts, New Jersey, and Pennsylvania). California was included as a comparison state, because it is viewed by many in the renewable energy community as a leader in renewable energy policy and an incubator for innovative policy concepts.[144]

All of the comparison states use a more traditional RPS design in which load serving entities are responsible for complying with the RPS, and compliance enforcement mechanisms exist. Like New York, many states require delivery from facilities not located in their ISO. However, each state has taken a somewhat unique approach to the design and implementation of its RPS and each has encountered unique barriers that can offer lessons and insight for the New York experience.

This section presents a brief summary of the RPS design and implementation strategy employed by each state. The section includes discussion of the experience each state has had to date in fulfilling its RPS requirements, and compares the barriers encountered in each state with those encountered by market participants in New York. Finally, the section provides a summary discussion of the key similarities and differences across states.

4.2.5.1 California. California's RPS currently requires load serving entities to increase procurement from eligible renewable energy resources by at least 1% of their retail sales annually, until they reach 20% renewable energy procurement by 2010. The first compliance year for California's RPS was 2004. The state is currently evaluating a potential increase in the RPS requirement to 33% by 2020. This has already been established by the Governor as a voluntary target.

[144] Texas has also been a leader in many respects, including leading the country in terms of installed wind capacity. Because Texas has 19 times the wind resource potential of New York (AWEA, http://www.awea.org/faq/wwt_potential.html) and significantly more rural areas, we did not consider Texas as a comparable state.

California's list of RPS eligible resources includes a fairly standard list of renewable generating technologies. Notably, municipal solid waste is included in this list. Further, there are no requirements regarding the date upon which a facility became operational.

California's RPS is administered jointly by the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC). CPUC's responsibilities include:

- Establish standard terms and conditions for IOU contracts.
- Implement flexible rules for compliance with annual targets.
- Impose penalties for failure to comply.
- Review and approves each IOU procurement plan and contract.
- Determine market price referent (MPR) for electricity from non-renewable sources.

CEC's responsibilities include:

- Certify eligible resources.
- Design and implements tracking and verification system to ensure no double counting of attributes.
- Allocate awarded Supplemental Energy Payments to eligible RE resources to cover above market costs.
- Develop program guidebooks.

The state's three large investor-owned utilities are required to submit procurement plans and to conduct annual RPS solicitations to procure renewable energy until they reach the 20% requirement.[145] Utilities can enter into contracts of varying lengths ranging from 10 to 20 years.[146] The CPUC oversees the annual solicitations and must approve RPS contracts between the utilities and generators to ensure that they comply with the Commission's "least cost best fit" selection criteria.[147]

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[145] Utilities can also procure resources through other "all resource" solicitations or through bilateral contracts.

[146] CPUC Decision 04-06-014, http://docs.cpuc.ca.gov/published/FINAL_DECISION/37401-07.htm#TopOfPage. Utilities are also allowed to enter into shorter-term contracts for a portion of their RPS supply, pursuant to CPUC Rulemaking 06-02-012.

[147] The California RPS procurement process is described in detail at http://www.cpuc.ca.gov/PUC/energy/electric/RenewableEnergy/procurement.htm.

Each load serving entity with RPS obligations is assigned an annual procurement target by the CPUC. Entities which fall short of the procurement target are charged five cents per kWh, up to $25 million per year.[148] However, entities can carry forward or "bank" deficits of up to 25% for three years, and deficits greater than 25% of that year's IPT if they have successfully demonstrated to the CPUC one of the four below conditions:

1. Insufficient response to the RPS solicitation.
2. Contracts already executed will provide future deliveries sufficient to satisfy current year deficits.
3. Inadequate public goods funds to cover above-market renewable contract costs.
4. Seller non-performance.[149]

No charges have been assessed yet.

A key feature of the California RPS is its use of the "Market Price Referent" (MPR) to determine how RPS resource costs will be allocated. The MPR represents the cost of a long-term contract with a combined cycle gas turbine facility, levelized into a dollar-per-kWh value. A new MPR is calculated for each year. Any RPS contract pricing that comes in below the MPR is automatically accepted by the CPUC as reasonable and contract costs are then rolled into the utility's standard rates. RPS pricing that comes in above the MPR must be more carefully evaluated by the CPUC. If the contract is deemed reasonable for the purposes of meeting the utility's RPS requirements, the utility would request rate recovery for the above MPR costs associated with the contract.[150]

Another relatively unusual feature of the California RPS is that energy and RECs have historically been transacted as a bundled commodity. The state required that the CPUC and CEC jointly determine the availability of an adequate attribute tracking system that will avoid double counting of attributes before

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[148] CPUC R.06-05-027

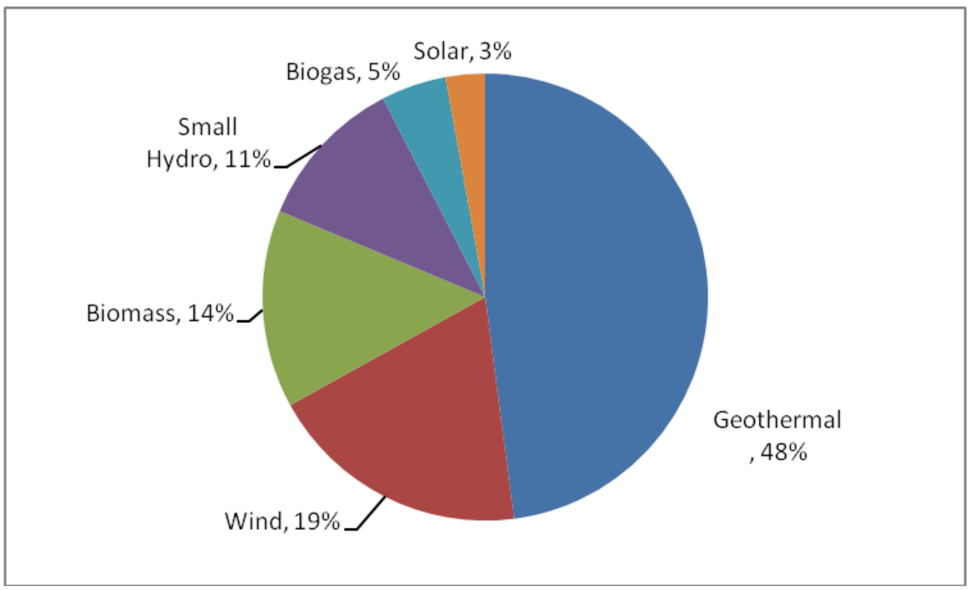
[149] California Public Utilities Commission. 2006. *RPS Annual Procurement Targets Reporting and Compliance Staff White Paper: Methodology for Determining Loading Serving Entity Compliance with the Renewables Portfolio Standard (RPS) 20% by 2010 Procurement Requirement.*

[150] This new methodology for covering above MPR costs was introduced through SB 1036, effective January 1, 2008. Prior to passage of SB 1036, above MPR costs would have been covered through "Supplemental Energy Payments" (SEPs) made by the California Energy Commission. System benefits funds were collected to support potential SEPs. However, these funds were not called upon. SB 1036 calls for the continued collection of SEP funds from ratepayers through 2011, and these funds are to be returned to utilities. Information on the MPR is available through the CPUC website at: http://www.cpuc.ca.gov/PUC/energy/electric/RenewableEnergy/mpr.

unbundled trade of RECs would be permitted for the purposes of RPS compliance. The Western Region Electricity Generation Information System, an electronic certificate-based system similar to those in place in PJM and ISO-NE, has been developed to cover attribute trade across several western states. The CPUC and CEC appear close to approving the use of this system for trade of unbundled RECs for use in complying with California's RPS.[151]

Renewable energy accounted for 12.7% of electricity sales, collectively, for California's three large IOUs in 2007.[152] As shown in Figure 22, of the renewable energy supplied to the state in 2007 (including both utilities and other load serving entities), geothermal accounted for the largest percentage (48%), followed by wind (19%) and biomass (14%).

Figure 22. Summary of Renewable Energy Resources Supplied in California in 2007



Source: CPUC RPS program status summary: http://www.cpuc.ca.gov/PUC/energy/electric/RenewableEnergy/

[151] CPUC and CEC draft resolution, issued September 23, 2008. http://docs.cpuc.ca.gov/Published/Comment_resolution/91309.htm.

[152] CPUC program status summary: http://www.cpuc.ca.gov/PUC/energy/electric/RenewableEnergy/.

California has been falling behind in its progress towards meeting its goals, as shown in Table 12. Total RPS sales have increased a total of 1.8% from 2003 to 2007, but electricity sales have increased more quickly, resulting in a decline in RPS sales as a percentage of electricity sales from 14% to 12.7%. The CPUC expects California's IOUs may hit 20% in the 2012-2013 timeframe, if the state successfully removes barriers to project development.[153]

Table 12. Renewable Sales as a Percentage of Total Sales Has Been Declining in California

		2003	2004	2005	2006	2007
PG&E	RPS Eligible GWh	8,828	8,575	8,543	9,114	9,047
	RPS GWh as % of bundled sales	12.4%	11.6%	11.7%	11.9%	11.4%
SCE	RPS Eligible GWh	12,613	13,248	12,930	12,706	12,465
	RPS GWh as % of bundled sales	17.9%	18.2%	17.2%	16.1%	15.7%
SDG&E	RPS Eligible GWh	550	678	825	900	881
	RPS GWh as % of bundled sales	3.7%	4.3%	5.2%	5.3%	5.2%
TOTAL	RPS Eligible GWh	21,991	22,500	22,298	22,719	22,393
	RPS GWh as % of bundled sales	14.0%	13.9% ↓	13.6% ↓	13.2% ↓	12.7% ↓

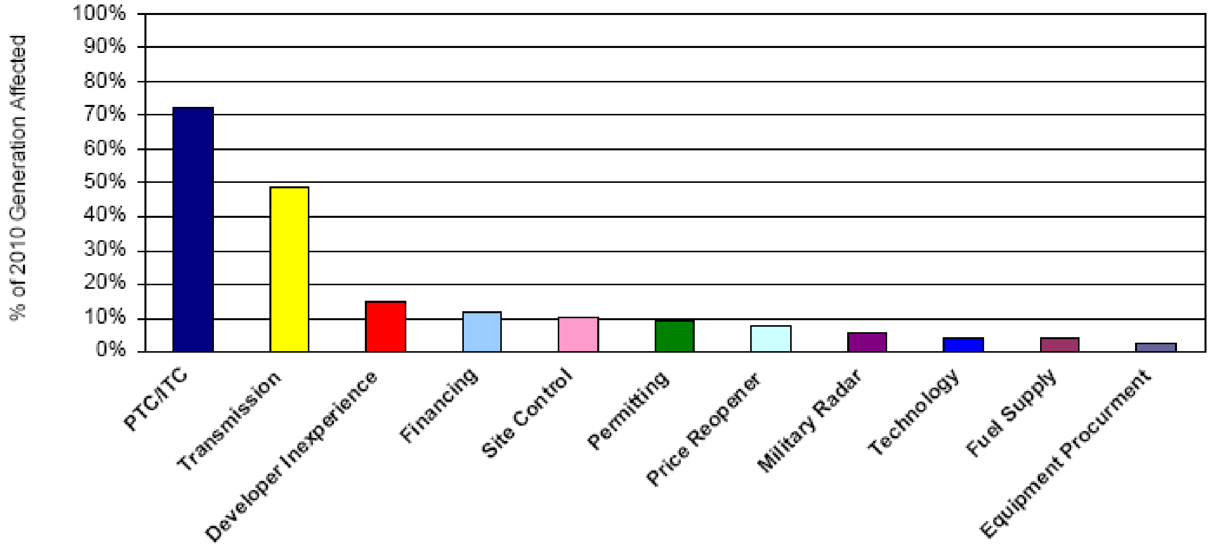
Source: California Public Utilities Commission. *Renewables Portfolio Standard Quarterly Report July 2008*.

The CPUC analyzes the barriers or risk associated with contracts for future RPS supply. The most prominent risk categories identified through their analysis include uncertainty around federal tax incentives (PTC) and transmission capacity. Other significant risk categories included developer inexperience, financing, site control, and permitting. To mitigate transmission risks in the short term, the California ISO is reforming the ISO queue process to cluster interconnection requests and expedite planning for upgrades needed to facilitate renewable energy generation. In addition, the California Renewable Energy Transmission Initiative is working to ensure coordinated, timely, and cost-effective transmission upgrades to serve renewable energy capacity growth over the medium and long-term. The CPUC has also streamlined its permitting process to facilitate rapid process of environmental permits for transmission projects.[154]

[153] California Public Utilities Commission. 2008. *Renewables Portfolio Standard Quarterly Report: July 2008*.

[154] California Public Utilities Commission. 2008. *Renewables Portfolio Standard Quarterly Report: April 2008*.

Figure 23. Risk factors identified for 2010 California RPS Generation



Source: California Public Utilities Commission. 2008. *Renewables Portfolio Standard Quarterly Report: July 2008*.

According to a representative from the CEC, some of the biggest market changes observed in recent years have been an increase in the cost of equipment and materials, and an increasing role of greenhouse gas regulation as a driver for renewable energy development.

In addition to the RPS, California's utilities offer feed-in tariffs to support development of smaller (under 1.5 MW) customer-sited, non-net metered renewable energy facilities.[155] The tariffs are available to all RPS-eligible technologies that meet the program eligibility criteria.

4.2.5.2 <u>Massachusetts</u>. The Massachusetts RPS calls for 4% of electricity sold in the state to come from "new" renewable resources by 2009, increasing by 1% per year thereafter with no stated expiration date. The first compliance year for the RPS was 2003. An RPS framework was originally set forth in the Massachusetts electric industry restructuring law passed in 1997. Substantial revisions to the RPS were recently passed in July 2008 as part of the Massachusetts Green Communities Act.

[155] Originally introduced through Assembly Bill 1969 and expanded in July 2007 through CPUC Decision 07-07-027. CPUC website: http://www.cpuc.ca.gov/PUC/energy/electric/RenewableEnergy/eligibleallocations.htm.

The Massachusetts RPS has historically had a relatively narrow definition of eligible resources. Until passage of the Green Communities Act, only RECs from "new" (post 1997) renewable electric generating facilities were considered RPS eligible.[156] In addition, emission requirements for biomass are stricter than most states. The Green Communities Act expanded the definition of eligible resources by establishing two distinct classes of resource eligibility (Class I and Class II). Biomass eligibility rules remain stringent under the revised RPS.

Class I resources are largely the same as those that have been considered eligible to date. As part of the new Class I requirements, suppliers will need to meet a portion of their requirement with "in-state, on-site systems of not more than two megawatts (MW) in capacity which began commercial operation after December 31, 2007." Class II resources include eligible renewable resources that were operational before 1998. Municipal solid waste / waste-to-energy facilities are included in the list of eligible Class II resources.

The Massachusetts RPS is administered by the state's Department of Energy Resources (DOER). DOER responsibilities include registering renewable energy generators as eligible for the Massachusetts RPS, monitoring compliance with the RPS, and reporting on RPS accomplishments.

DOER will also establish a separate Alternative Energy Portfolio Standard (AEPS) in which a minimum portion of suppliers' electricity sales will have to come from alternative sources such as gasification with capture and sequestration of CO_2, Combined Heat and Power, and flywheel technologies.[157]

In the Massachusetts RPS, all load serving entities in the state are responsible for complying with the annual RPS requirements. They can comply through procurement of a sufficient quantity of RECs and/or by making Alternative Compliance Payments (ACP). In 2008, the ACP was set at $58.58 /MWh. Costs associated with the RPS compliance in Massachusetts are passed on to ratepayers through suppliers' electricity rates.

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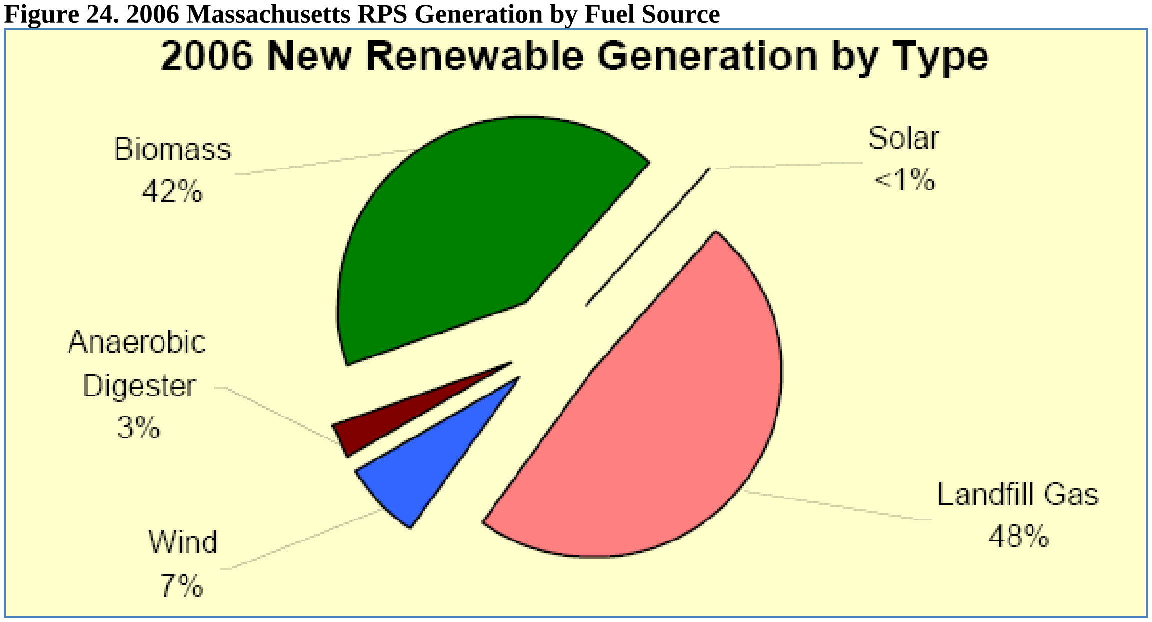
[156] Eligible resources include solar photovoltaics (PV); solar thermal-electric energy; wind energy; ocean thermal, wave or tidal energy; fuel cells utilizing renewable fuels; landfill gas; low-emission advanced biomass power conversion technologies using fuels such as wood, by-products or waste from agricultural crops, food or animals, energy crops, biogas, or liquid biofuels; and geothermal energy.

[157] Database of State Incentives for Renewable Energy: http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MA05R&state=MA&CurrentPageID=1&RE=1&EE=1.

The most recent compliance year for which compliance data is available is 2006. In 2006, three quarters of the total RPS obligation was met through RPS qualified sources. The remainder of compliance obligations was met through ACPs. ACP collections for the 2006 compliance year totaled $17.8 million. These funds are placed in an account at the Massachusetts Technology Collaborative, an agency that administers clean energy incentive programs for the state.[158] The ACP provides a signal to the market as to what is the maximum price.

In 2006, biomass and landfill gas generators accounted for the 90% of RECs used for RPS compliance. In contrast to New York's heavy dependence on wind for RPS compliance, wind accounted for only seven percent of RECs used for Massachusetts RPS compliance during 2006 (Figure 24). The generation mix reflects the more limited on-shore wind resources available in New England, significant local opposition to wind farm development, the strict scheduling requirements of the RPS, and the Class II vintage eligibility requirements that allow landfill gas projects built before 1998.

Figure 24. 2006 Massachusetts RPS Generation by Fuel Source



Source: Massachusetts Department of Energy Resources. 2008. *Massachusetts Renewable Energy Portfolio Standard: Annual RPS Compliance Report for 2006*. Does not include shortfall met by ACPs.

[158] Massachusetts Department of Energy Resources. 2008. *Massachusetts Renewable Energy Portfolio Standard: Annual RPS Compliance Report for 2006*.

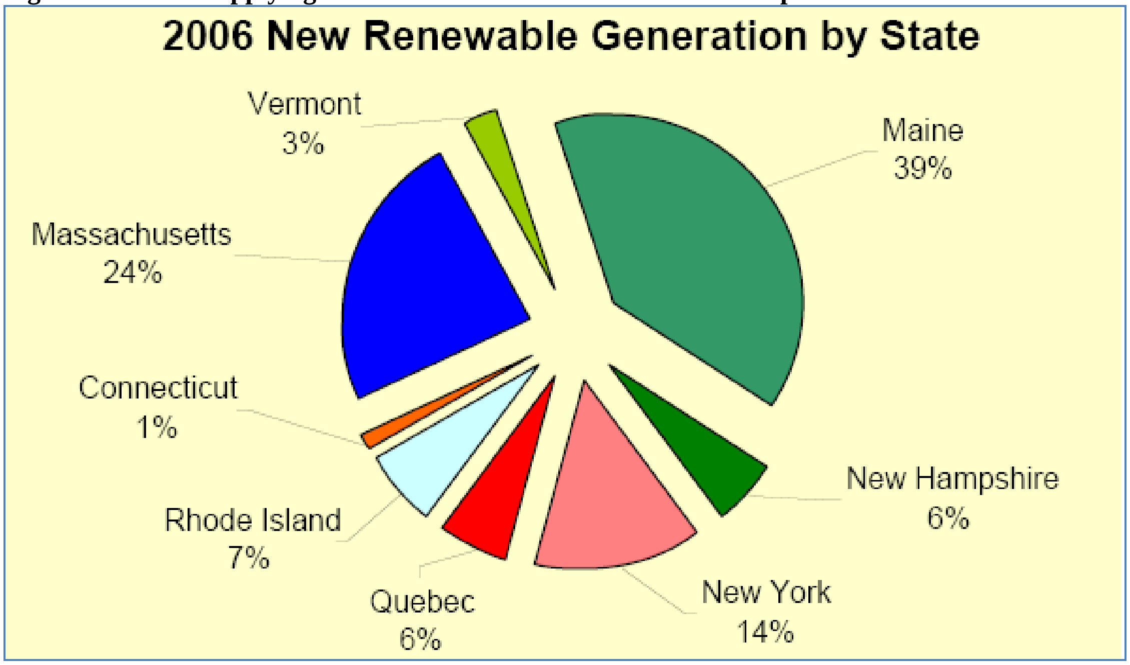
Massachusetts is part of the ISO-NE control area, and renewable energy resources located anywhere within the ISO-NE region can be applied toward the Massachusetts RPS. RECs from facilities located in adjacent control areas can register to be eligible for the Massachusetts RPS as long as they schedule delivery of energy from their unit to the ISO-NE control area on an hourly matching basis for the period the MWh are being claimed[159]. The state is currently reviewing the potential to apply more stringent import rules that would require facilities from adjacent control areas to commit their units as capacity resources for an annual period, and to reduce the quantity of RECs granted to the facility by the amount of any exports from the region.[160]

Renewable energy resources located within Massachusetts have historically accounted for a relatively small portion of the total RECs used to comply with the state's RPS. In 2006, renewable energy resources located within Massachusetts accounted for 24% of total new renewable energy generation used for compliance. The remainder of RECs came from other New England states, New York, and Canada. Generators located in New York accounted for 14% of the RECs used for Massachusetts RPS compliance in 2006 (Figure 25). Participation by generators located in New York started in 2004 and has accelerated since.

[159] This is stricter than New York's external NYISO requirement, which requires delivery from the local control area to the NYISO only, not delivery from the facility.

[160] Commonwealth of Massachusetts, Chapter 169 of the Acts of 2008, Section 105.

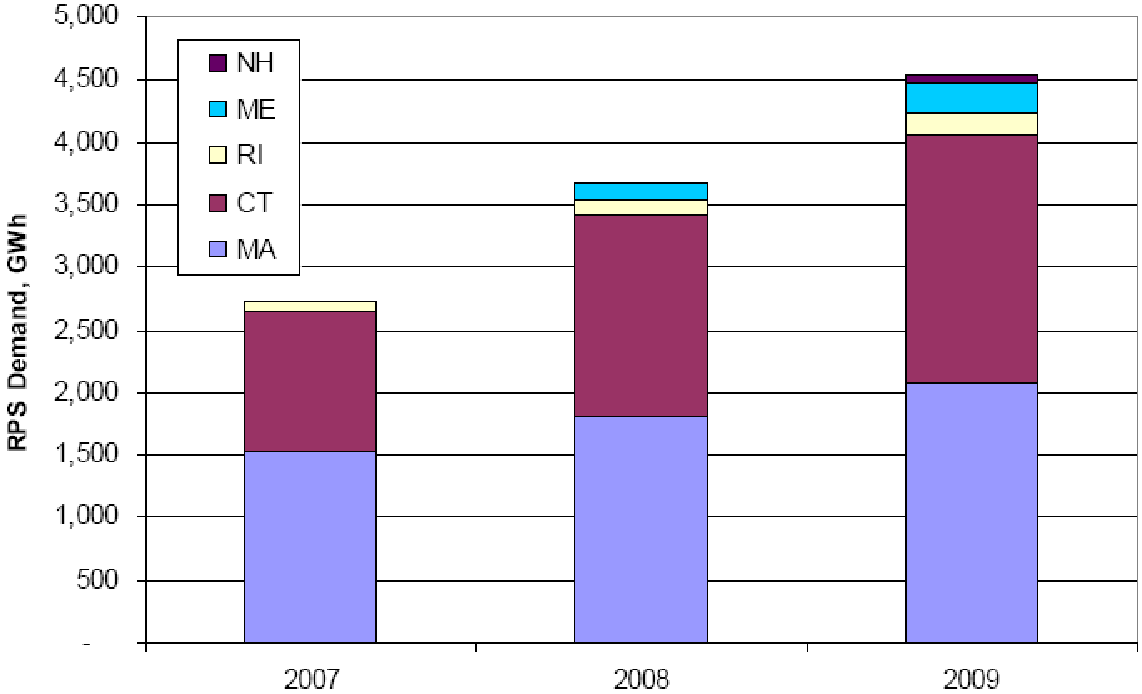
Figure 25. States Supplying RECs for 2006 Massachusetts RPS Compliance



Source: Massachusetts Department of Energy Resources. 2008. *Massachusetts Renewable Energy Portfolio Standard: Annual RPS Compliance Report for 2006*.

In the future, DOER expects a much greater percentage of RPS compliance to be met through REC procurements as opposed to ACPs. This is due, in part, to a growth of renewable energy supply. DOER credits this growth to the fact that the RPSs in a number of New England states provide a substantial financial driver for increased renewable energy development in the region. DOER also recognizes that increased demand from RPSs in neighboring states will put increased constraints on supply in the region, with Connecticut providing the greatest source of demand for RECs outside of Massachusetts (Figure 26).

Figure 26. New England RPS Demand



Source: Massachusetts Department of Energy Resources. 2008. *Massachusetts Renewable Energy Portfolio Standard: Annual RPS Compliance Report for 2006*.

Passage of the Massachusetts Green Communities Act in July 2008 will have significant effects on the renewable energy markets in New York in the future. The Act significantly increases the state's commitment to investment in energy efficiency, which should decrease the volume of demand for RECs resulting from the RPS, as the RPS requirements are based on percentage of retail sales. The Act calls on utilities to sign 10 to 15 year contracts with renewable energy developers located in Massachusetts to assist with financing, and it establishes a longer-term framework for the RPS, taking it out to 25% in 2030.[161]

According to a DOER representative, the greatest barriers facing large scale renewable energy development in Massachusetts are a lack of availability of long-term contracts, transmission constraints, local opposition to development, and permitting. Some potential steps the state is considering for addressing these barriers include providing developers with financial assistance to offset pre-development costs, helping to identify and highlight sites that are most favorable for development from an environmental permitting perspective, and making permitting timelines clearer and more predictable for developers. Massachusetts, like New

[161] Commonwealth of Massachusetts Executive Department Press Release. "Governor Patrick Signs Energy Bill Promoting Cost Savings, Renewable and Clean Energy Technology." July 2, 2008.

York, is a home rule state for permitting. However, the Massachusetts Energy Facilities Siting Board can override home rule for siting of energy facilities larger than 100 MW.

4.2.5.3 New Jersey. New Jersey's RPS requires that 22.5% of the state's electricity be sourced from renewables by 2021. As a subset of that total requirement, 2.12% of the state's electricity supply must come from PV by 2021.[162] New Jersey's first compliance year was 2005.

The NJ RPS has a tiered system, including two resource classes. The list of Class I eligible resources is similar to New York's list of Main Tier eligible resources, though hydropower is excluded from the definition. Class II resources include hydropower facilities no greater than 30 MW in capacity, and "resource recovery" facilities. RECs can come from anywhere within the PJM region, or they can be delivered into the PJM region. If they are delivered into the PJM region, they must be from facilities that went into service on or after January 1, 2003 to be deemed eligible.

Electric power suppliers must comply with the RPS by procuring RECs and solar RECs (SRECs), or by making ACPs or Solar Alternative Compliance Payments (SACPs). RECs are transacted through the PJM Generation Attribute Tracking System (GATS). SRECs have historically been transacted through New Jersey's own SREC tracking system, though the state is transitioning this over to the GATS as well.

The ACP and the SACP will remain at their original 2004 levels—$50/MWh ACP, $300/MWh SACP through the 2008 compliance year. The SACP level will increase according to a rolling eight year schedule after that time. The new SACP levels were set at levels that were deemed high enough for this mechanism to function as an economic driver for solar development in the state.

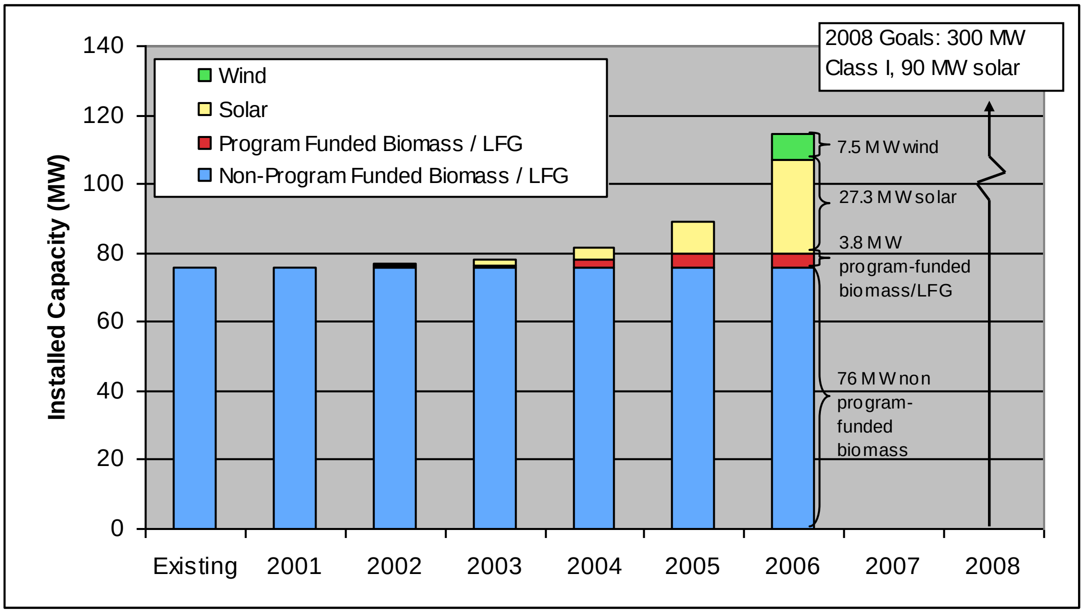
In-state installed capacity, together with Class I RECs from generators elsewhere in the PJM region, were sufficient to enable New Jersey's electricity suppliers to meet RPS requirements for the 2006 compliance year, the most recent year for which data are available. There has been only a minimal use of ACPs and

[162] The RPS Reporting Year extends from June 1 through May 31. Suppliers have a three month true-up period following the end of the Reporting Year to complete all REC / SREC trading for RPS compliance.

SACPs for compliance, with revenue from these payments totaling approximately $50,000 for 2006.[163] Limited data is available regarding the sources of RECs used for Class I RPS compliance.

While New Jersey's load serving entities are able to comply with the RPS, the policy is resulting in limited development of non-solar renewable energy development within the state. The state has set specific non-solar Class I renewable energy development goals based on economic development potential and has, so far, fallen short of these goals (Figure 27). To help stimulate development of in-state resources, the state makes loans and grants available to support large-scale renewable energy project development.

Figure 27. Cumulative Annual State-Funded Class I Capacity, and Non-Program Funded Biomass / Landfill Gas Capacity, Relative to BPU Goals[164]



Source: Summit Blue Consulting. 2008. *Assessment of the New Jersey Renewable Energy Market: Volume I.* New Jersey Board of Public Utilities Office of Clean Energy.

According to the New Jersey Board of Public Utilities representative, the most substantial barrier to large scale renewable energy development in New Jersey is difficulty securing long-term contracts for RECs. New Jersey's development potential for on-shore resources is also quite limited compared with states such

163 New Jersey Board of Public Utilities records for 2006 RPS compliance year.

164 Data on the dates which non-program funded landfill gas projects came online was not available to the project team. Therefore, it is assumed that all 76 MW were online prior to 2001.

as New York and Pennsylvania. Public opposition is also a barrier to offshore wind development. New Jersey has taken an active role in trying to better understand local concerns and environmental impacts related to offshore wind development, and the state has been proactive in facilitating development of an offshore wind pilot project.

4.2.5.4 <u>Pennsylvania</u>. Pennsylvania's Alternative Energy Portfolio Standard (AEPS) requires that 18.5% of electricity supplied by load serving entities come from eligible alternative energy sources by 2021. The first compliance year for the AEPS was 2007. Only a limited number of entities were required to comply with the AEPS in 2007, because compliance is not required until the obligated entities' deregulation transition charges are recovered or until their generation rate caps expire.[165]

Eligibility definitions in Pennsylvania are broader than in most other northeastern states. The AEPS includes two tiers of eligible resources. Tier I resources include photovoltaic energy, solar-thermal energy, wind, low-impact hydro, geothermal, biomass, biologically-derived methane gas, coal-mine methane, and fuel cells. There are no restrictions on the date when these facilities became operational as there is in other states. Tier II resources include waste coal, distributed generation systems, demand-side management, large-scale hydro, municipal solid waste, wood pulping and manufacturing byproducts, and integrated gasification combined cycle coal technology. The AEPS also includes a specific solar PV requirement; 0.5% of electricity supply must come from PV by 2021. Like California, there are no eligibility requirements regarding the date upon which a facility became operational.

Purchases from any facility in the PJM territory are deemed eligible for the AEPS. Resources can also come from MISO for Pennsylvania suppliers operating as part of that control area. New York resources are not eligible.

The AEPS is administered by the Pennsylvania Public Utilities Commission and the Department of Environmental Conservation with assistance from, Clean Power Markets, a consultant . Clean Power Markets is responsible for verifying compliance.

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[165] Pennsylvania Public Utility Commission. 2008. *2007 Annual Report: Alternative Energy Portfolio Standard Act of 2004.*

Like Massachusetts and New Jersey, entities that fall short of their RPS obligations are required to pay an ACP. The ACP is set at $45/MWh for all resources, except solar for which it is set at "200% of average market value" of solar credits sold during the reporting period. Load serving entities are entitled to full recovery of costs associated with AEPS compliance as long as they can demonstrate through rate cases that their costs are reasonable and prudent.[166] No ACPs were used for compliance in 2007.

For the 2007 compliance year, the primary renewable energy resources operating in Pennsylvania included waste coal, conventional hydropower, landfill gas, woody biomass, and wind plants. The PUC expects to see growth of in-state Tier I eligible resources, such as fuel cells, and Tier II resources, such as coal gasification. The PUC also projects that demand for electricity will decrease due to more robust energy efficiency incentive programs and increasing electricity prices.[167]

According to a PUC representative, the most substantial barrier to development in Pennsylvania is local opposition. A large percentage of renewable energy development potential in Pennsylvania exists in rural areas where industrial-scale energy project development is often unwelcome. The DEP is working to revise the permitting process to put forth more streamlined siting and permitting rules.[168]

In addition to the AEPS, Pennsylvania's clean energy sector will be driven by direct state funding. In July 2008, Governor Rendell signed a $650 million clean energy bill that will provide $165 million for loans and grants to facilitate development of non-solar alternative and renewable energy projects among business and local governments, $80 million and grants and loans for the solar sector, and $25 million for wind and geothermal projects.[169]

4.2.5.5 <u>Summary</u>. Key differences exist between New York's RPS and the RPSs in the states reviewed. New York's program uses a central procurement approach in which there is one primary buyer of RECs for

[166] Sources: Database of State Incentives for Renewable Energy: http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=PA06R&state=PA&CurrentPageID=1&RE=1&EE=1; and personal communication with PA PUC representative, July 28, 2008.

[167] Pennsylvania Public Utility Commission. 2008. *2007 Annual Report: Alternative Energy Portfolio Standard Act of 2004.*

[168] Personal communication with PA PUC representative, July 28, 2008.

[169] Commonwealth of Pennsylvania Department of Environmental Protection Press Release. "Governor Rendell Signs Bill Establishing $650 million energy fund to support conservation, spur renewable energy development." July 9, 2008.

RPS compliance. Funding for REC procurement is limited to a pre-defined RPS budget, and New York's RPS does not incorporate the use of compliance penalties.

With the exception of California, each state has had or is introducing a set-aside within its RPS to support development of a certain category of resources and each state allows the sale of unbundled RECs. RPS eligible resources vary across states. In contrast to New York's definition of eligible Main Tier resources, waste-to-energy resources are eligible in some form in all states reviewed here. Massachusetts, New Jersey, and Pennsylvania are all part of multi-state power control areas, and each of these states has the flexibility to draw on resources from anywhere in their power control area without needing to import energy. The mix of technologies and fuel sources used for RPS compliance in each state has varied, due to a combination of eligibility requirements, delivery requirements, and resource availability.

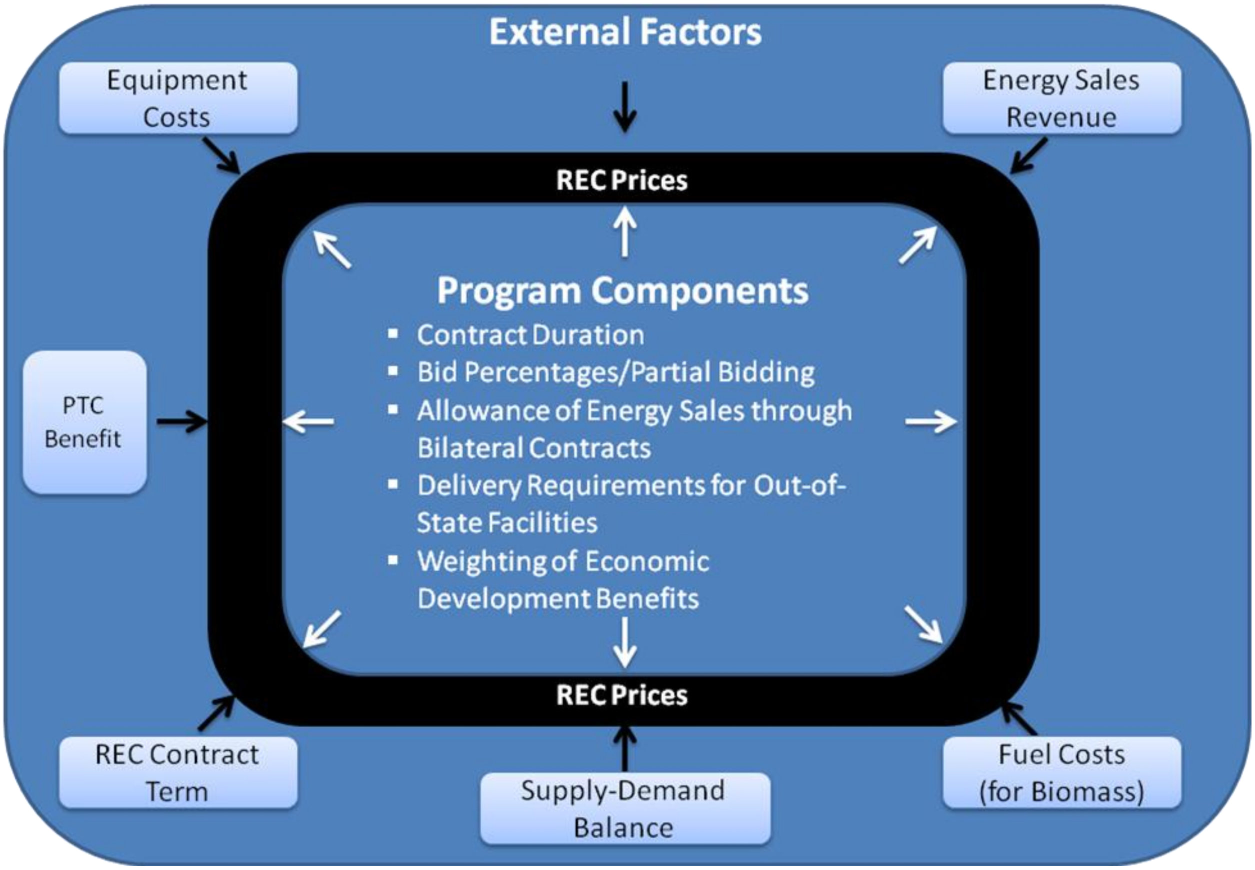
Barriers to development are similar across states. California, like New York, has identified federal tax incentive uncertainty as a top barrier. Transmission capacity was identified among the top barriers in California and Massachusetts. Permitting and local opposition are barriers in all states reviewed.

4.3 REC PRICES – THE MARKET SIGNAL

RECs are the renewable attributes produced by renewable generation. NYSERDA pays renewable generators for RECs, with the electricity sold in the New York Independent System Operator (NYISO) market or bilaterally. REC prices represent the key indicator from the market regarding the cost of renewables. They represent the premium payments needed to support new renewable generation after accounting for energy revenues and tax credits.

REC prices paid by NYSERDA under the RPS program reflect a number of factors related both to the design of the program, and to external market factors (Figure 28). These factors are discussed in detail in the following sections of the report.

Figure 28. Factors that may affect RPS REC pricing



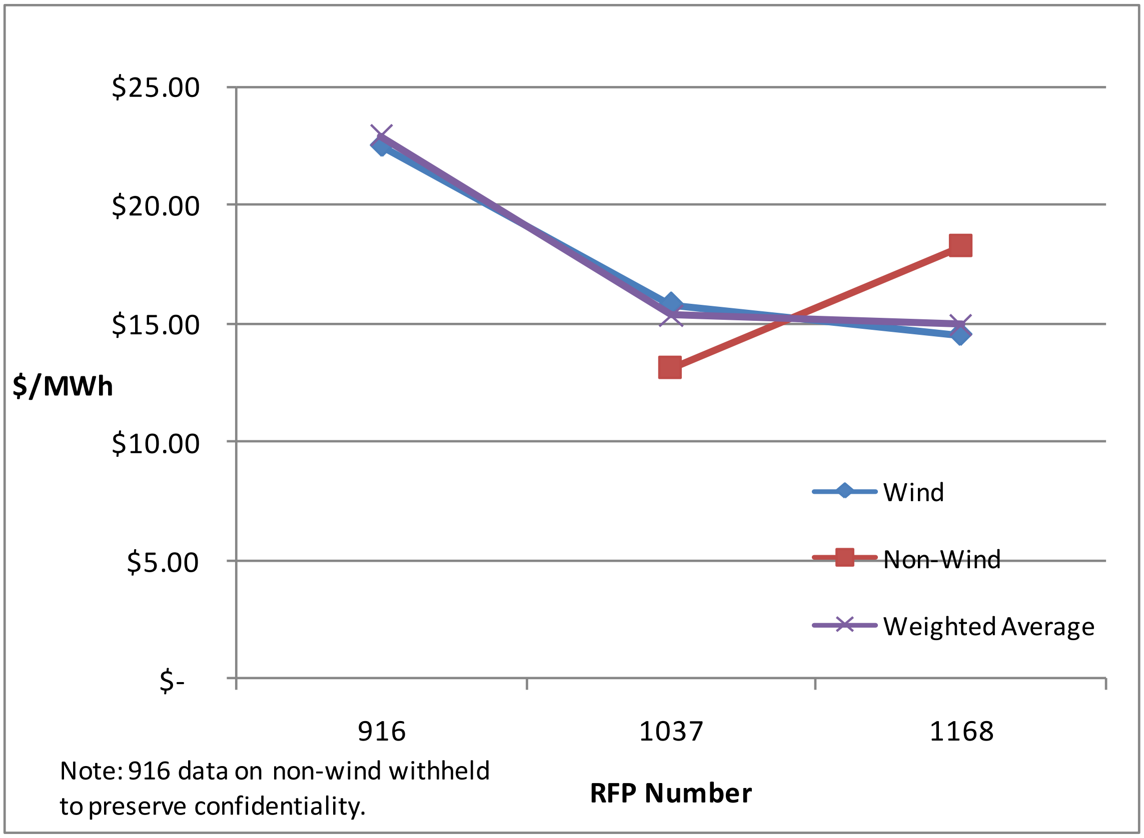
Source: Summit Blue Consulting

4.3.1 New York RPS Program REC Pricing Summary

Average prices for awarded RECs have declined overall in each of the three procurements, as can be seen in Figure 29. From \$22.90 in RFP 916, average prices dropped to \$15.31 and \$14.94 in RFP 1037 and RFP 1168, respectively. This trend has been led by wind; non-wind (hydro and biomass) prices increased from RFP 1037 to RFP 1168, from \$13.13 to \$18.30.[170] Overall, the prices for the three technologies converged. It is possible that, to some extent, this is due to awareness of the average prices in the prior award.

[170] NYSERDA's RFP 916 resulted in three winning non-wind bids by a single developer. To preserve price confidentiality, we have withheld non-wind prices for this RFP.

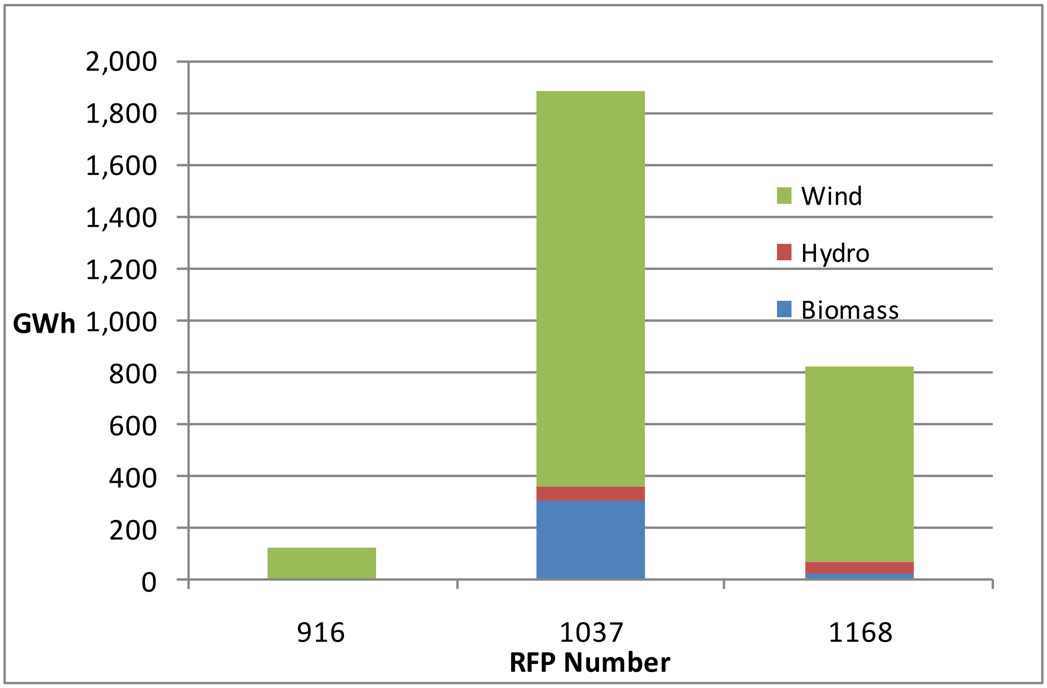
Figure 29. Wind REC Prices Decline, Others Increase



Source: NYSERDA and Summit Blue Consulting.

Wind has dominated in all three RFPs, as can be seen in Figure 10. Wind has comprised at least 80% of the awarded annual energy in all of the RFPs. Overall, awarded annual energy increased substantially from RFP 916 to RFP 1037, then dropped in RFP 1168 due to limitations on available funds.

Figure 30. Wind Has Consistently Dominated



Source: NYSERDA and Summit Blue Consulting.

4.3.2 REC Price Comparisons

To provide a rough indicator of where NYSERDA's RPS compliance costs stand relative to other states in the region on a per-unit ($/MWh) basis, REC pricing data were gathered for neighboring states. These data are presented with an understanding that an "apples to apples" comparison of RPS compliance costs across states is not possible, because each state's RPS rules and renewable energy market characteristics differ substantially.

For example, in California, utilities currently procure both energy and attributes as bundled renewable energy supply under long-term contracts. Pricing data in these contracts are not publicly available. As a result, the incremental cost of RPS compliance is difficult to track while in the case of New York, collections are set and made public and the incremental costs of the program, as measured by weighted average REC prices, are also made public. A lack of transparency on program costs is also the case with a number of RPS programs that are administered by utilities where the incremental cost of procuring renewable energy is rate based. Most Western and Midwestern states' RPSs are also more recent, and REC

SUMMIT BLUE CONSULTING, LLC

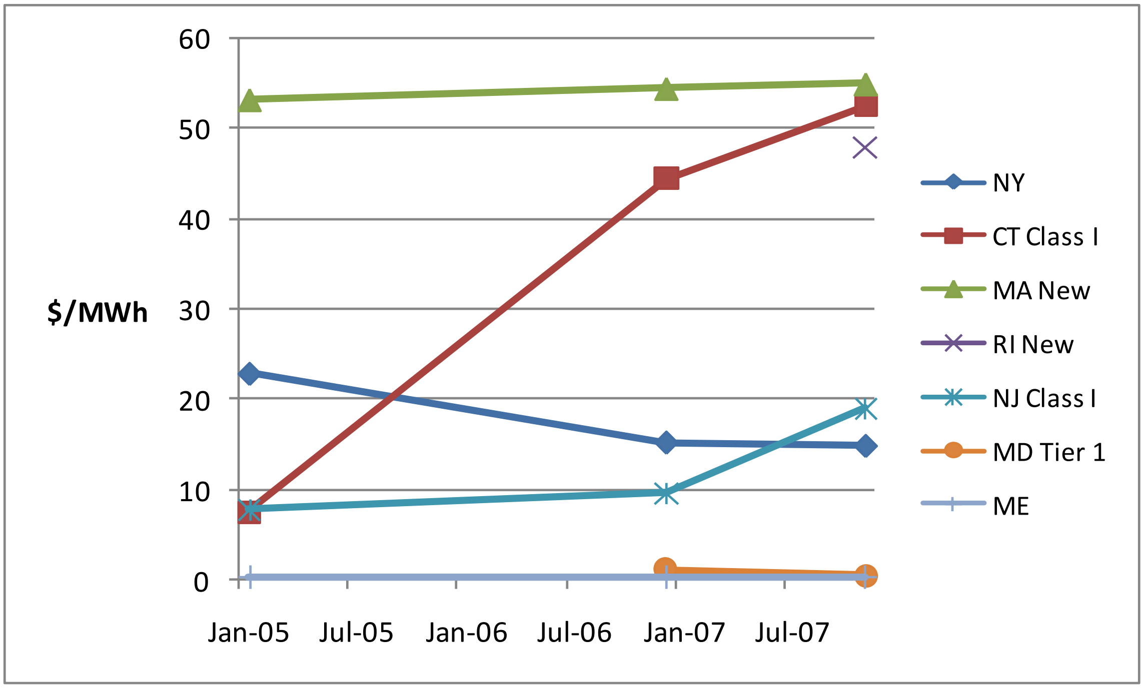
tracking systems are in their infancy and/or do not track cost data. Therefore, it is too early to obtain RPS cost data for most states in these regions.

In contrast, northeast states with RPSs rely upon unbundled REC transactions for compliance, and most of the states are a few years into their RPS compliance schedules. Further, REC pricing data is made available by a major REC market broker, Evolution Markets. As a result, a comparison of REC prices across some Northeast states, at some level, is possible. However, even among states in the Northeast, variation in resource availability, geography, population density, and RPS rules result in significantly different market conditions from one state to the next.

Recognizing the limitations of a REC price comparison, it is nonetheless valuable to track where New York's REC prices stand relative to other states for which data is available. Such a comparison provides an opportunity to reflect on the differences across a subset of RPS markets and how these differences manifest themselves both in REC trading prices and RPS compliance costs.

This section presents REC pricing data provided by REC broker, Evolution Markets, as well as REC data from NYSERDA's RPS program records. Figure 31 presents a comparison of New York RPS REC prices with the prices of RPS RECs traded in other states for which data are available.

Figure 31. NY RECs Compared to Neighboring States



Source: NYSERDA and Evolution Markets.

New York REC prices have become less than those in most neighboring states. The price differences are likely due to a variety of factors, as discussed below.

4.3.2.1 Neighboring States. Neighboring states include those that trade within the ISO-NE England- and PJM regions.

ISO- NE. Looking first at the states in ISO-NE, it is apparent that RPS design issues have a significant effect on REC prices. Maine has allowed all existing renewables, including existing large hydro to be eligible. Municipal solid waste facilities have also been eligible under Maine's RPS. Since Maine could draw upon an abundant source of eligible supply, the percentage of renewables originally required by the

RPS was lower than the existing percentage of renewable energy consumed.[171] Consequently, Maine has consistently had a surplus of RECs and REC prices have been extremely low.

Connecticut Tier 1 REC prices have risen sharply since early 2005 in response to two revisions to the RPS rules: (1) a requirement that generators match REC purchases with physical energy delivery to ISO-New England on an hourly basis[172] and (2) exclusion of construction and demolition waste from eligibility for Tier 1.[173]

With a shortage of eligible resources, Massachusetts' load serving entities have fallen short on meeting their requirements through procurement of RECs;[174] and therefore, have made substantial use of the Alternative Compliance Payment (ACP) provision to meet their RPS requirements since 2003. In 2006, ACPs comprised 25.7% of the total obligation.[175] At over $50/MWh, these ACPs have functioned as a ceiling price for RECs in Massachusetts, as REC prices have tended to migrate toward the ACP due to the supply/demand imbalance. ACP levels have the potential to affect REC prices in other New England states as well, such as Connecticut, though the ACP only becomes a real factor in REC pricing when there is a supply shortage.

Vintage requirements for the RPSs in New England vary. In Connecticut, generators are eligibility if they came on line after July 1, 2003.[176] Massachusetts uses a December 31, 1997 vintage date.[177] As noted

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171 Maine's original RPS called for 30% renewable energy supply by 2000, and existing facilities were eligible. In 2006, Maine amended its RPS to include a requirement for 10% of the state's supply to come from "new" (in service on or after September 1, 2005) renewable energy facilities by 2017. Database of State Incentives for Renewables and Efficiency. http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=ME01R&state=ME&CurrentPageID=1&RE=1&EE=1. Downloaded July 30, 2008.

172 New England Wind Forum. http://www.eere.energy.gov/windandhydro/windpoweringamerica/ne_astate_template.asp?stateab=ct. Downloaded July 30, 2008.

173 Connecticut Substitute Senate Bill No. 212 and Public Act No. 06-74. "An Act Concerning Biomass." http://www.cga.ct.gov/2006/ACT/Pa/pdf/2006PA-00074-R00SB-00212-PA.pdf.

174 Massachusetts Division of Energy Resources. 2008. *Massachusetts Renewable Energy Portfolio Standard Annual RPS Compliance Report for 2006.*

175 Massachusetts Division of Energy Resources. 2008. *Massachusetts Renewable Energy Portfolio Standard Annual RPS Compliance Report for 2006.*

176 State of Connecticut, Department of Utility Control. "RPS Overview." http://www.dpuc.state.ct.us/Electric.nsf/bb23886a033a7ef28525713c000031d4/39b7cf92f5053bac8525730d005070b8?OpenDocument. Downloaded November 13, 2008.

above, Maine's RPS originally had no vintage requirements, though the State's RPS now includes a requirement for 10% "new" renewables by 2017,[178] and eligible new renewable-energy systems include those placed into service after September 1, 2005.[179] For reference, New York's vintage date requirement for the Main Tier program is January 1, 2003. Based on the low REC prices Maine has seen relative to other New England states and New York, it appears that vintage requirements play an important role in RPS compliance REC pricing.[180]

All of the New England states' RPSs allow facilities from throughout the ISO-NE control area to sell RECs for compliance with the state's RPS without meeting import requirements[181]. This helps reduce the effects of each state's resource availability constraints and makes REC prices more reasonable than they would be in the absence of this regional framework. However, as a whole, New England has had difficulty developing new renewable resources as a result of relatively limited on-shore wind resource availability, and local opposition to development. Thus, compliance REC prices are still relatively high throughout most of the region.

PJM. REC prices among states in the PJM control area (Maryland and New Jersey are discussed here) have been lower than those in New England. This is, in large part, due to the fact that Maryland and New Jersey can draw on resources across the entire PJM region without needing to incorporate costs associated with energy delivery requirements for imports. For example, New Jersey has limited renewable energy resource availability; however, the state has successfully drawn on resources elsewhere in PJM and has kept its Class I REC prices (for most sources installed after January 1, 2003) among the lowest in the region. Renewable resources in the PJM territory include a large supply of landfill gas facilities, as well as Pennsylvania's substantial installed wind capacity.

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[177] 225 CMR: Division of Energy Resources. 10/19/07 225 CMR – 111 225 CMR 14.00 Renewable Energy Portfolio Standard.

[178] Database of State Incentives for Renewables and Efficiency. http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=ME01R&state=ME&CurrentPageID=1&RE=1&EE=1. Downloaded July 30, 2008.

[179] Maine Revised Statutes. Title 35-A: Public Utilities Heading: PL 1987, C. 141, PT. A, §6 (NEW). Part 3: Electric Power Heading: PL 1987, C. 141, PT. A, §6 (NEW) Chapter 32: Electric Industry Restructuring Heading: PL 1997, C. 316, §3 (NEW)

[180] Though not a New England state, Maryland's low REC prices are a further indicator of the role of vintage in determining REC prices; that state has no facility vintage requirements.

[181] Like most other states, the NY RPS requires facilities not located in the NYISO to make delivery to the NYISO.

To date, Pennsylvania has not competed with other states in the region for access to these resources. Though Pennsylvania's first RPS compliance year was 2007, the majority of load in the state is not yet subject to the RPS; the policy will not take full effect until default electricity pricing left over from the state's deregulation expires within the next few years. In the future, greater demand for PJM's renewable resources may affect REC pricing in the region, though this was not explored in detail as part of this assessment.

Maryland has no vintage requirements for facility eligibility, and Municipal Solid Waste is an eligible resource. In addition, Maryland's goals have been relatively modest (1% in 2006 and 2007) and were only recently (April 2008) increased.[182] Therefore, any increases in Maryland's REC prices are not reflected here.

Factors Accounting for Differences in Neighboring States. A number of factors likely account for the REC price differences between New York and its neighbors. One factor is the more abundant wind resource in New York, which is ranked 15th of the 50 states. None of the other neighboring states are ranked in the top 20.[183] Differences in RPS targets are important as well, and the substance of the target is integrally related to resource eligibility requirements. Key among these are vintage requirements, the geographic region upon which each state can draw on resources without out-of- control area facilities needing to meet import requirements (typically defined by the size of the electricity control area in which the state is located), and energy delivery requirements for imports. In addition, states have different technology eligibility requirements, which affects the supply/demand balance, and thus REC pricing. Unlike New York, Massachusetts and Connecticut do not allow incremental hydro projects to be eligible, and Maryland, New Jersey and Connecticut include municipal solid waste facilities as RPS eligible resources.[184] Massachusetts has relatively stringent emission requirements for biomass plants.

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[182] Database of State Incentives for Renewables and Efficiency. http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MD05R&state=MD&CurrentPageID=1&RE=1&EE=1. Downloaded July 30, 2008.

[183] American Wind Energy Association, "Wind Energy Production Tax Credit," Fact Sheet, 2008, http://www.awea.org/pubs/factsheets/PTC_Fact_Sheet.pdf .

[184] Cory, K, and Sweezey, B. 2007. "Renewable Portfolio Standards in the States: Balancing Goals and Implementation Strategies." National Renewable Energy Laboratory.

Other important factors leading to the price difference are rooted in New York's RPS structure, which is unique among its neighbors. New York's use of a central procurement approach and periodic competitive solicitations means that the competitive landscape is much different in the State than in other Northeast states. The availability of long-term contracts likely reduces prices by increasing revenue certainty. In addition, New York does not adhere to "hard targets" for RPS compliance. Other Northeast states require entities with RPS obligations to pay an ACP or penalty fee if they cannot meet their RPS requirements by obtaining RECs.[185] The ACP can function as a key factor in determining REC prices when there is a supply shortage in those states. In contrast, if New York's RPS budget for a given procurement is insufficient to support purchases of enough RECs to meet the annual RPS target, the target is not met and there are no consequences or cost implications. A benefit to ratepayers from the lack of hard targets is that New York ratepayers do not have to pay the penalties in the case of shortfall, because the RPS program only pays for resources actually acquired by NYSERDA.

Texas. Looking outside the Northeast, REC prices in Texas have consistently been lower than New York's: $11.85 at the time of RFP 916, dropping to $3.50 and $4.25 at the time of RFPs 1037 and 1168, respectively. There are important differences between the Texas and New York markets that should be taken into account when comparing prices. Most notably, the wind resource in Texas is much more abundant. Texas is ranked second in the nation in terms of technical potential and has 19 times the resource of New York.[186] Texas has also been proactive in facilitating renewable development. The Texas Senate has required that the Public Utilities Commission designate competitive renewable energy zones sufficient to support the growing demand for generating capacity, and develop a plan to construct transmission capacity to deliver to customers the electric output from those zones.[187]

4.3.2.2 Voluntary Markets. The voluntary markets for RECs are largely separate from the compliance REC markets, and no direct relationships are apparent with respect to REC prices across the two markets.

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185 Paying an ACP does not get a state closer to its RPS targets in terms of building new resources.

186 American Wind Energy Association. http://www.awea.org/pubs/factsheets/Top_20_States.pdf. Downloaded July 30, 2008.

187 Texas Senate Bill 20. Enrolled version.

Voluntary REC market prices are not directly comparable with compliance REC markets for several reasons. First, Voluntary RECs are not subject to the same geographic and eligibility requirements as are RECs supplied to the RPS compliance markets. The New York RPS advances the development of new resources by buying from “new” capacity and by providing stable long-term revenue streams that help projects secure financing. In contrast, voluntary sales may, and in many cases do result in paying existing resources for RECs.[188] The types of resources that sell into the voluntary market are determined by the preferences of the market, rather than by RPS policy goal. These preferences vary somewhat across regions, and are influenced by the way a product is marketed.

In addition, demand for the voluntary RECs is not driven by a policy goal of increasing a states supply of renewable energy. Demand for voluntary RECs is typically driven by a corporation’s desire to green their image or alternatively, by an individual’s preference to support renewable energy. As a result, the supply/demand balance has, to date, produced REC prices far below those of the RPS compliance markets, including New York’s.

The voluntary REC markets have also, in some cases, been less closely tracked in the past than have RECs in RPS compliance markets. This presents opportunities for double counting, which may be a factor in the lower prices associated with voluntary RECs. While certifications such as Green-E, sponsored by the Center for Resource Solutions, exist, such certifications are not required for sales of voluntary RECs. New York’s attribute tracking system, administered by the Department of Public Service as part of the State’s Environmental Disclosure Label program, is also subject to double counting due to the manual nature of the system. In addition, double counting of existing renewables can occur in New York due to the fact that the RPS program does not actually take title to attributes from facilities counted toward New York’s “existing renewables” RPS baseline. There is nothing keeping New York’s existing renewables from selling RECs into the voluntary markets.

[188] Resources eligible under the Main Tier of New York’s RPS must have entered commercial operation after January 1, 2003. Limited exceptions are made to provide RPS financial support to hydroelectric, wind and biomass resources that demonstrate the need for financial assistance to remain in operation. These are referred to as “maintenance resources.”

4.3.3 External Factors Affecting the REC Prices

Market forces have a strong influence on REC prices. This section will address general market forces that contribute to REC price levels. These market fundamentals can be translated to any market for RECs, not just the New York market. As a result, this section will discuss these factors at a high level and address specifics to the New York compliance market where appropriate.

4.3.3.1 Framework Approach for Developing REC Prices. Like all investments, renewable energy projects must meet a certain threshold level of return on investment. That is, the amount of revenue earned from a project must exceed the costs of that project by a certain level:

$$\textit{Target Return on Investment} < \frac{(\text{Revenues} - \text{Expenses})}{\text{Expenses}}$$

The threshold level of return on investment (ROI) is established by the investors in a project. Each investor will establish a ROI commensurate with the risk it assumes through its capital contribution and through the anticipated repayment. These rates of return are then weighted according to the share of overall capital contributed by each investor respectively. This overall ROI is then set as the minimum return that will be accepted if the project moves forward.

RECs are considered the premium that a project needs to receive in order for it to meet that target ROI. At a fundamental level, investors evaluate the other revenues and expenses that make up a project's economics to determine the premium necessary to achieve the ROI. RECs are the last piece of the financial package for renewable energy; in essence, RECs are the lynchpin of renewable energy investment for most of the United States. If the REC revenues fail to make a project's economics "whole," then the project is not built.

Thus, the main drivers of REC prices are the main drivers in renewable energy project economics. If the project could be built so that it produced energy at market rates while achieving the investors' target ROI, then REC revenues would be unnecessary. Currently, however, renewable energy projects are still more expensive to build than conventional energy generation technologies. The factors that make the renewable energy projects more expensive than the market price for energy, therefore, are the factors that drive REC prices.

Table 13 presents a simplified list of a renewable energy project's revenues and expenses. It provides a basic background on the factors that contribute to renewable energy project economics. Some of these, such as the operations and maintenance (O&M) costs, are typically noise in the equation; the cost to maintain wind turbines, for example, is typically low relative to other components of the project economics. Other factors are major drivers in project economics; as a result, they are major drivers of REC prices. The following sections discuss these drivers.

Table 13. Simplified List of Revenues and Costs for Renewable Energy Projects

Revenues	**Costs**
Energy Sales	**Capital Costs**
Production Tax Credit	*Equipment*
REC Sales	*Siting and Permitting*
Other Incentives / Rebates	*Labor*
Capacity revenues	*Interconnection*
	Land Lease/Purchase
	Expenses
	Debt Service
	Fuel Costs
	Operations & Maintenance
	Property Taxes
	Income Taxes

Source: Summit Blue Consulting

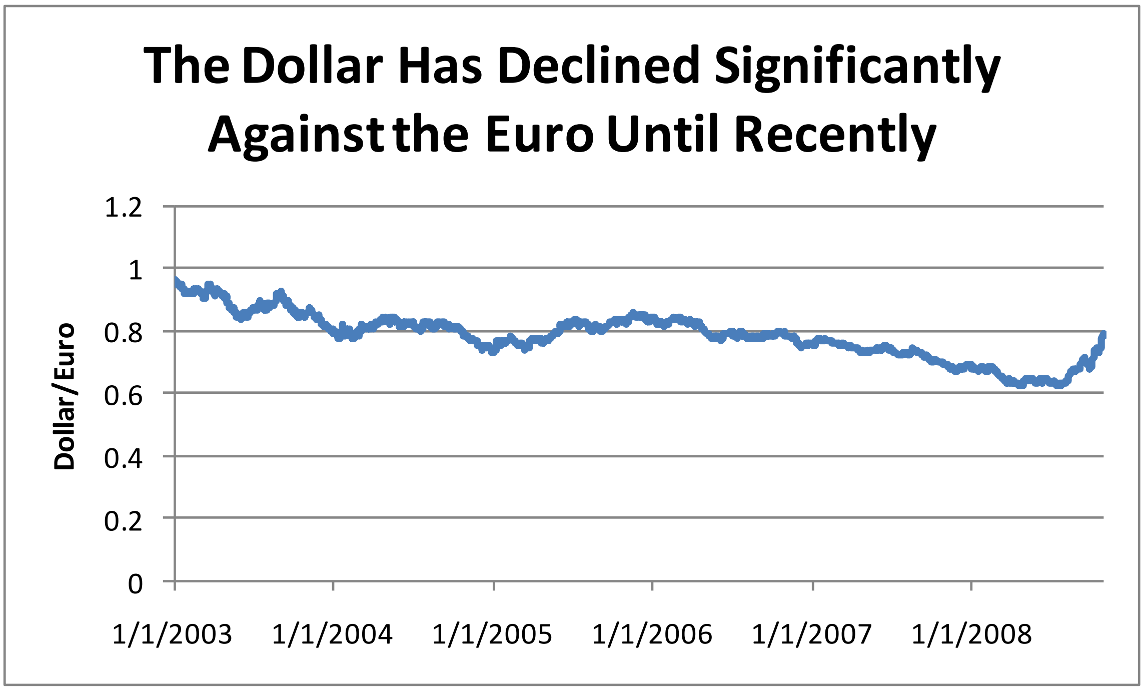
4.3.3.2 <u>Key Driver: Major Expenses: Equipment Costs.</u> Equipment costs make up the bulk of costs for new renewable energy projects. With the exception of biomass facilities, capital costs make up a greater percentage of lifetime costs for renewable energy projects than for conventional energy facilities, due to the lack of fuel costs. Capital costs can make up 40-60% of the lifetime cost of natural gas units compared to 75% for wind facilities.[189] Costs for renewable generation plants, as with all types of

[189] European Wind Energy Association, "Wind Energy Costs – Investment Factors," December 2004, http://www.ewea.org/fileadmin/ewea_documents/documents/press_releases/factsheet_economy2.pdf. These percentages are dependent on the discount rate used; this calculation assumed a 7.5% discount rate. The EIA reports a capital cost of $706/kW for natural gas combined cycle and $1,434/kW for wind (*Annual*

generation plants, increased significantly from 2004 through 2007. These costs increases were driven by increased costs for commodities, such as concrete, copper, and steel, driven in turn by the increased demand for these commodities by developing countries, such as China and India.[190]

The declining value of the dollar relative to the euro, until the recent credit crisis, shown in Figure 32, has also been a factor in the increase in equipment costs. This is a particularly important factor for wind turbines due to the large portion of the manufacturing market being dominated by European companies. In the U.S., the second, third, and fourth places in terms of capacity installed were held by European companies in 2007, with the fifth and sixth places being held by Asian companies.[191]

Figure 32. Value of the Dollar has Declined in Euros, 2003-2008



Source: FXHistory, "Historical currency exchange rates", http://www.oanda.com/convert/fxhistory.

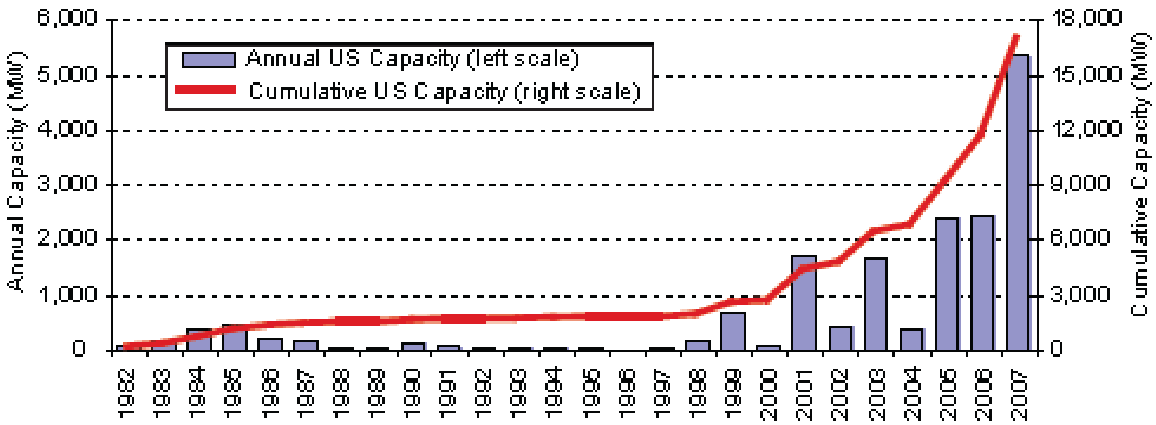
Energy Outlook, 2008), although these costs have likely risen since this report was published. It should be noted that these capital costs include non-equipment costs, such as land and development.

190 Matthew L. Wald, "Costs Surge for Building Power Plants," *New York Times*, July 10, 2007, World Business Section, http://www.nytimes.com/2007/07/10/business/worldbusiness/10energy.html.

191 American Wind Energy Association, *AWEA 2007 Market Report*, January 2008.

During this period, wind turbines were subject to strong demand in the U.S., which also contributed to the increase in prices. Congress renewed the federal PTC in August 2005 through the end of 2007 and again in December 2006 through the end of 2008,[192] eliminating the question, for three consecutive years, about whether the PTC would be available. This, combined with the proliferation of RPSs in the U.S., led to three record years of wind capacity growth, topped by a 46% increase in 2007, as can be seen in Figure 33. This strong demand led to supply shortages and price increases. Price increases over this period, plus estimated prices in 2008, are shown in Figure 34.

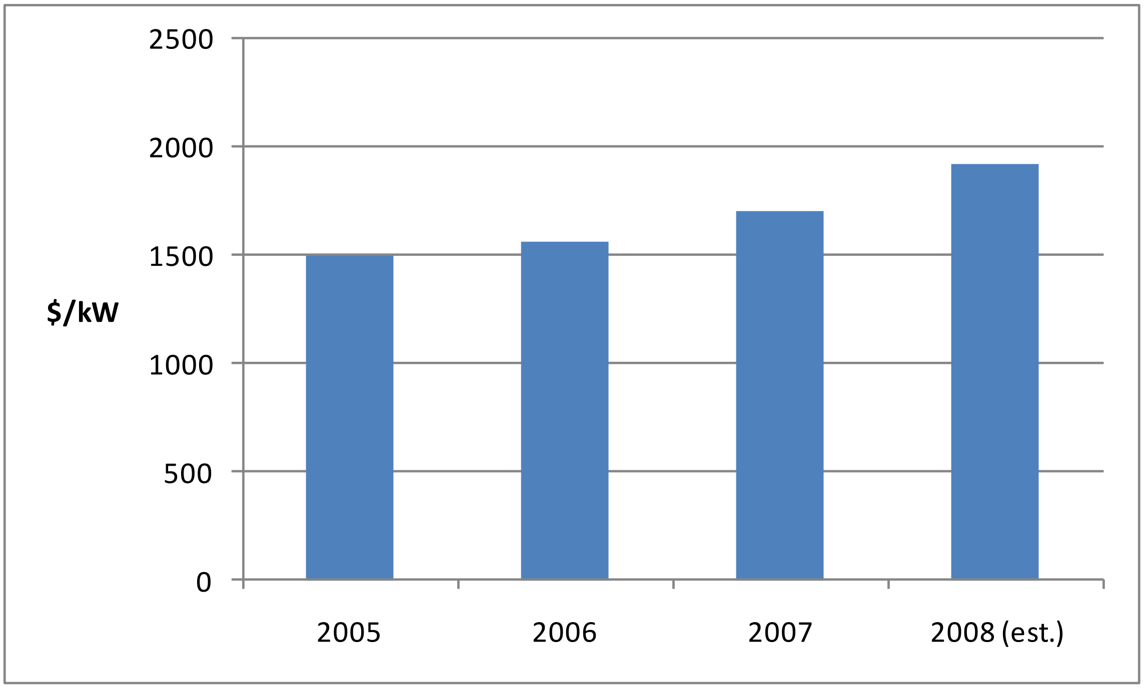
Figure 33. U.S. Wind Capacity Has Surged in Recent Years



Source: R. Wiser and M. Bollinger, *Annual Report on U.S. Wind Power Installation, Cost, and Performance Trends: 2007*¸ U.S. Department of Energy, 2008. Data from AWEA.

[192] Database of State Incentives for Renewables and Energy Efficiency, "Renewable Energy Production Tax Credit," Last reviewed February 2008, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=US13F&State=federal&currentpageid=1&ee=0&re=1.

Figure 34. Installed U.S. Wind Project Costs Have Been Steadily Increasing



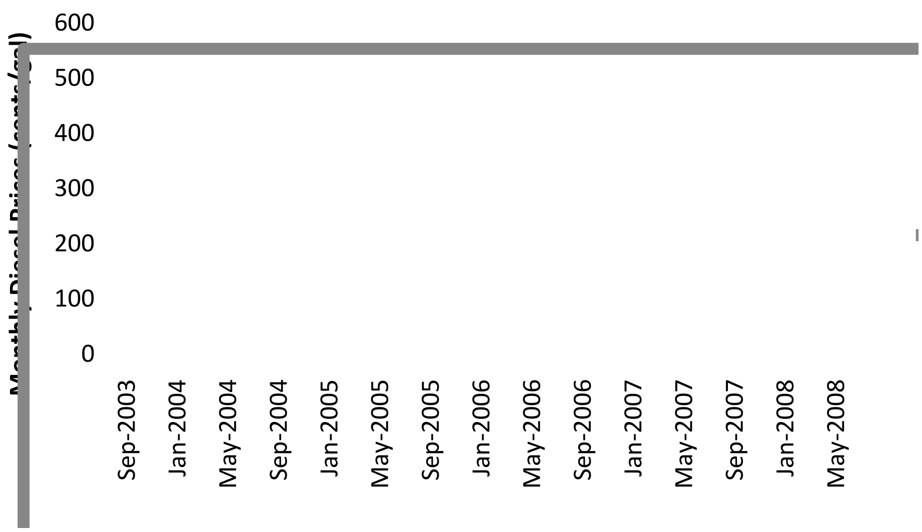
Source: R. Wiser and M. Bollinger, *Annual Report on U.S. Wind Power Installation, Cost, and Performance Trends: 2007*¸ U.S. Department of Energy, 2008.

4.3.3.3 <u>Key Driver: Major Expenses: Fuel Costs for Biomass Facilities</u>. Biomass facilities have one unique issue among renewable energy technologies: fuel supply. Whether this fuel supply is from forest residue, mill waste, landfill gas, or agricultural waste, the availability of the fuel supply at predictable prices is a precondition to project development. For agricultural waste and landfill gas, this issue is less complex than for the forest residue and mill waste. The inability to secure long-term, fixed-price contracts for forest residue and mill waste is a major barrier to more widespread investment in open-loop biomass projects that depend on by-products from other industrial processes as feedstocks.

Those projects that are built without long-term agreements in place are subject to volatility in the prices for the fuels and to volatility in the cost of diesel to process and transport the fuel. Mill waste and forest residues are by-products of other industrial processes. As a result, the availability of these fuels varies with the activity in the primary industries; over 15 years, these industries are expected to have some cyclicality. The volatility in prices for these fuels can wreak havoc on a project’s cash flow and lead to insufficient cash to meet loan repayment obligations.

Additionally, the overall cost of these fuels is closely tied to the price of diesel. Forest residues typically require processing, which is done at the site of origin. Since these fuels typically come from remote areas, diesel-fired generators are used to process the raw materials before they are transported on diesel-fueled trucks to the point of use. As seen in Figure 35, diesel prices have increased by 188% over the past five years. This increase is passed straight through to the bottom line for biomass projects using forest residue as fuel.

Figure 35. Diesel Prices Have Increased Dramatically



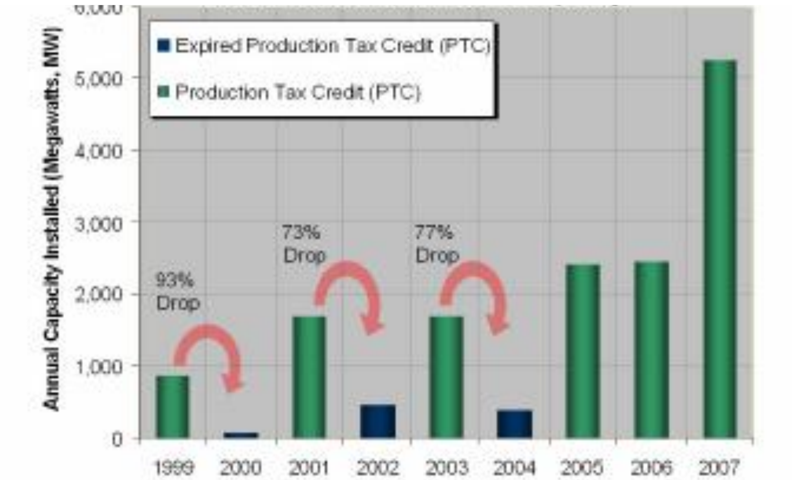
Source: Energy Information Administration, "Spreadsheet of Complete Diesel Historical Data," Data 2: Monthly Diesel Prices – All Types, Central Atlantic Region, http://tonto.eia.doe.gov/oog/info/wohdp/diesel.asp#graph_buttons.

4.3.3.4 **<u>Key Driver: Project Revenues.</u>** The other element of the ROI formula is the revenue streams associated with a given project. Most renewable energy projects have two primary revenue streams in addition to REC sales: energy sales and federal PTC benefits. Alone, these two revenue streams are not typically sufficient to produce the required rate of return. The amount of "insufficiency" determines the level of REC prices necessary to bring a project to fruition.

The federal PTC is subject to uncertainty due to the federal policy-making process. Until 2005, the federal government frequently allowed the PTC to expire before reinstating it. The PTC has been continuously available from 2005 through 2008 and was extended through 2009 as a result of the Emergency Economic

Stabilization Act of 2008, signed by the President on October 3, 2008.[193] The PTC is available for wind projects at a rate of approximately $20 per MWh, and for biomass and hydro projects at a rate of approximately $10 per MWh. As shown in Figure 36, the federal PTC has had a profound impact on the annual installation of wind capacity.

Figure 36. Historic Impact of PTC Expiration on Annual Installation of Wind Capacity in the U.S.



Source: American Wind Energy Association, "Wind Energy Production Tax Credit," Fact Sheet, 2008, http://www.awea.org/pubs/factsheets/PTC_Fact_Sheet.pdf.

Developers and investors affirm that the availability of the PTC affects the REC prices required to bring a project to fruition. When the PTC is in effect, the project economics are more favorable than when it has lapsed. Thus, the REC prices must be adjusted to make up for the lost revenue when the PTC has lapsed. Some investors discussed the approach of offering two different REC prices, one would be considered if the PTC was in effect and the other when the PTC had expired. This is a clear connection between REC price and the existence and applicability of a PTC.

Energy revenues are determined by two main components: the amount of energy generated and the energy price. The amount of energy generated is dependent on the underlying resource: higher quality resources result in higher revenues; lower quality resources (i.e., those with less wind available) result in lower revenues.

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[193] Tom Raum, "Bush signs $700 billion bailout bill," *Associated Press*, October 3, 2008, http://ap.google.com/article/ALeqM5hT-MwpK6QSoOPF74bGFqnUl_HVuwD93J6ND00.

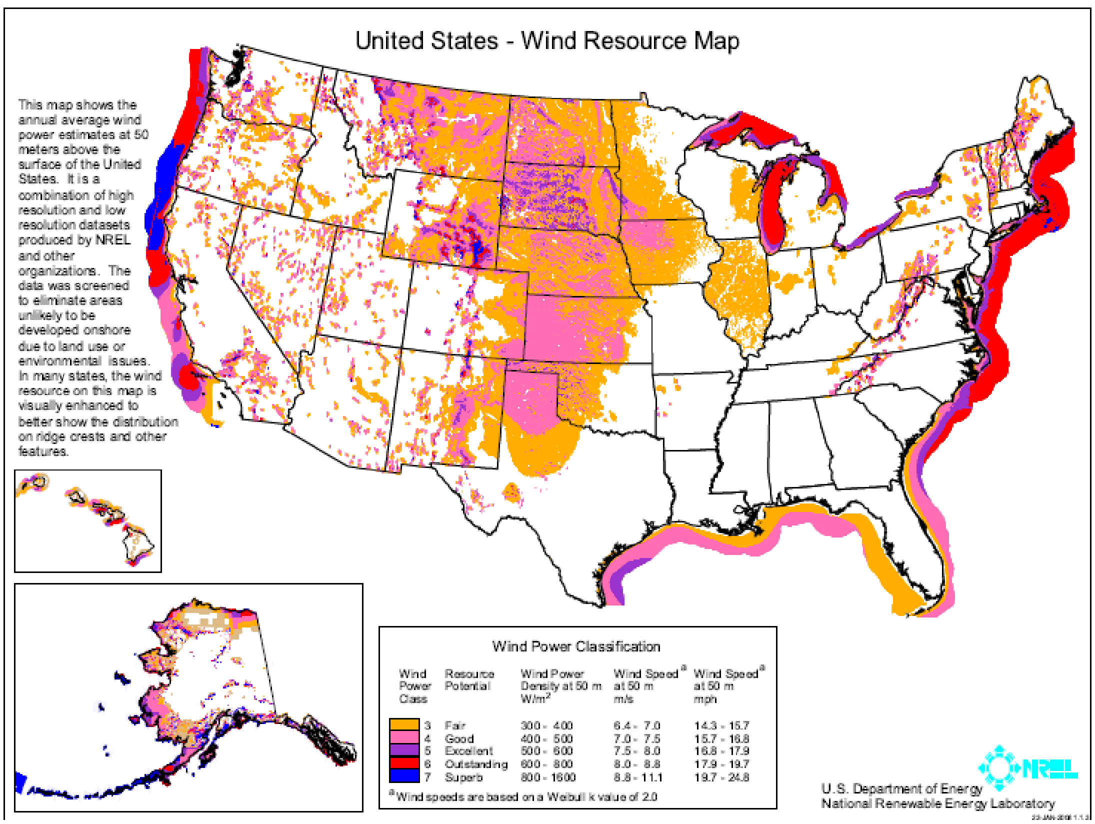
This is the result of the physics underlying power production from wind turbines:

$$Power = \frac{1}{2}\alpha\rho\pi r^2 v^3$$

This equation says that the power produced from a turbine is dependent on the efficiency of the turbine (α), the density of the air (ρ), the square of the radius of the turbine (r), and the *cube* of the velocity of the wind (v). In other words, a decrease in the velocity of air of two meters per second reduces the power produced from the turbine by a factor of eight.

Figure 37 shows that the wind resources in New York are less productive than those in Wyoming or Iowa, two states experiencing a significant amount of wind development. Thus, the power (and energy) production of New York's projects are lower than those in other states, reducing the amount of energy available for sale.

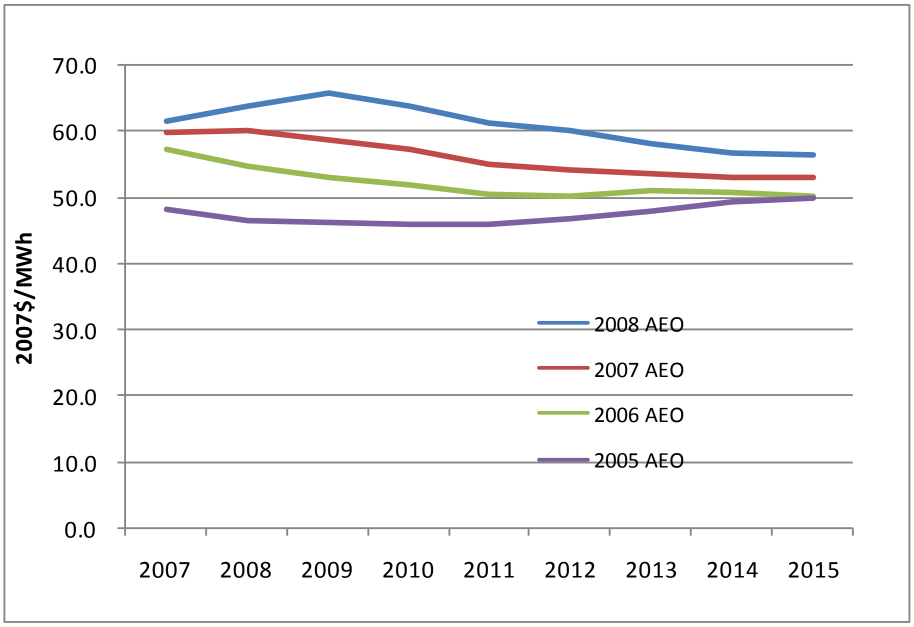
Figure 37. Wind Resource in New York Are Significant, but Less than Many States



Source: National Renewable Energy Laboratory, "United States – 50-Meter Wind Resource Map," January 2006, http://www.windpoweringamerica.gov/pdfs/wind_maps/us_windmap.pdf.

Higher energy prices in New York than in other parts of the country help to make up some of the revenue gap that would otherwise occur due to the lower energy production. New York's average annual retail electricity prices were the third highest in the country in 2005, the most recent year for which data are available.[194] Forecasts for the generation component of electricity prices, as shown in Figure 38, have steadily increased, which has likely reduced the need for renewable generators to seek as much revenues from the REC market.

Figure 38. The Forecasts for Generation Prices Have Steadily Increased



Source: Energy Information Administration, *Annual Energy Outlook 2005-2008*, "Electricity Supply, Disposition, Prices, and Emissions" and Summit Blue Consulting.

Average prices do not translate to actual revenue, however, especially for wind facilities, which often operate during off-peak periods. While New York RPS program allows RPS contract holders to sign bilateral contracts for their energy, it is difficult for intermittent resources to secure such contracts. Instead, developers must risk selling energy on the open market (which makes it difficult to secure low-risk capital) or enter into hedge agreements with banks. In recent years, banks have begun to offer lower energy prices through these hedges, also called "synthetic Power Purchase Agreements (PPAs)," due to a perceived increase in risk in the market. Such synthetic PPAs often offer energy prices at a 25% discount to the

[194] Energy Information Administration, "Coal and Electricity Prices and Expenditures," *State Rankings, 2005*, http://www.eia.doe.gov/emeu/states/_seds.html.

prevailing market prices and are offered for a maximum of ten years. This ten-year period leaves the project owners with significant revenue risk in the out years, which can increase the cost of capital. In the wake of the redesign of the nation's financial markets in late 2008, it is unclear how open the market for hedges will be at all, further increasing the risk in energy revenue.

Greenhouse gas markets are likely to increase the cost of fossil generation and thereby impact the revenues which are available for renewable energy in the future through increased wholesale electricity market clearing prices. The Regional Greenhouse Gas Initiative (RGGI) was launched in the fall of 2008 and funds from allowance sales may be made available for renewable energy-related purchases. Moreover, there is still uncertainty about a federal greenhouse gas regulatory scheme. How these markets will interact with one another and with the renewable energy marketplace is still uncertain, but most interview subjects believed that there would be interaction in the future.

4.3.3.5 Key Driver: Supply-Demand Balance. This fundamental principal of economics – or some variation on it – was mentioned by 16 of the 28 developers interviewed as one of the most important drivers of REC prices. Today's market for renewable energy is driven by policies, including the federal PTC and federal investment tax credit (ITC) and state-level RPS policies. As a result, the primary forces shaping the supply and demand for RECs are the different elements of these policies. Many of the policy elements discussed herein are present in New York's RPS, but some of them are not. This section is intended to provide a broad view of the forces that *can* shape REC prices; the absence of some of these policy elements can also have an effect on REC price. Variations on many of the forces shaping the supply-demand balance will be discussed in the 2009 RPS Evaluation Report; therefore, this section will only mention them briefly.

The main force shaping supply of RECs is the definition of eligible projects. This definition includes several factors: the technologies, geographic scope of projects, inclusion of existing renewable energy capacity, definition of new or incremental generation, and the treatment of customer-sited projects.[195] Any expansion or contraction of the eligible projects can have a dramatic effect on REC prices. In 2005, for example, Connecticut's Department of Public Utility Control allowed existing out-of-state biomass projects

[195] Ryan Wiser, "Meeting Expectations: A Review of State Experience with RPS Policies," Lawrence Berkeley National Laboratory, March 2006, http://eetd.lbl.gov/ea/EMS/reports/awea-rps.pdf.

to qualify as Class I renewable resources.[196] The REC price tumbled from the $35-40 per MWh range in July 2005 to a "no bid" of $2.50 per MWh at the end of 2005 in response to the new supply-demand balance in the market.[197]

As evidenced by the Connecticut example, the risk associated with political or regulatory uncertainty is dramatic. Uncertainty about whether a given regulator or policy maker will remain firm on compliance targets can affect both supply and demand. Supply can be affected, because developers may view a market with high levels of political or regulatory uncertainty as less attractive than those with perceived higher levels of political will. Demand can be affected as responsible organizations become hesitant to purchase enough RECs to meet their compliance obligations. This uncertainty is especially heightened when laws establishing RPS policies have caps on electricity price impacts or caps on budgets allocated to meet the RPS targets; these types of policy creations are seen as limiting the functioning of a liquid market.

The forces shaping demand are equally important in determining REC prices. These policy elements typically revolve around the amount of renewable energy required, the flexibility available for meeting those targets, and the enforcement of compliance.

- The **targets** set in the RPS and the **schedule for achieving** them establishes the basic demand for the REC market (assuming that RECs are the mode of compliance).
- However, the **flexibility** available to responsible parties in achieving those targets can affect the actual demand. For example, the ability to **bank** RECs for future compliance periods or **borrow** them from future compliance periods can raise or lower demand for renewables, respectively, during a given compliance period.
- Further, the **level of enforcement** can affect the intensity with which the RPS targets are pursued. ACPs have a dramatic effect on REC prices if they are collected on schedule; ACPs effectively serve as a cap on REC prices. Unclear penalties for non-compliance or delays in applying existing penalties can lead to lower demand than anticipated by RPS targets.

[196] Ibid.

[197] Andrew Kolchins, "An Overview of the Renewable Energy Credit Markets" (presented at the Sixth Goddard Forum: The Opportunities and Challenges of the PA RPS, State College, PA, January 30-31, 2006), http://woodpro.cas.psu.edu/Goddard%20Forum%202006/Kolchins.pdf.

4.3.3.6 <u>Key Driver: Term of REC Contract.</u> The term of the REC contract also affects the REC price. It is difficult to generalize about what the effect is, however, because the effect is different from one investor to the next. The interviewees discussed the market forces that brought international energy corporations and domestic tax equity investors into the U.S. market for wind energy and the character of investors in biomass and landfill gas. Based on the interviews, the types of contract terms preferred according to the characteristics of the market actors defined earlier are characterized and presented below.

Corporate investors with in-house energy traders or that have experience with power plant development tend to prefer lower levels of commitment in REC contracts. These parties are comfortable taking on the market risk associated with a portion of the project's REC revenue, but typically need to obtain a REC contract for at least some portion of their project output to mitigate a certain threshold level of revenue risk. For example, a large corporate investor might sign a shorter contract for RECs associated with all of a given facility's generation or a longer contract associated with only a fraction of the energy produced by a facility. Generally speaking, these actors have an optimistic view of the REC market in New York going forward and would prefer to have the opportunity to realize that upside; since many of their projects are financed using the corporate balance sheet, rather than project assets, as collateral, they have the flexibility to take on this risk. As a result, these parties tend to raise the bid price of RECs in longer term contracts that commit a high percentage of a given facility's generation, because they want to be compensated for the opportunity cost of locking in the revenue stream.

On the other hand, small and medium-sized developers tend to want longer contracts, because it adds to the amount of certain revenues against which a project can secure debt or outside equity. With minimal internal capital, these developers are dependent on other investors' willingness to fund the project; and most of these investors prefer to minimize price risk, recognizing that they are accepting some development risk by investing in a less experienced developer. These parties tend to increase the REC bid price when the contracts are shorter, because they still need to secure the same amount of guaranteed revenue streams in order to get the project financed and then built.

Tax equity investors tend to fall somewhere in between these two ends of the spectrum. Their returns are dependent on tax benefits as well as on cash flows, and they are more risk averse than the corporate investors. Tax equity investors prefer to see fixed REC revenues that guarantee they will receive their return on time. In some cases, this may entail selling a fraction of the project's RECs through a guaranteed contract for the duration of the tax equity's majority interest in the project, and in other cases, it may entail selling all of the project's RECs in that manner. As long as their threshold return criteria are met with minimal risk, they are somewhat flexible in the exact term of a REC agreement.

4.3.3.7 Secondary Factor: Development Costs. The factors discussed so far in this section have the greatest effect on REC prices, but one other market factor also contributes to the REC price sought by project owners: the development costs. These are considered project expenses and contribute to the overall calculation of ROI described earlier in this section. They vary significantly from one market to another, however, depending on local rules, governing agencies, and public support for the projects. Increases in these expenses require higher revenues to achieve the target ROI. Among the costs of developing a project, interconnection and project siting costs tend to be the most significant in the New York market.

4.3.3.8 Summary: External Factors Affecting REC Prices. REC prices are typically the last piece of a project's finances that are put into place. Accordingly, they are expected to "make up the difference" between the project's existing return on investment and the threshold return on investment established by the investor. On the cost side of the equation, the major external market factors driving REC prices include equipment costs and, for biomass projects, fuel costs. On the revenue side of the equation, the combination of the natural resource (e.g., wind) availability and wholesale electricity prices determine the revenue from energy sales, which are the major project revenue, followed closely by the PTC. From a macro-market perspective, the supply-demand balance for renewable energy in the market and the term of the REC contract also affect REC prices. In the future, greenhouse gas regulatory systems are also anticipated to make project economics more attractive for renewable energy, resulting in a downward trend for REC prices.

4.3.4 Program Components that May Be Affecting REC Prices

The previous section discussed how factors outside the control of the New York RPS program affect REC prices. Those factors, such as equipment costs, energy market pricing and availability of the PTC, clearly have a significant bearing on the REC prices NYSERDA will pay under the RPS program. However, components of the RPS program itself, such as contract length and the weighting of economic benefits, have the potential to influence REC prices bid into the program as well. To gain a better understanding of how design features of the RPS program may be affecting REC prices, developers were asked a series of questions on this topic during our in-depth interviews with these key market participants.[198] This section summarizes findings from this research. The section focuses on REC price effects related to the specific set of program design features for which NYSERDA requested input.[199] These features are:

- Weighting of Economic Development Benefits in Selection of Winning Bids
- Contract Duration
- Bid Percentages and Partial Bidding
- Delivery Requirements for Out of Control Area Facilities
- Allowing Sale of Energy through Physical Bilateral Contracts

These program components were found to have varying levels of impact on REC pricing, as discussed below. Some program components not specifically targeted in the interviews were found to affect REC prices as well. These are discussed briefly at the end of the section.

4.3.4.1 Weighting of Economic Development Benefits in Selection of Winning Bids. In the first Main Tier solicitation (RFP 916), winning bidders were selected based on REC bid price alone. In the second solicitation (RFP 1037), in accordance with a PSC Order, NYSERDA required bidders to report on the expected economic benefits that would result from their project. RFP 1037's selection process weighed the value of economic benefits at 30%, while REC bid price, weighed at 70%, was still the dominant factor in selecting winning bidders. Developer input varied with regard to the value of the economic development decision criteria, and the effort, detail and accuracy associated with estimating such benefits. However, developers generally reported that this weighting criterion had little effect on the REC prices bid into the program.

[198] Variations on the same questions pertaining to this topic were asked both of participating and non-participating developers. However, in most cases, the most robust responses came from participating developers. Responses coming from non-participating developers are noted as appropriate.

[199] NYSERDA commissioned surveys of RPS program bidders after both the first and second solicitations. Those surveys gathered input on a number of detailed program design elements. Findings from the second RPS solicitation (RFP 1037) are largely consistent with findings from the current evaluation. The interviews conducted for this evaluation were broader in scope than those conducted during the earlier bidders' surveys. The interviews for this evaluation covered some specific program design elements, but also included questions on a number of other market-related issues.

Biomass project developers strongly favor the inclusion of the economic benefits criteria. Their projects' operation and maintenance requirements are significantly more labor intensive than wind and hydro repowering projects and, therefore, create more local jobs per unit of capacity than the other technologies.[200] One biomass developer explained that, since they recognized economic benefits would be factored into the selection process, and that theirs would be favorable, there was a slight effect on their bid pricing.

Wind and hydro developers were generally indifferent to the inclusion of economic development benefits in the selection process. Not surprisingly, wind companies with a significant presence in the State were more favorable toward the inclusion of economic benefits in project selection. Some smaller developers opposed the inclusion of this decision criteria, as calculating the benefits adds another layer of complexity to the proposal process for these companies.

Some expressed that the estimation process was burdensome, while others felt that it was straightforward. Some developers explained that they make these types of estimates anyway as part of their general community outreach efforts for a project. There was some concern about the accuracy and consistency with which the estimates are made.

4.3.4.2 Contract Duration. Developers generally supported the ten-year contract duration, though there was a strong preference for greater flexibility to suit the unique needs of different projects. Most developers expressed that the contract term should be at least ten years. A third of the developers interviewed stated that the ideal contract length would be 20 years, expressing that a longer contract term enables them to bid lower REC prices because the project is taking on less revenue risk.[201] This long-term revenue stability is also key in securing project financing, particularly for larger capital-intensive wind projects.

A few developers prefer shorter contract duration, so they can retain upside potential and the freedom to respond to future changes in the marketplace. This included interviewees across wind, biomass, and

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[200] According to NYSERDA program records, in terms of total value of long-term jobs relative to total bid capacity, biomass projects bidding into the program in the second and third solicitations estimated benefits seven times greater than wind projects.

[201] One developer noted that 20 years also coincides with the lifetime of many turbines.

landfill gas technologies. One biomass developer explained that uncertainty in fuel supply pricing makes it difficult for them to settle on a long-term REC price, and that contract duration of three years or less would be preferable. Another interviewee explained that landfill gas projects have lower capital costs than wind projects. Therefore, they have shorter debt periods and do not need long-term contracts for financing. Based on the comments of those who prefer shorter contract lengths, it can be inferred that these entities build some premium into their REC pricing for longer term contracts to account for the opportunity cost of tying up their RECs for longer than they would prefer.

In general, however, the benefits of long-term price stability appeared to outweigh concerns about foregoing potential for future profits in more lucrative REC markets. Those who wish to retain upside potential appear to be doing so by only bidding a portion of their project output into the program.

Some respondents' comments were conditioned on whether NYSERDA continues to play the role of central procurement agent; if NYSERDA remains the only substantial buyer of RECs in the State, then there are limited alternatives and they do not mind making a long-term sales commitment. However, if there are additional potential REC buyers participating in the New York market in the future, they would be wary about locking into a price with NYSERDA.

Several developers preferred the flexibility to choose a contract length so they could make their REC contract consistent with the duration of their energy hedge pricing arrangements or other contracts. Others expressed that the financing needs of each project are different and that the program should respond with greater flexibility in contract lengths to accommodate this diversity in the marketplace.

4.3.4.3 Bid Percentages and Partial Bidding. An area in which the RPS program provides great flexibility for participants is in determining the percentage of project output to bid for sale to NYSERDA. While projects in the first Main Tier solicitation could opt to sell as little or as much of their project output to NYSERDA as they wished, in later RFPs, pursuant to PSC order, project developers could sell up to a 95% maximum limit. The rationale for the 95% limitation is that the RPS program seeks to retain a sufficient supply of generation to support New York's voluntary REC market. In the second solicitation, bids as low as 10% of the project's output were proposed. In the third solicitation (RFP 1168), participants were also subject to a minimum bid percentage of 30%.

Of the thirteen participating developers that commented on this topic, about three quarters said they would have sold 100% of their project output to the program if given the option. The primary reasons given by developers for this preference were that the administrative burden is high to secure voluntary market REC sales for a relatively small volume of output, and voluntary market REC prices are low. One developer selling the maximum 95% project output to NYSERDA explained that they need to be careful to ensure they meet their delivery requirements to NYSERDA. If they enter into additional agreements for the remaining 5%, they must also carefully monitor delivery to those entities. It would be much easier for them to manage REC off-take agreements if they could sell the entire output to one entity. Since developers selling the maximum amount to NYSERDA expressed that they cannot count on REC sales for the remaining 5% of their project output, one might assume that they are bidding REC prices into the program that cover their REC revenue needs for the entire output of the project.

Those developers who prefer to sell a smaller portion of their project output to NYSERDA are generally larger wind companies and landfill gas developers. The rationale for this position is that they wish to retain the potential to sell into more lucrative markets, such as the New England RPS compliance markets.

About a third of all companies that have bid into any of the three RPS solicitations have submitted at least one bid with a bid percentage of less than 95% of the project's output that could be sold to NYSERDA. Four of the eight unique companies that have held RPS REC contracts with NYSERDA have had at least one contract for less than 95% of a project's output.[202] Only one company (a wind developer) that currently holds REC contracts with NYSERDA plans to sell less than 50% of its projects' output once the projects become operational.

Some companies submitted multiple bid percentages for one or more of their bid facilities. Winning bids have resulted for two of those companies. Based on the range of bids received by NYSERDA, it appears that providing bidders with the flexibility to submit a variety of bid percentages does affect the bid prices submitted, but there is no clear trend or strategy apparent in bid pricing.

4.3.4.4 <u>Delivery Requirements for Out of Control Area Facilities.</u> When New York's RPS first went into effect, intermittent facilities located out of the electricity control area could sell attributes (i.e.,

[202] The number of unique companies here does not include those selling RECs from maintenance resources.

RECs) into the New York RPS as long as an equal quantity of energy was also delivered into the New York ISO control area during the same calendar month. In 2006, the Public Service Commission issued an Order changing the matching requirement from monthly to hourly. The rationale behind this change was to: 1) to provide "greater confidence that at any particular hour, the output of an out-of-control-area intermittent renewable generator with an RPS Program contract will have a direct transmission and commodity price suppression effect on the New York electric system;"[203] and 2) to level the playing for in state and out of control area facilities.[204] When out-of-control-area facilities were able to match REC sales with energy delivery on a monthly basis, they had greater flexibility than in-area facilities to maximize market pricing associated with their power delivery which, the PSC found, put them at a competitive advantage relative to in-state facilities. For example, if in hour X, the effective Locational Marginal Price in the NYISO may be $20/MWh, while it is $25/MWh in the bid facility's location in a different ISO. During that hour, a facility located in the NYISO would automatically be subject to the NYISO pricing scheme, while the non -NYISO facility could take the more favorable pricing in their own power market.

Non-intermittent facilities located out-of-control-area are required to deliver energy associated with RPS attributes (RECs) from the facility's injection point in its control area to the New York control area on an hourly matching basis.[205]

For intermittent facilities, scheduling delivery into the NYISO control area to match REC production from an another control area on an hourly matching basis is significantly more complex than meeting the earlier monthly matching delivery requirement. And the rules for non-intermittent facilities are similar. In general, however, developers seem to accept the import requirements and plan their business strategy accordingly. New York's rules are, in fact, similar to those currently in place in neighboring Massachusetts, as well as other states.[206]

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[203] For example, with a monthly matching requirement, there was no incentive for a facility to deliver energy into the NYISO at the time the energy was produced. As a result, if a facility produced energy during a peak demand period, New York would not receive energy delivery during that period and would therefore have greater difficulty meeting its peak demand, and pricing in the state would, theoretically, be marginally higher. State of New York Public Service Commission, "Order on Delivery Requirements for Imports from Intermittent Generators," CASE 03-E-0188, Issued and Effective June 28, 2006. p. 2.

[204] Ibid.

[205] NYSERDA, "Renewable Portfolio Standard Program Purchase of Renewable Energy Attributes," Request for Proposals (RFP) Nos. 1037 and 1168, 2006, p. 16.

[206] There appears to be a movement among RPS states to impose stricter import rules, with Massachusetts currently exploring more stringent potential import policies, and Connecticut recently adopting stricter requirements. As noted earlier, Massachusetts is exploring the possibility of requiring out of state facilities

Most of the participating developers interviewed have only bid NYISO facilities into the New York RPS program. Developers explained that it would not make economic sense to bid out of state facilities into New York, largely because healthy REC markets exist in the regions in which their out of state facilities are located. For example, some of the wind developers participating in the New York RPS also have facilities in the ISO-NE and PJM control areas. Given the presence of RPS markets in those control areas, and the fact that those RPS markets can draw on any facility within their respective control areas without any import requirements, the companies have every reason to sell RECs within the region that their facility is located. The in-region economics are particularly favorable for any facilities located within the ISO-NE control area, as new renewable energy supply is short within that region, and they can sell RECs into the lucrative Massachusetts and Connecticut RPS markets.

Only two projects located outside the NYISO currently hold contracts to sell RECs into the New York RPS. These include: 1) the Bear Creek wind project located in Pennsylvania, which holds a four year contract which ends in 2010; and 2) the High Falls hydro repowering project located in Quebec, which holds a ten year contract and is currently under construction. Notably, the Bear Creek project was selected under first Main Tier solicitation (RFP 916), which occurred before the PSC adopted the hourly matching delivery requirement for intermittent out-of-control-area facilities. As a result, the Bear Creek facility is subject to the earlier monthly matching delivery requirement. The High Falls facility will be subject to the hourly matching requirement.

To maintain confidentiality, input provided by interviewees from the companies that hold NYSERDA REC contracts for these two projects cannot be provided here. However, the limited participation in the New York RPS program by out-of-control-area facilities is an important indicator in and of itself. The import rules appear to present enough of an economic barrier to most out-of-control-area projects that companies do not believe they can bid competitive REC prices into the New York RPS program for these facilities. This should not substantially affect REC pricing in New York, since there is not a shortage of NYISE program participants. However, greater flexibility for imports from non-NYISO generators could increase competition by increasing the range of supply available.

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to participate in the ISO-NE capacity market and to “net” renewable imports into the state with brown power exports. This process was initiated through the Green Communities Act passed in by Massachusetts in June 2008.

4.3.4.5 Allowing Sale of Energy through Physical Bilateral Contracts. As a means of protecting the integrity of New York's Environmental Disclosure Program, when the New York RPS first went into effect, only facilities selling energy into the NYISO spot market could participate in the RPS program. In June 2006, the New York PSC issued an order stating that facilities participating in the RPS program could sell energy either into the NYISO spot market *or* through physical bilateral contracts. The PSC determined that modifications could be made to the Environmental Disclosure Program to accommodate this change.[207] Because of this timing, facilities bidding into the second Main Tier solicitation (RFP 1037) were able to take advantage of physical bilateral contracts. The rationale behind this change was that allowing physical bilateral contracts would improve market liquidity and reduce risk. This, in turn, was expected to result in lower REC prices bid into the RPS program.

A few of the developers that had participated in both the first and second solicitations, or had considered bidding in the first solicitation, commented that the ability to enter into physical bilateral contracts had, in fact, reduced their REC bid price in the second solicitation. Average REC prices for awarded projects dropped from $22.90 in the first solicitation to $15.31 in the second solicitation. This may be one of the factors contributing to this drop in average REC prices.

Several interviewees noted that, although they do not use physical bilateral contracts for their own projects, the PSC's decision was valuable in that it increases market liquidity and flexibility. The majority of participating developers reported that they sell their energy into the NYISO spot market, though a significant number of facilities do sell at least a portion of their energy through bilateral contracts.

4.3.4.6 Other Program Components With Potential to Affect REC Prices. Other program components that may be affecting REC prices based on input from market stakeholders include:

- *Program structure in which all technologies compete with one another*.

  Some interviewees noted that having all technologies compete in the same competitive bidding process results in REC prices that are lower than what certain technologies need in order to be

[207] New York's Environmental Disclosure Program previously relied on bundling of energy and attributes, and only counted sales of energy through the NYISO spot market.

economically viable. For example, technologies that are less well established than hydro and onshore wind would have to reduce the bid price to be competitive. However, certain program features do benefit non-wind technologies, such as the option to enter into shorter contract terms for fuel-based technologies, and the economic benefits scoring criteria, in which biomass projects are likely to excel because biomass provides more long-term jobs than wind or hydro[208]

- *Limited selection criteria*.

  Some interviewees recommended that the program be changed to consider factors such as resource diversity, proximity to load, and a project's ability to support grid stability in the selection process. Some noted that existing market mechanisms, such congestion pricing and the installed capacity market, already help level the playing field across technologies and projects. Others expressed that projects that can offer benefits other than low REC prices and economic benefits would have difficulty competing effectively under the current RPS program structure.

  If the RPS program were structured to offer special opportunities for those technologies that have more difficulty competing under the existing program structure (i.e., through technology carve-outs in the RPS), the resulting average REC prices for the program would be higher than they are currently.

- *Vintage Requirements*.

  The requirement that facilities must have become operational on or after January 1, 2003 to qualify to participate in the Main Tier program could result in higher RPS REC prices in New York compared to other states that allow older facilities to qualify. The purpose of this "vintage" requirement is to use RPS funds to drive the development of new or additional renewable generation. The vintage requirement can result in higher REC prices, because New York's abundant facilities that make up New York's abundant baseline of existing renewables are not competing for RPS funds. Furthermore, facilities that are using REC revenues to help secure financing to construct a new facility generally have higher REC revenue requirements than existing facilities.

[208] This is discussed in the NYSERDA 2008 Economic Benefits Report.

- *Commercial Operation Milestone Date and Contract Security*.

  The RPS program requires participants to make contract security payments based on the expected in-service dates of their project(s) as a means of discouraging participation by speculative developers. Bidders are generally provided with at least two construction seasons before they must be fully operational. For example, the default "Commercial Operation Milestone Date" for projects in RFP 1168 is December 31, 2008. Awardees in RFP 1168 can extend their Commercial Operation Milestone Date to November 30, 2009 by making an additional contract security payment.[209] Participants may ultimately lose all or a portion of their initial contract security payments if their project incurs significant delays beyond these milestone dates, though the bidder can minimize the loss of contract security if it chooses to terminate the contract with NYSERDA in anticipation of such delays.[210]

  In part because of the uncertainty around when and if future RPS solicitations will take place, many bidders look unfavorably upon these Commercial Operation Milestone Dates. Bidders whose projects may not be on an ideal schedule to participate in a given solicitation, but unsure whether there will be an opportunity to bid in future solicitations, may choose to build a risk premium into their bid price in case they miss the specified operation milestone and lose a portion of their security payments. Several interviewees noted that the short turnaround for the operation milestone is challenging given the uncertainty around permitting in the State and the fact that most projects follow a multi-year development timeline.

  Greater certainty around the future of the RPS program (i.e., a firm schedule of procurements to take place for several years into the future) may limit some of the concerns about Commercial Milestone Dates, as developers with projects that are earlier in the development cycle will feel more confident waiting to bid in future solicitations.

[209] Projects are required to provide NYSERDA with Contract Security payments in an amount equal to $6.00/MWh times the Bid Quantity shortly after notification of selection. The Commercial Operation Milestone Date can be extended to November 30, 2009 for participants in the RFP 1168 solicitation if the participant pays an additional $3.00/MWh in contract security.

[210] NYSERDA will refund 50% of the contract security amount if the bidder elects to terminate the contract in anticipation of significant project delays. For RFP 1168, this contract termination would have needed to occur by October 1, 2008. The RFP also outlines additional conditions under which NYSERDA or the bidder would retain security payments (RFP No. 1168, Section XIII.).

- *Bid ceiling price.*

  NYSERDA sets a bid ceiling price, or a price above which a bid facility will not be considered for selection. The rationale for applying a ceiling price is that it adds a layer of prudence to the project selection process, ensuring that the limited budget available to the RPS program is not spent on projects with unreasonably high prices or those projects that are somewhat speculative in nature. The ceiling price is kept confidential in order to ensure that competitive forces are the primary driver behind bid pricing; revealing the bid ceiling price would affect bidding behavior, causing bids to approach the ceiling price.

  A few developers would prefer that NYSERDA either eliminate or reveal the bid ceiling price as some developers that put a great deal of time into preparing their bid may not even end up being considered for selection if their bid exceeds the ceiling price. Further, speculation about the bid ceiling price can affect bidding behavior.

  While data from the interviews did not provide specific information on how the use of a bid ceiling price affects the bid prices submitted under the program, the existence of the bid ceiling price does inherently limit the REC prices paid by NYSERDA through the program.

The fact that the definition of “RPS-eligible attribute” includes any avoided emissions of carbon dioxide, methane and other greenhouse gases was not found to have any effects on REC prices to date. This may change in the future as the RGGI market becomes more familiar to market participants, and as potential future carbon regulations potentially raise the price of fossil fuel generation and the market clearing price, resulting in higher electricity revenues for all renewable technologies. However, the market clearing price increase may be somewhat offset by the price suppression effect of renewable energy on electricity which is discussed more fully in the next section. The point here is that a larger energy sales revenue stream could reduce REC revenue requirements and lower REC market prices. The specific effects of future carbon regulations will depend on how renewable energy facilities are treated in those regulations.

In summary, program design features are affecting REC prices in a variety of ways. The program feature with the most favorable effect is the long term duration of REC contracts. The State’s decision to allow projects to enter into physical bilateral contracts also appears to have had favorable effects on bid prices. Program design features, such as weighing economic development benefits and allowing partial bidding, appear to have neutral effects on REC pricing. Delivery requirements for non-NYISO facilities may be limiting program participation to in-state projects, but this unclear due to the abundance of resources in New York. Some additional program components may be limiting the number and type of projects that can effectively participate in the program. Program REC prices are lower than they would likely be if the program had selection criteria that gave special allowances for projects offering unique benefits.

4.4 PRICE EFFECT ON NATURAL GAS AND ELECTRICITY

Another important element of our analysis is an examination of the effect the Main Tier Program has had on natural gas and wholesale electricity prices in New York. These are two separate issues. The next section describes natural gas suppression, followed by a description of electricity price suppression.

4.4.1 Price Effect on Natural Gas

Natural gas price suppression would be due to the reduction in natural gas demand resulting from reduced use of the fuel for electricity generation. To understand the potential suppression effect, it is important to understand the market for gas and the size of the New York market. The next section discusses gas supplies, followed by a section on gas demand. Then gas prices are discussed, followed by a review of studies of gas price suppression and an analysis of how it might affect New York.

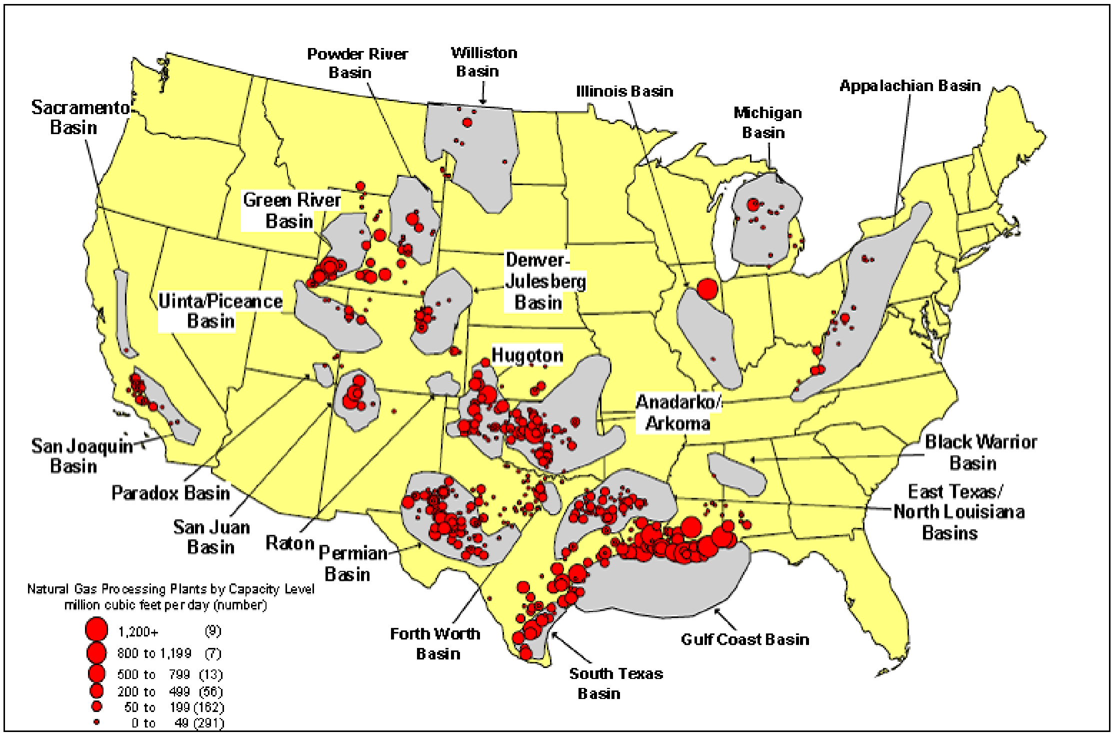
4.4.1.1 Supply of Natural Gas in New York and the U.S. Because natural gas can be transported and stored, the market for natural gas is national. Therefore, if demand drops in one area, other areas may absorb the supply. In the future, as a result of increased U.S. access to and reliance on supplies from foreign sources,[211] the U.S. natural gas market is expected to become more integrated with natural gas markets worldwide.

Although western New York produces a small amount of natural gas, the vast majority of New York's natural gas supply is imported via pipeline from other states and Canada. As shown in Figure 39, there are few natural gas processing plants in the Northeast: most of the U.S. plants are located in the Gulf and Western U.S. This situation differs from electricity generation, as most New York electricity is generated

[211] Energy Information Administration, *Annual Energy Outlook 2008 with Projections to 2030*, "Natural Gas Demand," 2008, http://www.eia.doe.gov/oiaf/aeo/gas.html.

by in-state plants. New York has moderate natural gas storage capacity, developed principally from depleted natural gas fields in the western part of the state. These storage sites are important for supplying the Northeast region, particularly during the peak demand winter season.[212]

Figure 39. Few Natural Gas Processing Plants Are Located Near New York



Note: Eight Alaska plants not displayed, but count is reflected in the legend.
Source: Energy Information Administration, Gas Transportation Information System, Natural Gas Processing Plant Database.

4.4.1.2 Demand for Natural Gas in New York and the U.S. In 2006, New York consumed 1,097,040 million cubic feet of natural gas, or 5% of total U.S. consumption (of 21,653,086 million cubic feet).[213] Of this, 388,040 million cubic feet (35%) were used to provide New York with over 42 million MWh, or 30%, of its annual electricity generation.[214] In 2010, the New York ISO projects total energy

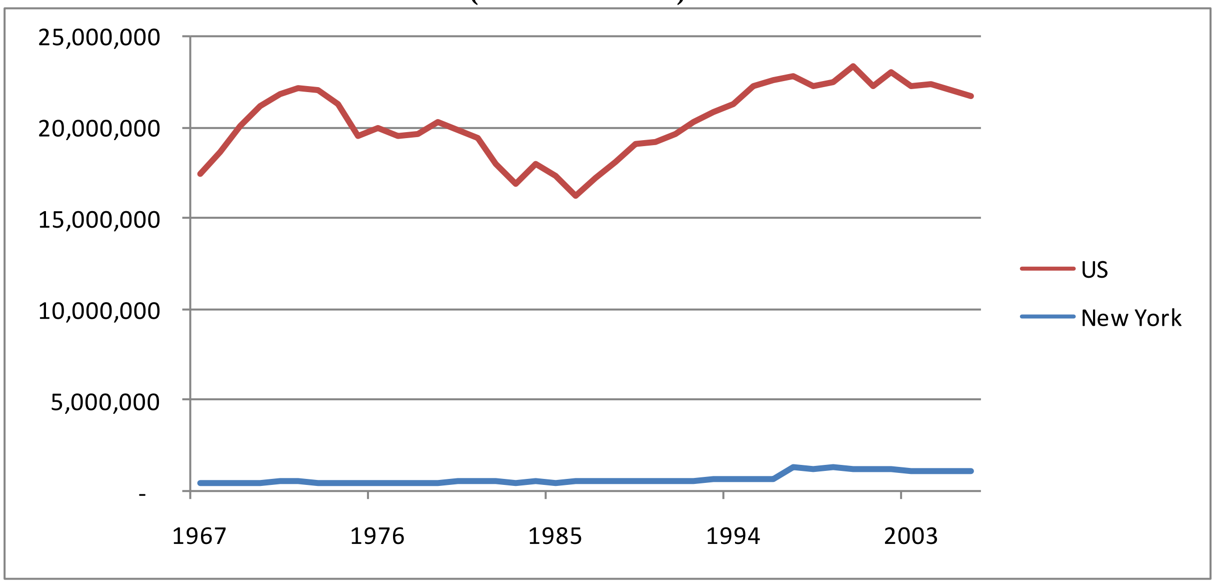
[212] Energy Information Administration, New York: State Energy Profiles Webpage, http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=NY.

[213] Energy Information Administration, Natural Gas Navigator Webpage, http://tonto.eia.doe.gov/dnav/ng/ng_sum_top.asp.

[214] Ibid.

requirements in New York will be 171 million MWh.[215] Nationwide, 6,222,100 million cubic feet (29%) of natural gas were used for power generation.[216] As shown in Figure 40 historical natural gas consumption in New York is a small portion of the U.S. market.

Figure 40. Natural Gas Consumption in New York is Modest Compared with U.S. Consumption (1967 – 2006) (Million cubic feet)



Source: Energy Information Administration, Natural Gas Navigator Webpage, http://tonto.eia.doe.gov/dnav/ng/ng_sum_top.asp.

4.4.1.3 <u>Natural Gas Prices.</u> Natural gas consumption in the electric power sector is highly responsive to price changes, because electricity producers can choose among different sources of energy on an ongoing basis. The price of natural gas varies depending on location and type of consumer (e.g., residential, commercial, industrial, or utility), and has increased significantly in recent years. In January of

[215] New York ISO, *2008 Load and Capacity Data*, "Gold Book," April 2008, http://www.nyiso.com/public/webdocs/services/planning/planning_data_reference_documents/2008_goldbook.pdf.

[216] Energy Information Administration, Natural Gas Navigator Webpage, http://tonto.eia.doe.gov/dnav/ng/ng_sum_top.asp.

1989, the wholesale price[217] of natural gas in the U.S. was $3.17 per thousand cubic feet.[218] Prices remained somewhat steady until 2000, then prices began increasing. In 2002, the price was $4.12 and increased an average of 20% per year, up to $8.11 in 2007. In January of 2008, the wholesale price was $12.12, and in June, $18.31. Current high natural gas prices are expected to stimulate the development of new gas supplies and, along with development of renewable energy, will constrain growth in natural gas consumption. Natural gas prices are expected to decline through 2016. After 2016, prices are expected to increase largely as a result of the increased cost of developing the remaining U.S. natural gas resource base.[219] In New York, wholesale prices appear to be similar to the U.S. prices. Figure 41 displays the historical gas prices in NY and the U.S. between 1989 and 2008. Figure 42 shows the historical and projected (1990 – 2030) natural gas wellhead prices in the U.S.

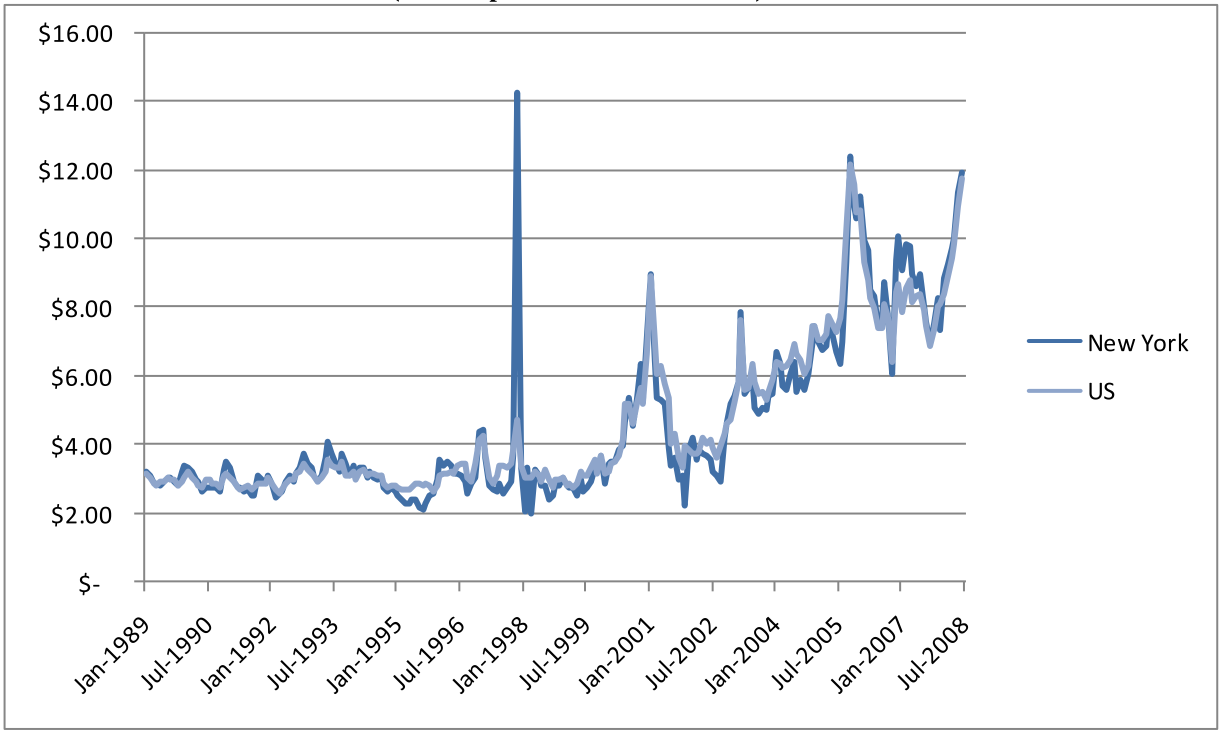
[217] Wholesale price here refers to the City Gate price – which is the price at which a distributing gas utility receives gas from a natural gas pipeline company or transmission system.

[218] Energy Information Administration, Natural Gas Navigator Webpage, http://tonto.eia.doe.gov/dnav/ng/ng_sum_top.asp.

[219] Energy Information Administration, *Annual Energy Outlook 2008 with Projections to 2030*, "Natural Gas Demand," 2008, http://www.eia.doe.gov/oiaf/aeo/gas.html.

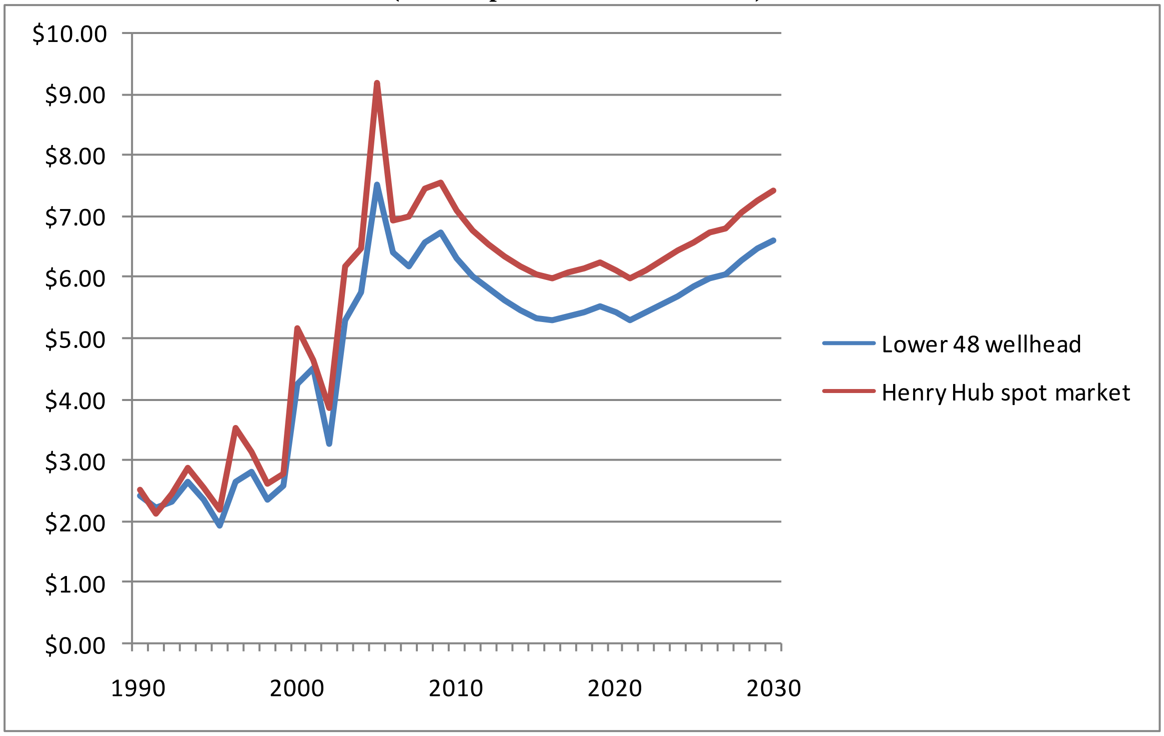
Figure 41. Historical Natural Gas Prices in New York Closely Follow U.S. Prices (Wholesale Prices 1989 – 2008)

(Dollars per thousand cubic feet)



Source: Energy Information Administration, Natural Gas Navigator Webpage, http://tonto.eia.doe.gov/dnav/ng/ng_sum_top.asp.

Figure 42. U.S. Natural Gas Prices Expected to Fall from Current Levels Before Rising (Wellhead Prices 1990 – 2030)
(Dollars per thousand cubic feet)



Source: Energy Information Administration, *Annual Energy Outlook 2008 with Projections to 2030*, "Natural Gas Demand," 2008, http://www.eia.doe.gov/oiaf/aeo/gas.html.

4.4.1.4 Impact of Increased Renewable Energy Supply on Natural Gas Prices. Several studies show the relationship between renewable energy and natural gas prices. A review conducted by the Lawrence Berkeley Lab of thirteen studies suggests that a 1% drop in gas demand nationwide would result from a 200 to 300 million MWh increase in renewable energy, and this could lead to a 0.8% to 2% reduction in long-term wellhead gas prices.[220] The studies reviewed were conducted by the following agencies:

- The Union of Concerned Scientists (UCS) (six studies)
- The Energy Information Administration (EIA) (five studies)
- The Tellus Institute (one study)

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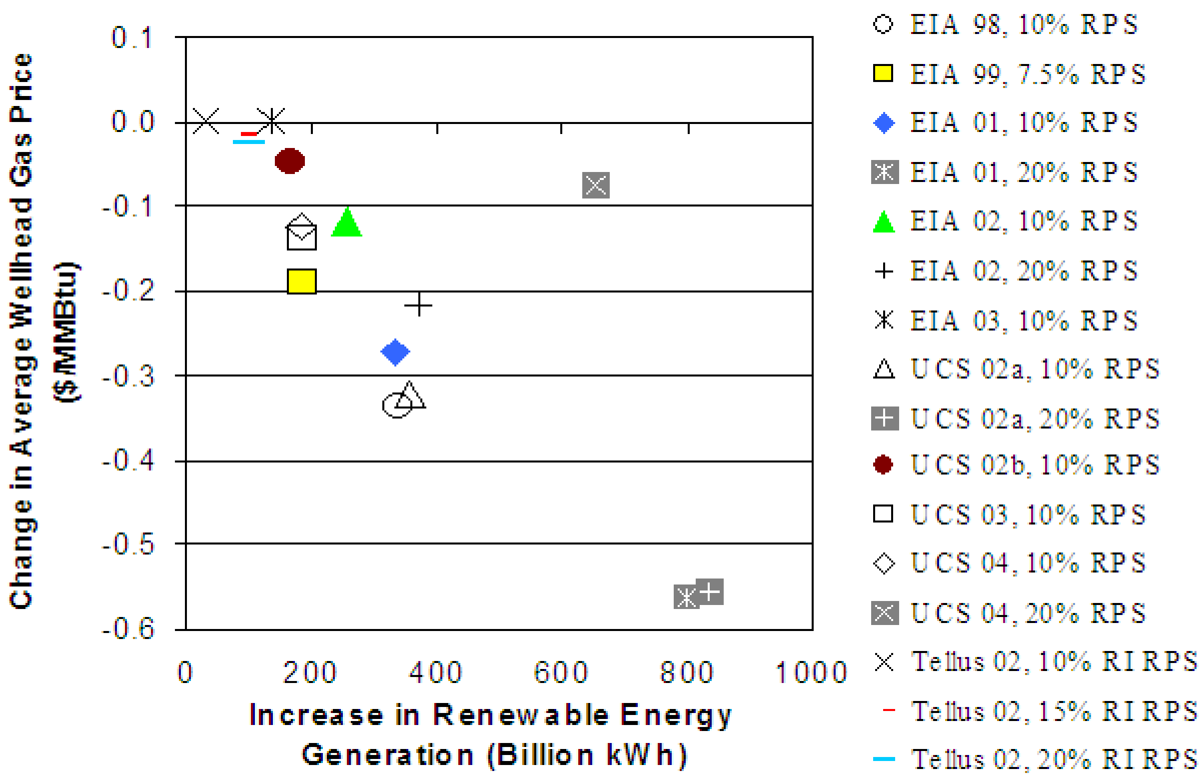
[220] G. Wiser, M. Bolinger, and M. St. Clair, *Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency*, Ernest Orlando Lawrence Berkeley National Laboratory, LBNL-56756, January 2005.

- The American Council for an Energy-Efficient Economy (ACEEE) (one study)

Several of these studies conduct multiple analyses, and all except the ACEEE study use the EIA's National Energy Modeling System (NEMS). The ACEEE study uses a model developed by Energy and Environmental Analysis, Inc. and focuses on reductions in gas prices from RE and energy efficiency (EE) in the short term. Most of the studies evaluate the impacts of large increases in RE from a projected national RPS. Some studies evaluate state RPS policies and some also include EE. All of the studies consistently conclude that RE will reduce natural gas demand, putting downward pressure on gas prices (see Figure 43).

Figure 43. Forecasted Natural Gas Wellhead Price Reduction in 2020



Source: G. Wiser, M. Bolinger, and M. St. Clair, Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency, Ernest Orlando Lawrence Berkeley National Laboratory, LBNL-56756, January 2005.

The first three NYSERDA procurements will provide 2,710,894 MWh of RE by 2010. Recent studies found that renewable energy displaces natural gas generation at a rate between 34% and 78% (each MWh of renewable energy is assumed to displace 0.34 to 0.78 MWh of natural gas generation), with more recent analyses showing lower levels of gas (and higher levels of coal) displacement, reflecting the increase in gas prices.[221] To explore the relative impacts of the most favorable scenario for natural gas suppression, we applied the 78% displacement rate, which would result in a reduction of 2,114,497 MWh in demand for natural gas for electricity generation due to the increase in renewable energy. This reduction in natural gas demand will have a negligible impact on gas prices. As previously stated, a 200 million MWh increase in renewable energy could reduce gas prices by 0.8% - 2%. Therefore, assuming a linear relationship exists between renewable energy production and gas prices, an increase of 2.7 million MWh could have an impact of 0.01% - 0.03%. This modest impact reflects the large geographic market for natural gas, attributable to natural gas's ability to be stored and transported. Only very large increases in supply from renewable energy would have detectable impacts on gas prices. Localized impacts may be experienced where gas prices are highly sensitive to demand in certain transportation-constrained regions.[222] For example, in New York City, natural gas demand at times exceeds available pipeline capacity, allowing prices to rise to reflect scarcity;[223] therefore, in this region, investments in renewable energy would possibly have larger impacts on local gas prices.

In summary, the natural gas price suppression due to renewable energy procured in the first three procurements is likely to be modest.

4.4.2 Electricity Price Suppression

The introduction of an RPS may result in reductions in wholesale electricity prices due to the market effects of increased electric energy supply resources. Any reductions would offset the premiums paid by New York's ratepayers for renewables through the RPS surcharge. To understand why prices would be reduced, it is helpful to understand how the market works. The next section gives an overview of the New York power markets. This is followed by an overview of the analysis done for the RPS Evaluation Report based

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[221] G. Wiser, M. Bolinger, and M. St. Clair, *Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency*, Ernest Orlando Lawrence Berkeley National Laboratory, LBNL-56756, January 2005.

[222] Ibid.

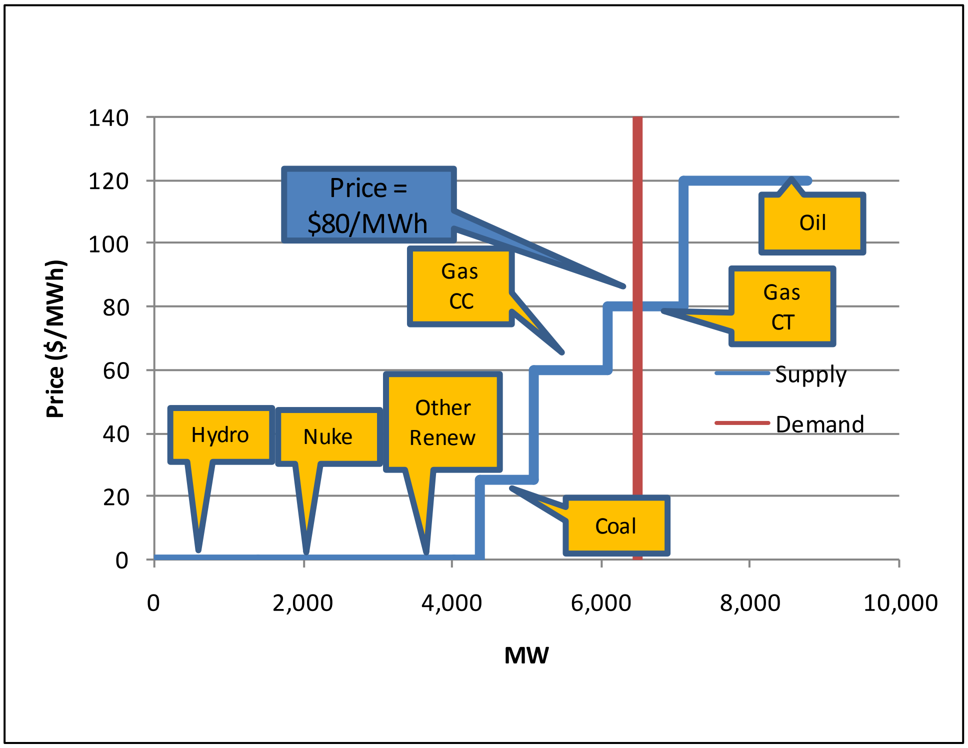
[223] B. Henning, M. Sloan, and M. de Leon, *Natural Gas and Energy Price Volatility* (prepared for Oak Ridge National Laboratory), Arlington, Virginia: Energy and Environmental Analysis, Inc., October 2003.

on three rounds of procurements, and a discussion of analyses previously completed that forecasted price suppression in New York.

4.4.2.1 <u>Overview of the NY Power Market.</u> The New York power market has been operated by the New York Independent System Operator (NYISO) since 1999. The NYISO operates real-time energy, day-ahead energy, ancillary services, and installed capacity markets. It also conducts congestion management. Typically more than 90% of energy transactions processed by NYISO occur in the day-ahead market.[224] NYISO will schedule the generating units that can most economically satisfy the energy needed to supply customers' demand and allow a sufficient reserve for contingencies. The New York marginal cost of energy is the base price that NYISO must pay to obtain the needed energy. Generators bid into the market, and the highest priced resource needed, or marginal resource, sets the price for all sellers. Figure 44 illustrates how the marginal price is set. The figure shows a stair-step of increasing supply costs. The first 5,000 MW consist of hydro, other renewables, and nuclear resources, which have essentially zero marginal energy cost. The next steps indicate increasingly more expensive resources: coal, gas combined cycle, gas combustion turbine, and oil. The demand at a given time is illustrated by a vertical line, reflecting the relatively inelastic nature of electricity demand in the short term.

[224] New York ISO. http://www.nyiso.com/public/products/energy_market/index.jsp. Downloaded July 31, 2008.

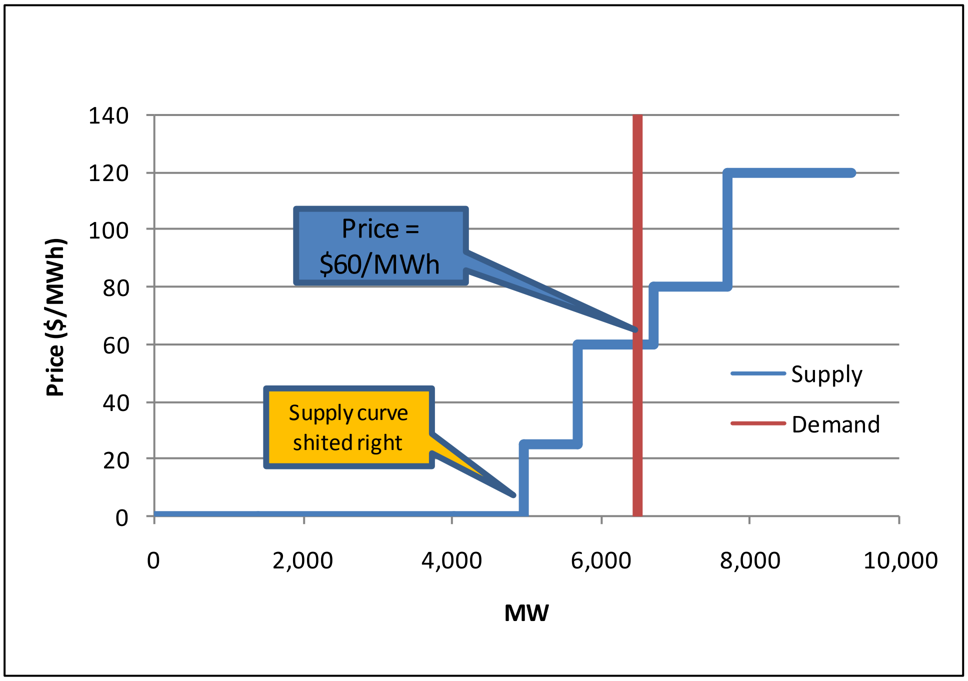
Figure 44. Example Supply and Demand Curve



Source: Summit Blue Consulting.

The addition of renewable generation, which would likely submit a low or zero bid, to the generation supply stack has the effect of pushing more expensive resources, such as oil-fired peaking plants with high heat rates, beyond the demand requirements at certain times. This means that less expensive resources (e.g., more efficient oil-fired units, or gas-fired units) would then set the marginal price, which lowers prices at that time. This is shown in Figure 45.

Figure 45. Price with 600MW Wind Added



Source: Summit Blue Consulting

4.4.2.2 <u>An Analysis of the First Three Procurements</u>. A model was developed to analyze the market price impacts of renewable energy resources that NYSERDA procured in the first three procurements. This model employed a statistical approach that considered the relationship between key drivers of electricity price. This approach is somewhat simplified in certain respects. It does not consider the effects in the capacity markets, nor does it consider effects of changing supply mix. However, we believe it is useful to provide insights into the effect, the direction and rough scale of the impacts.

The modeling was done in two stages:

1. A historical regression analysis of the years 2005, 2006 and 2007 to establish the relationship between electric market price and its drivers, such as load and natural gas prices; and
2. A forecast of market prices derived from the results of the regression analysis done in step 1 and forecasts of the values for all of the drivers in the year 2010.

The cost-effectiveness of renewable resources will depend, in part, on the (commodity) market value of their electrical output. Under the New York wholesale market design, commodity market revenues depend on the Locational Based Marginal Price (LBMP), which is specific to each of the eleven NYISO zones. The LBMP was the price value (i.e., dependent variable) used in the analysis.

The drivers (i.e., independent variables) that were considered were the ones most likely to be significant:

- Natural gas price (supplied to electric generators) – affects the price of generation most at peak times;
- Load – most likely to be correlated with price;
- Reserve margin – the smaller the reserve margin, the more likely that prices will be higher due to demand/supply economics; and
- Renewable energy generation – has the effect of reducing load.

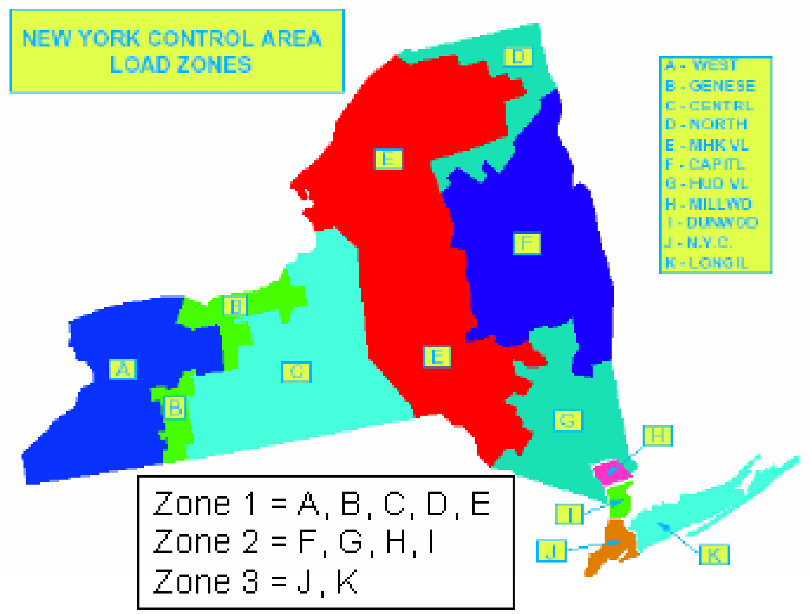
As was done in the 2008 cost study, the 11 NYISO zones were aggregated into three "Mega-zones" that capture the vast majority of market price differentials across the state based on an analysis of zonal market prices.[225] Within each mega-zone, prices have tended to be similar, and transmission constraints are minimal relative to the constraints between mega-zones, as can be seen in Figure 46.

The three mega-zones are defined as:

- Zone 1 = NYISO zones A, B, C, D and E
- Zone 2 = NYISO zones F, G, H and I
- Zone 3 = NYISO zones J and K.

[225] NYSERDA. 2008. *New York Renewable Portfolio Standard Cost Study Update Main Tier Target and Resources.*

Figure 46. NYISO Load Zones Map



Source: NYSERDA. 2008. New York Renewable Portfolio Standard Cost Study Update: Main Tier Target and Resources. Details of the analysis are presented in Appendix A.

4.4.2.3 <u>Results Show Significant Suppression</u>. The analysis used two approaches: a single zone and a multizone. The single zone assumed each megazone region was isolated – this approach tended to overstate impact in Zone 1, where most of the renewables were sited, and understate impacts in Zone 3, where none were sited, as shown in Table 14. The multizone analysis assumed that renewable additions in all zones were interconnected – this approach probably overstates the impacts in Zone 3 and understate impacts in Zone 1, as seen in Table 15. The results show that both model approaches appear to forecast consistent price suppression effects of approximately $100/MWh for each MWh of renewable energy produced.

Renewable generation in 2010 is predicted to be 5.62% of load in Zone 1 and 0.11% of load in Zone 2. Total load in the three Zones represents 34%, 19%, and 47% of total NYISO load, respectively. Total renewable generation in 2010 is projected to be 3,244 GWh.

Table 14. Price Suppression in 2010 from First Three Procurements – Single-Zone Model

Single-Zone Model							
	Total Electricity Sales - no RE ($M)	Total Load - no RE (GWh/year)	Reduction in Total Price of Electricity Sales ($M)	Reduction in Total Price of Electricity Sales as %	$ Saved/MWh of Total RE Added	$ Saved/MWh of Total Load in Zone	% of Total Load as RE
Zone 1	$4,471	57,164	$347.5	7.77%	$108.20	$6.08	5.62%
Zone 2	$3,403	31,581	$3.8	0.11%	$117.43	$0.00	0.11%
Zone 3	$8,608	79,690	$0.0	0.00%	NA	NA	0.00%
All Zones	$16,483	168,435	$347.5	2.11%	$107.13	$2.06	1.93%

Source: Summit Blue Consulting.

The single-zone model shows that Zones 1 and 2 will benefit from price suppression, with the amount of suppression proportional to the amount of renewable generation in the zone. Zone 1 shows a 7.7% reduction in total price of electricity sales, and Zone 2 shows a 0.11% reduction. Total electric price savings are $107/MWh for each MWh of renewable energy generated through the first three procurements.

Table 15. Price Suppression in 2010 from First Three Procurements – Multi-Zone Model

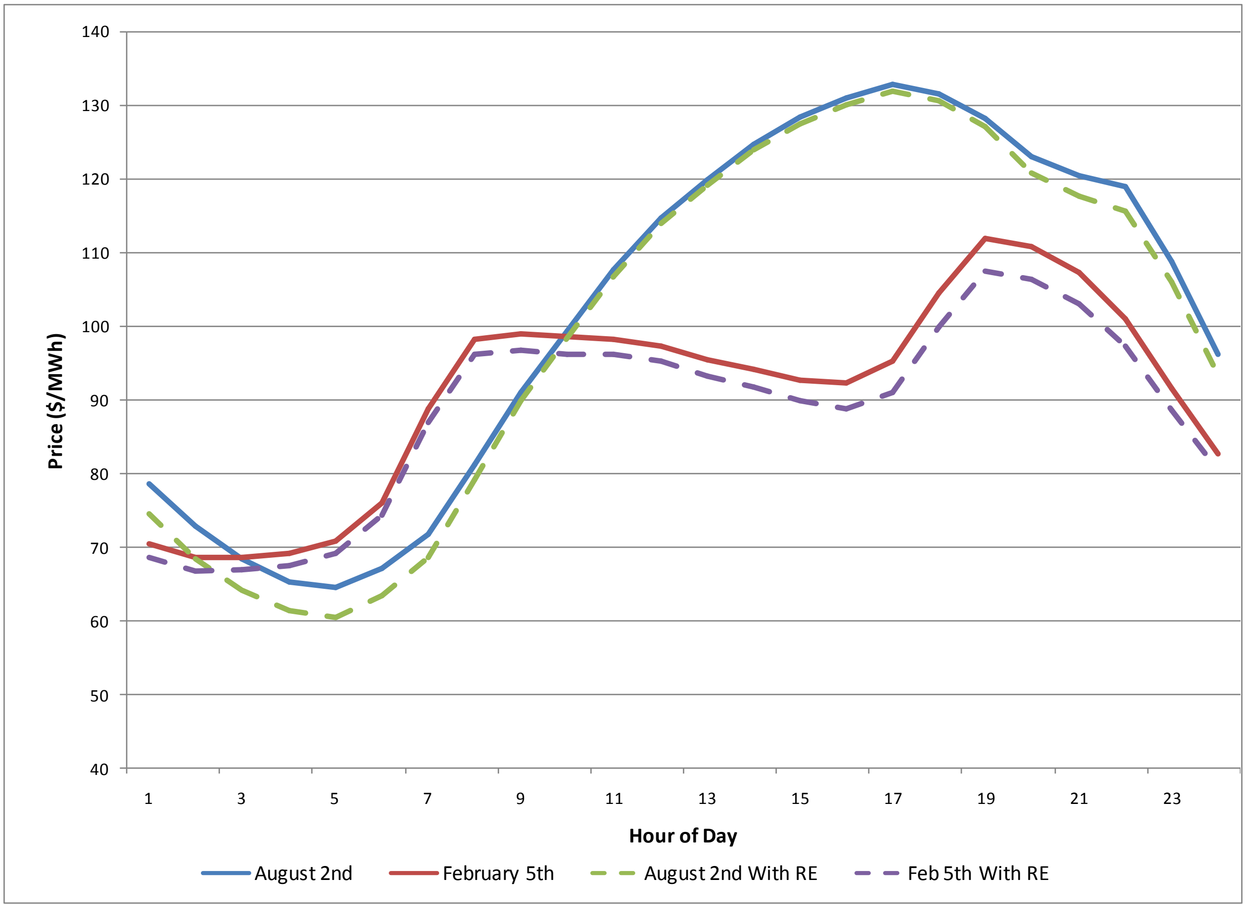
Multi-Zone Model							
	Total Electricity Sales - no RE ($M)	Total Load - no RE (GWh/year)	Reduction in Total Price of Electricity Sales ($M)	Reduction in Total Price of Electricity Sales as %	$ Saved/MWh of Total RE Added	$ Saved/MWh of Total Load in Zone	% of Total Load as RE
Zone 1	$4,190	57,164	$111.7	2.67%	NA	$1.95	5.62%
Zone 2	$3,486	31,581	$78.6	2.26%	NA	$2.49	0.11%
Zone 3	$8,576	79,690	$133.3	1.55%	NA	$1.67	0.00%
All Zones	$16,252	168,435	$323.6	2.16%	$99.77	$1.92	1.93%

Source: Summit Blue Consulting.

The multi-zone model shows price suppression in all three Zones due to the interactive effect between zones. The amount of suppression is somewhat correlated with the amount of renewables in each Zone, with Zone 1 realizing the highest percentage reduction in total electric price. The savings on the basis of percentage of load in the Zone are highest in Zone 2. Total savings are $100/ MWh for each MWh of renewable energy generated through the first three procurements in the multi-zone model.

The price suppression on the peak days in 2010 are shown in Figure 47 below, with the dashed lines showing suppressed prices. The suppression on the peak summer day is less than on the peak winter day, possibly due to greater wind generation at that time compared to the summer peak day.

Figure 47. Price Suppression on Peak Days in 2010



Source: Summit Blue Consulting. More detailed results are presented in Appendix A.

4.4.2.4 <u>Previously Completed Studies on Electricity Price Suppression in New York</u>. The New York Department of Public Service (DPS) 2004 cost study projected that the RPS would result in significant electricity wholesale price reduction.[226] The study used the MAPS production simulation model, which is a detailed program that models the cost performance of each power plant in the New York ISO on an hourly or intra-hourly basis. The study found that the addition of renewable resources, most of which are price takers and have zero fuel cost, would tend to suppress energy market clearing prices. The study considered intermittency of the renewable resources and the change in the mix of resources needed to maintain reliability, such as a greater proportion of combustion turbines. The results of the analysis are summarized in Table 16. The reductions of $4 to $8 per renewable MWh will partially offset the REC prices paid by NYSERDA. As can be seen the table, the reduction in state-wide price would be significantly less – less than $1/MWh.[227]

Table 16. 2004 DPS Cost Study (Forecasted or) Projected Power Price Reductions

Year	Reductions (2003$, millions)	Reductions (nominal $, millions)	Increment Target (GWh)	Reductions ($/Renewable MWh)	New York State Load (GWh)	Price Reduction ($/MWh)
2006	$4.93	$5.40	1,203	4.10	162,237	0.03
2009	$9.45	$11.17	5,655	1.67	167,993	0.07
2013	$90.70	$118.29	11,794	7.69	176,081	0.67

Source: NYDPS *2004 Cost Study,* inflation adjustment from U.S. Bureau of Economic Analysis and U.S. Treasury yields, actual historical State load for 2003-2006, forecast before adjustments from Case 07-M-0548, Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard

In 2008, the DPS conducted another study of electricity price suppression from future renewables added after 2009, after the second procurement. As such, it did not consider any price suppression from the first two procurements, which resulted in projects installed in 2009 or earlier. It considered three load scenarios with two RPS goals: a 25% RPS based on an updated load forecast, a 25% RPS adjusted by an energy-efficiency performance standard (EEPS) of 15% by 2015, and a 30% RPS adjusted by an EEPS. As with the 2004 study, this study used the MAPS model.

The 2008 study also considered the impact of renewables on installed capacity (ICAP) market prices. The ICAP market is based on the obligation placed on load serving entities (LSEs) to procure ICAP to meet minimum requirements. The requirements are determined by each LSE by forecasting the contribution to

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[226] New York State Public Service Commission. 2004. *New York Renewable Portfolio Standard Cost Study Report II.* Volume A.

[227] The reduction per renewable MWh represents the total reduction divided by the number of renewable MWh added. The reduction in state-wide price represents the total reduction divided by the total state load.

its transmission district peak load, plus an additional amount to cover the installed reserve margin. Because renewable generators can recover costs in the REC market from NYSERDA, it is unlikely that they will be price setters in the ICAP market. As with the energy market, the addition of price-taking capacity is likely to depress prices until equilibrium in the market-place is reached, which the DPS expects to be 2015 in a 25% RPS case and after 2020 in an EEPS case (the EEPS defers capacity additions).

The 2008 study found significantly higher impacts than the 2004 study, as can be seen in Table 17. The price reductions per renewable MWh are above $30 in all cases through 2013, as can be seen in Figure 48. These higher results are primarily due to the substantially increased costs of natural gas, oil, and construction costs that have taken place since the 2004 study, which have increased the marginal costs likely to be suppressed. For example, as of 2004, the projected price of natural gas for electric generation in 2009 was $5.06/MMBtu, while, as of 2008, the projected price had risen to $8.21/MMBtu.[228] Assuming natural gas fired units set the price most of the time with an average heat rate of 8.0 MMBtu/MWh,[229] this price difference would translate to a $25/MWh electricity price increase which explains most, if not all, of the difference in price suppression seen between the 2004 and 2008 study.

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[228] Energy Information Administration. 2004 and 2008. *Annual Energy Outlook.* Historical inflation from Bureau of Economic Analysis, projected inflation assumed to be 2.5%.

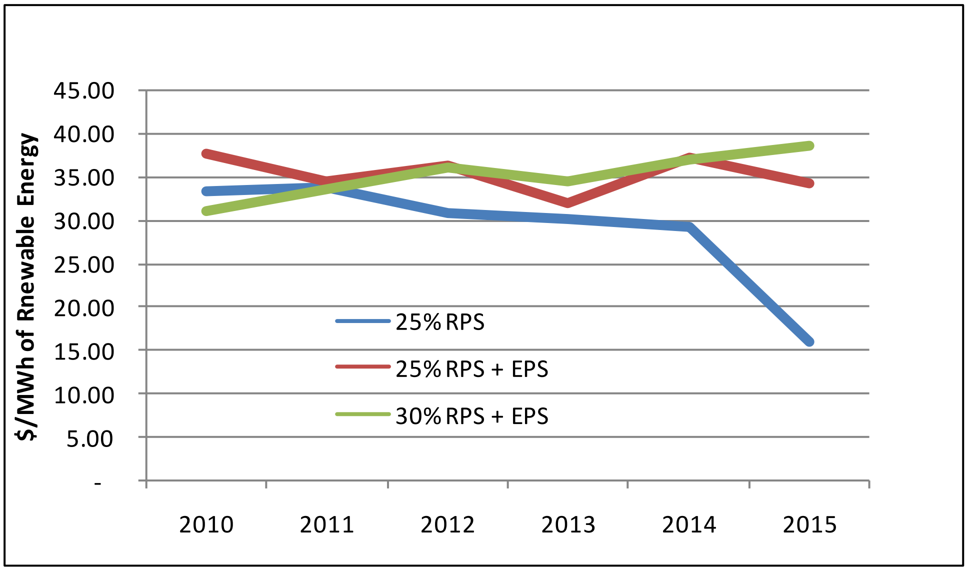
[229] A combined cycle plant has a heat rate of approximately 7.0, and combustion turbine has a heat rate of approximately 10.0.

Table 17. The 2008 DPS Price Suppression Study Found Significant Suppression Likely

Year	Energy Price Reductions (millions)	ICAP Price Reductions (millions)	Total Price Reductions (millions)	Incremental Energy (GWh)	Reduction ($/Renew-able MWh)	New York State Load (GWh)	Price Reduction ($/MWh)
	25% RPS						
2010	$46.40	$8.68	$55.08	1,650	33.39	169,730	0.32
2011	$92.80	$19.57	$112.37	3,320	33.85	171,889	0.65
2012	$121.80	$32.13	$153.93	4,999	30.79	174,043	0.88
2013	$158.05	$44.73	$202.78	6,747	30.06	176,081	1.15
2014	$172.55	$25.39	$197.94	6,747	29.34	178,191	1.11
2015	$107.30	$0.00	$107.30	6,747	15.90	180,365	0.59
	25% RPS + EPS						
2010	$31.90	$6.40	$38.30	1,015	37.73	169,730	0.23
2011	$55.10	$13.51	$68.61	1,988	34.50	171,889	0.40
2012	$55.10	$17.11	$72.21	1,988	36.31	174,043	0.41
2013	$46.40	$17.27	$63.67	1,988	32.02	176,081	0.36
2014	$56.55	$17.43	$73.98	1,988	37.21	178,191	0.42
2015	$50.75	$17.52	$68.27	1,988	34.33	180,365	0.38
	30% RPS + EPS						
2010	$40.60	$8.47	$49.07	1,576	31.13	169,730	0.29
2011	$91.35	$19.21	$110.56	3,285	33.66	171,889	0.64
2012	$143.55	$30.91	$174.46	4,834	36.09	174,043	1.00
2013	$176.90	$42.43	$219.33	6,372	34.42	176,081	1.25
2014	$218.95	$53.88	$272.83	7,356	37.09	178,191	1.53
2015	$261.00	$59.53	$320.53	8,309	38.58	180,365	1.78

Source: NY DPS 2008 Price Suppression Study, actual historical State load for 2003-2006, forecast before adjustments from Case 07-M-0548, Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard

Figure 48. Price Suppression Results per MWh are Largely Similar Across Scenarios



Source: NY DPS 2008 Price Suppression Study. Note that the suppression value reflects the $ reduction per renewable MWh added, not the $/MWh of reduction in electricity price.

4.4.2.5 <u>Comparison with the DPS 2008 Study.</u> The DPS 2008 study[230] showed projected savings of $33.39 per renewable MWh in 2010, less than projected here. The DPS study differed from this study in several ways:

- The DPS considered the price suppression impacts due to the third RPS procurement and later additions, and did not consider the first two procurements, while the study presented by Summit Blue covered the first three procurements.
- The DPS forecast energy market impacts were based on production cost simulations using the GE-MAPS model, whereas this study was based on a more simple regression analysis and did not include many of the detailed analyses that a production cost model does.
- The DPS study included ICAP benefits that represented 16% of the savings, whereas this study did not include ICAP benefits.

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[230] New York State Public Service Commission. 2008. *Forecast Renewable Portfolio Standard Price Suppression Impact.*

- The DPS model considered projected natural gas, oil, coal, and nuclear prices, whereas this study only considered natural gas prices as a fuel variable.

There are several caveats and possible explanations that need to be considered when examining these results:

- One would expect the price suppression impacts from this study to be higher than the DPS study partly due to the fact that this study includes all of the first three procurements, and the DPS study did not consider the first two procurements. Including a greater amount of renewable generation would result in moving the total load further down the supply curve, thus reducing the price by a greater amount. As the supply curve is a stair-step curve and not smooth, moving down the curve enough to move down one of its "steps" could result in a large reduction in price.
- It is likely that price suppression is not directly proportional to the amount of renewables. In other words, as more renewables are added, the suppression effect per MWh of renewables added would go down, although the total suppression effect would increase.
- A more detailed hourly simulation would provide more details on which hours show the most price suppression, the effects of renewables on the resource mix, the influence of pricing between zones, and the impacts of other factors that affect price in addition to the renewable energy.
- This study did not consider changes in the resource mix due to the addition of renewables – the intermittency of renewable resources and the change in the mix of resources needed to maintain reliability, such as a greater proportion of combustion turbines. This would most likely reduce the price suppression effect.

4.4.2.6 Summary. The likely impact of the first three procurements on natural gas and electricity prices was examined. The analyses considered how the reduction in demand for these products due to the RPS program would affect prices.

The analysis indicates that the effect on natural gas prices seen in New York is likely to be modest. This is primarily because the large geographic market for natural gas, relative to the impacts of the program, attributable to natural gas's ability to be stored and transported.

The effects on electricity prices in New York are likely to be more significant, due to the more local nature of the electricity generation. Summit Blue's analysis estimates that the reduction in wholesale electricity prices in the year 2010 are likely to be approximately \$2/MWh. Each MWh of renewable energy added has the effect of lowering electricity costs by approximately \$100/MWh, significantly more than the \$15 or more paid per MWh for the REC. This value is higher than was estimated by the DPS's study of incremental impacts after the second procurement. We would expect it to be higher because the first two procurements will avoid the highest cost resources on the supply curve.

While all three price suppression studies varied considerably in scope, approach and when they were done, all three exemplify trends toward significant price suppression effects due to the RPS.

Section 5

CUSTOMER SITED TIER RPS PROGRAM- RENEWABLE DISTRIBUTED GENERATION MARKET CONDITIONS

This section includes summaries of market prices for technologies receiving CST incentives, as well as a comparison of New York's incentives with those offered by other key states. The role the CST programs are playing in improving the affordability of the technologies they support is also addressed, along with current market conditions for technologies supported by the CST programs.

The CST was a secondary focus of the overall RPS market conditions assessment. As a result, limited primary data were collected. Two installers representing each of the technologies were interviewed, with the exception of fuel cells, for which only one company was interviewed. Responses from these interviews, together with input from NYSERDA program staff, and additional research informed this limited assessment for the CST programs. Data limitations for this assessment make it challenging to provide broad findings, however, the data do help illuminate some key issues related to the markets for small-scale renewable technologies in New York.

5.1 COMPARISON OF TECHNOLOGY COSTS AND INCENTIVES OFFERED ACROSS MARKETS

This section compares installed costs and incentives paid in other leading states and by other New York renewable energy incentive programs for customer-sited renewables.

5.1.1 Installed Costs

Summit Blue researched the market-based prices (i.e., installed cost/watt with no incentives) for PV, small wind, fuel cells, and anaerobic digester gas (ADG) systems for the comparison states: Massachusetts, Pennsylvania, New Jersey, Wisconsin, California, and New York. Data sources for this analysis included program data, where available, and secondary sources. Few state-specific data were available for wind, fuel cell, and ADG systems. Also, little state-specific data were available for Massachusetts and Pennsylvania.

As shown in Table 18, market-based prices for PV ranged from \$6.50/W (LIPA) to \$10/W (New York City, small residential systems in New Jersey, and some systems in Wisconsin). Both ends of this spectrum were represented within New York. Wind prices ranged from \$3/W to \$5/W, and insufficient data were available for comparing prices for fuel cells and ADG systems across markets.

In general, market-based prices tend to vary more by the installed capacity of the system than by the location. One might expect to find lower market prices in states like New Jersey and California where incentive program and net metering rules have supported substantial customer-sited renewable energy development for a number of years.

Table 18. Market Based Prices for Customer-Sited Renewable Energy Systems

<table>
<tr><th>State</th><th>PV</th><th>Wind</th><th>Fuel Cells</th><th>ADG</th></tr>
<tr><td>NY[1]</td><td>NYC = $10/W
NY State = $8.50/W
LIPA = $6.50/W</td><td rowspan="4">$3/W - $5/W[5]</td><td>Sufficient data not available</td><td>$4-5/W</td></tr>
<tr><td>NJ[2]</td><td>Residential (≤10 kW) = $10/W
Residential (>10 kW) = $8/W
Commercial (≤20 kW) = $10/W
Commercial (21-100 kW) = $9/W
Commercial (>100 kW) = $7/W</td><td>Sufficient data not available</td><td>Sufficient data not available</td></tr>
<tr><td>WI[3]</td><td>$8-10/W (utility intertied without batteries)</td><td>Sufficient data not available</td><td>Sufficient data not available</td></tr>
<tr><td>CA[4]</td><td>Systems < 10 kW = $8.50/W
Systems ≥ 10 kW = $7.50/W</td><td>$8/W</td><td>Sufficient data not available</td></tr>
</table>

[1] Photovoltaics: Rickerson, W., L. Ettenson, T. Marotta, T.Case, "Solar and the city," renewable energy focus, September/October 2007. NYSERDA Power Naturally website. Available at http://www.clean-power.com/PowerNaturally/Default.aspx.
[2] Photovoltaics: ranges of averages shown. Installed costs vary based on system size and sector (e.g., residential vs. commercial). Summary of about 1,000 projects from the CORE program in 2007 and 2008. Data available at http://www.njcleanenergy.com/renewable-energy.
[3] Photovoltaics: Wisconsin K-12 Energy Education Program. Available at http://www.uwsp.edu/CNR/wcee/keep/Renewable_Energy_Education/.
[4] Photovoltaics: Installed costs vary based on system size and sector (e.g., residential vs. commercial). Summary of about 13,000 projects from the CSI program in 2007 and 2008. Data available at https://ccse.powerclerk.com/default.aspx?P=11; Fuel Cells: Average of 34 projects in the SGIP Program completed or in process projects in 2007 and 2008. Data available at the California Center for Sustainable Energy website, http://www.sdenergy.org/ContentPage.asp?ContentID=279&SectionID=276&SectionTarget=35.
[5] These values vary based on the size of the turbine and the manufacturing company. Information for the wind turbine costs is from Bergey Windpower (www.bergey.com), ARE Wind Turbines (www.abundantre.com), conversations with Entegrity Wind Systems, Inc. Summer 2007 values, and Lorax Energy Systems, LLC, presentation by Henry DuPont, 2004. The data are for wind turbines with installed capacities of 10kW, 50kW and 100kW. These costs include the cost of the turbine and tower, but not the cost of the installation. From our research, costs were not differentiated by location, and the assumption is that installation costs are similar across all four states. Similar costs are cited by AWEA for small wind systems (www.awea.org).

5.1.2 Incentives

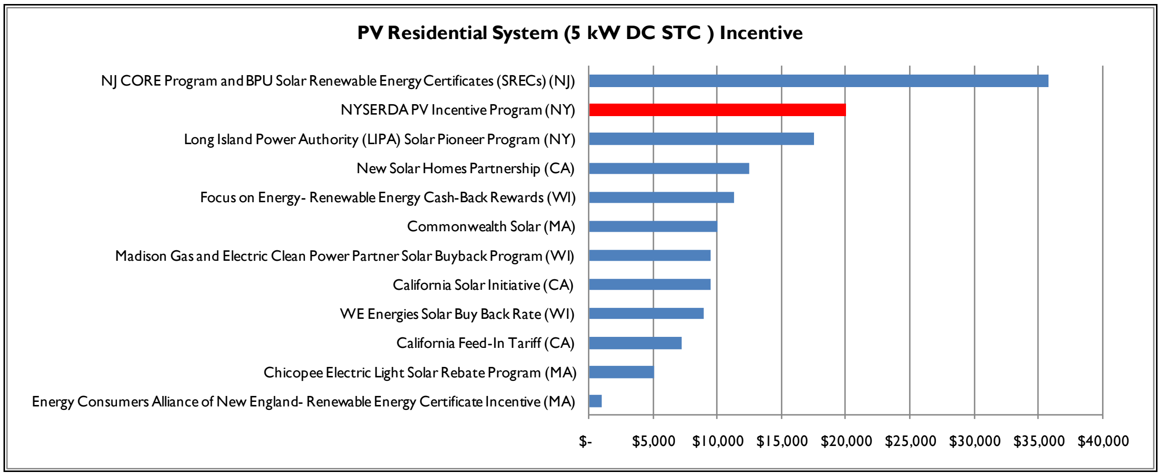
Summit Blue completed a comparison of incentives offered by other states with leading customer-sited renewable energy programs for PV, small wind, fuel cell, and ADG technologies. Comparison states included Massachusetts, Pennsylvania, New Jersey, Wisconsin, and California. LIPA's programs were also included in the comparison.

For each technology, one or more representative system sizes were selected in order to facilitate an accurate comparison across states. This was necessary, since most states offer different incentives for different system size ranges, and some states offer a combination of upfront and production-based incentives. In general, the representative system sizes selected reflect the average system sizes of applicants to NYSERDA's CST program.

Findings are presented below in a series of figures that are organized by technology. In each figure, NYSERDA's programs are represented with a red bar. Note that the scales for the charts are different. Supporting notes on the representative systems analysis shown in the figures below are available in Appendix G. Supporting information on each program including the incentive levels and notes about the programs, along with tables, are available in Appendix H.

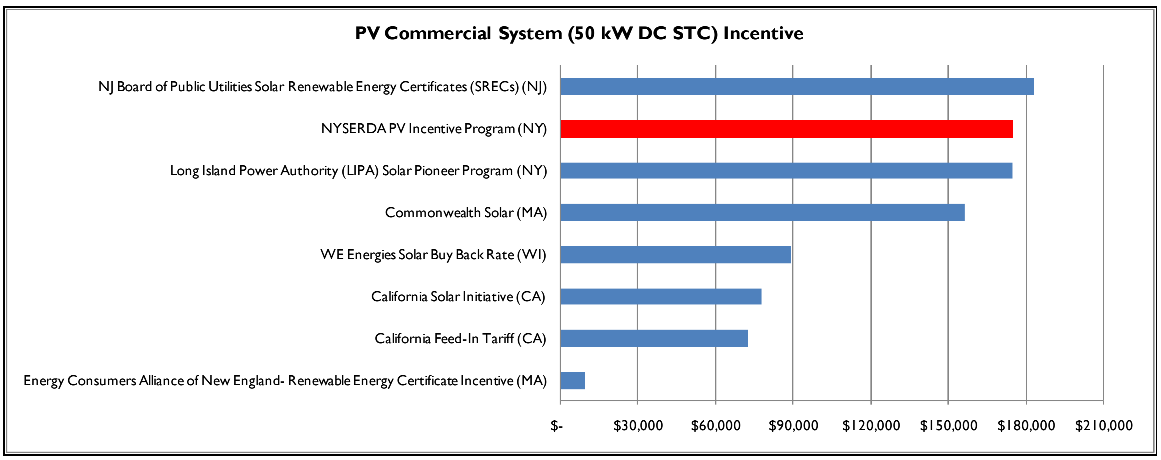
For the PV incentives comparison, a representative residential system size of 5 kW and a representative commercial system of 50 kW were selected, as shown in Figure 49 and Figure 50. For the residential system, NYSERDA's program is at the top of the list in terms of the value of its incentive package ($20,000). For the commercial system, NYSERDA gives the same incentive as the LIPA Solar Pioneer Program with $175,000 in incentives for a 50 kW system.

Figure 49. Incentive amounts for PV programs for a representative residential PV system[231]



Source: Refer to Appendix H[232]

Figure 50. Incentive amounts for PV programs for a representative commercial PV system[233]



Source: Refer to Appendix H

231 Summit Blue Consulting assumed the representative residential PV system to be 5 kW based on NYSERDA CST Data file, "PV Evaluation_Data_kW and Installers_6-11-08."

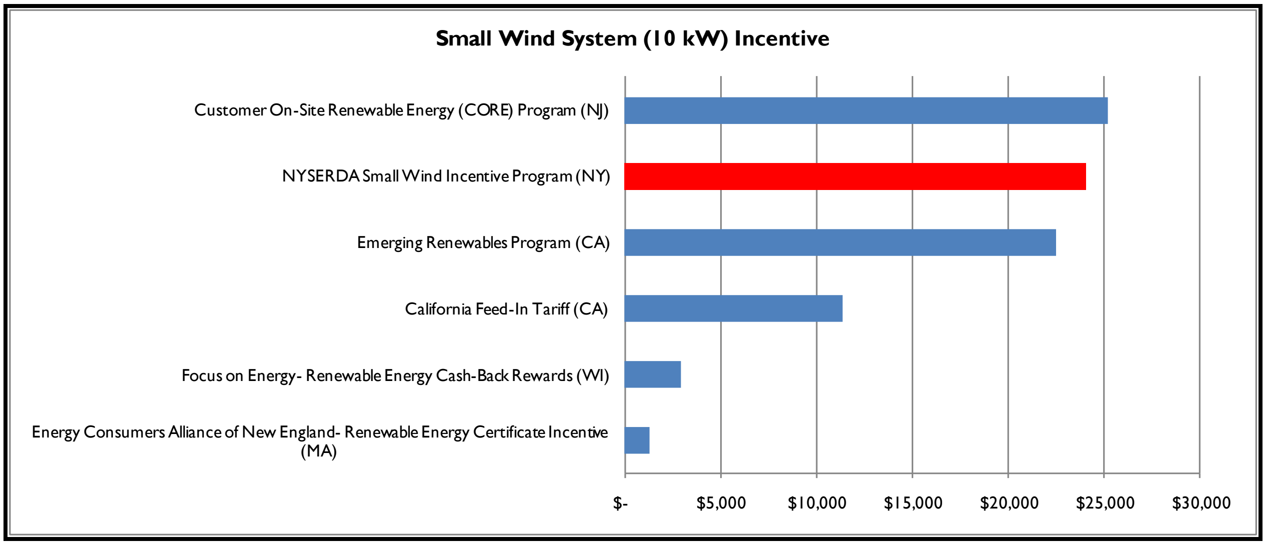
232 NJ technically offers rebates for <10 kW systems, but they have an over-subscribed budget and a long queue (2007 applicants still waiting for funds).

233 Summit Blue Consulting assumed the representative commercial PV system to be 50 kW based on average sizes from the NJ Customer On-Site Renewable Energy program, the California Solar Initiative, and by taking into account the maximum NYSERDA funded capacity of 50 kW.

NYSERDA also offers competitive incentives for small wind systems compared to other leading states. Figure 51 shows the incentive amounts for a representative 10 kW system. New Jersey offers the highest level of incentive for this system size.

With comparatively high incentive levels and oversubscription for PV, NYSERDA should consider lowering incentives to better leverage funds.

Figure 51. Incentive amounts for small wind programs for a representative small wind system[234]

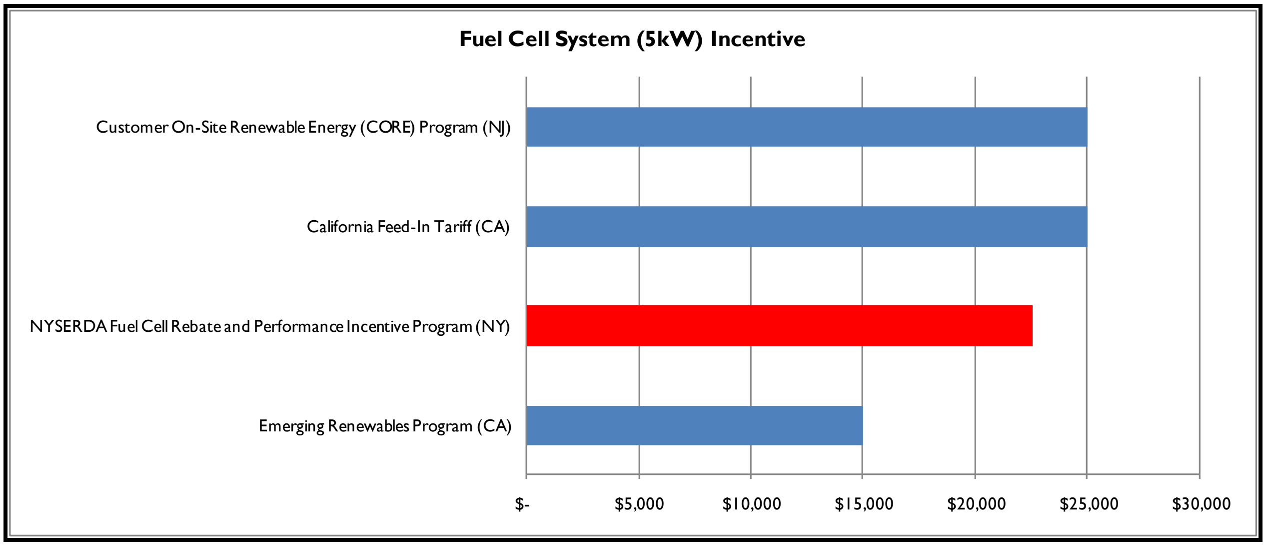


Source: Refer to Appendix H

Fuel cell programs are offered less widely across the comparison states; four fuel cell incentive programs were identified. The results of the review are shown in Figure 52. New Jersey and California both ranked ahead of New York in terms of the value of their incentives for fuel cells sized at 5 kW.

[234] Summit Blue Consulting assumed the representative small wind system to be 10 kW based on an average size from the NYSERDA RPS CST program data.

Figure 52. Incentive amounts for fuel cell programs for a representative fuel cell system[235]

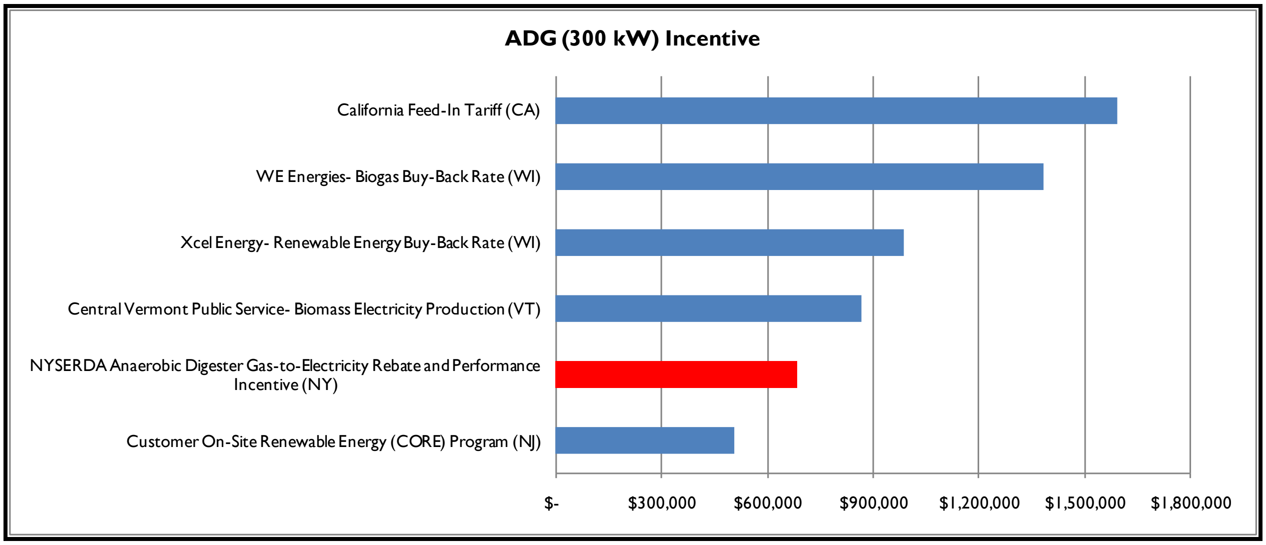


Source: Refer to Appendix H

The analysis shows that ADG programs in California, Wisconsin, and Vermont are strong and are providing large incentives to eligible customers. For the representative system in Figure 53, NYSERDA's program provides lower incentives than most other leading states.

[235] Summit Blue Consulting assumed the representative fuel cell system to be 5 kW based on interviews with installers.

Figure 53. Incentive amounts for anaerobic digester gas (ADG) programs for a representative ADG system[236]



Source: Refer to Appendix H

[236] Summit Blue Consulting assumed the representative ADG system to be 300 kW based on the CST ADG Applications Database.

5.2 EXTENT TO WHICH RPS INCENTIVES MAKE CST TECHNOLOGIES ECONOMICALLY FEASIBLE FOR CONSUMER PURCHASE

This section summarizes the views of project managers and installers regarding the extent to which the incentives offered under the CST of the RPS make renewable energy installations affordable and, therefore, economically feasible for consumers. These views are particularly relevant to the CST program due to the perspective on a diffuse retail market. "Affordability" is a relative term; what may be affordable to a small set of wealthy consumers may be out of reach to the mainstream. The intent of exploring affordability in the interviews with program staff and installers was to get a sense of whether the incentive levels offered to each project under the CST technologies were substantial enough to move the market forward and to provide NYSERDA with a reasonable chance of achieving RPS targets.[237]

5.2.1 Project Managers[238]

Project managers highlighted some factors related to affordability that apply across all technologies. For example, current retail electric rates affect the economics of all technologies. In addition, the project managers point out that the incentives help decision-makers move forward with an installation, but other key drivers to project development must also exist. Project managers reported, however, that the degree to which CST incentives make renewable energy installations economically feasible for consumers varies from technology to technology.[239]

[237] This is separate from the issue of whether the CST programs have enough total funding to achieve the program targets.

[238] Three interviews were conducted with six NYSERDA program staff for this portion of the report.

[239] NYSERDA incentives vary from technology to technology. Small wind incentives are based on the lesser of $4,000 per meter of rotor diameter or $4,000 per kW of wind turbine power output at 11 m/s. Incentives are further adjusted by tower height and multipliers based on the type of customer (i.e., farm, not for profits, schools, etc.). ADG systems receive incentives of $500 per kW and $0.10 of kWh. Fuel cell incentives are tiered by the size of the fuel cell. Large fuel cells (25 kW or larger) can receive $1,000 per kW of capacity with a cap of $200,000 per project site. Small Fuel Cells (less than 25 kW) can receive $2,000 per kW of capacity with a cap of $20,000 per project site. In addition, fuel cells can receive performance incentives and bonus incentives for installations in sites of essential public service. PV incentives for standard residential installations are $4 per watt for the first 5 kW and $3 per watt for the second 5 kW with a 10 kW maximum. Non-residential installations are eligible for incentives of $4 per watt for the first 25 kW and $3 per watt for the second 25 kW with a 50 kW maximum. Bonus incentives are available for ENERGY STAR labeled homes, schools, not for profit organizations, government systems, and building integrated PV systems.

For ADG technologies, limitations on the amount of incentive that can be provided to projects are a challenge. However, the project managers recently received more applications than expected, indicating that the program is still perceived as valuable to potential applicants. If a farmer already has a digester, adding electric generating capabilities is more economically viable than if he had no infrastructure in place already. According to project managers, a simple payback of four to five years with incentives for ADG technologies is a reasonable "affordability threshold." A six-month payback would mean the incentive was too much. For waste water treatment plant (WWTP) facilities, affordability is highly dependent on current retail electricity rates, which determine their avoided electricity costs (i.e., higher kWh rates translates into larger savings due to avoided electricity costs, making the systems more affordable).

For both types of systems (agricultural and WWTP), project managers report relatively more funding opportunities than for other CST technologies.

Agricultural ADG systems have the advantage of additional support through the US Department of Agriculture and the farm bill in the form of loan guarantees and some grants. Farming operations, however, are already close to the margin and funding is simply a risk mitigation strategy. Such support also requires that the project's sponsor have good credit. One project shows the possibility of receiving third-party investments, but this is the exception. WWTP ADG systems often benefit from public funding available through the U.S. EPA State Revolving Fund,[240] a capital bond issue, or some other municipal finance vehicle.

Benefits of ADG projects are also significant, making these projects attractive for a variety of reasons other than project economics. Benefits include economic development, odor abatement, and nutrient management. The scale of the projects is generally relatively large, and the most attractive projects can approach the $1 million program funding cap.

Affordability of PV systems, according to the manager of the NYSERDA PV program, is a barrier and makes PV largely a niche product for people who want to put in systems either for public relations purposes or to support the environment. The level that makes it affordable, therefore, is unclear. Payback,

[240] The Clean Water State Revolving Fund programs provide more than $5 billion annually in recent years to fund water quality protection projects for wastewater treatment, nonpoint source pollution control, and watershed and estuary management.

which takes into account factors such as a time horizon, incentive level and overall cost, is an important issue for affordability. If the incentives are increased to make the payback too short, however, the program will quickly run out of money, so lower equipment pricing is key to the future affordability of the technology. NYSERDA also makes loans available to potential PV purchasers, which can help make PV affordable to consumers for whom a PV investment would otherwise be infeasible.

For small wind, the NYSERDA program manager points out that it is not a mainstream affordable technology, but is mostly purchased by consumers that have a special interest in wind turbines and want to support the environment. The program manager suggests that turbine prices may start to decline, because there are now more turbine choices available in the market (creating more competition among manufacturers).

Small wind projects tend to take better advantage of loans than PV projects, because of the different customer base. According to the program manager, small wind projects are often sited on farms (and treated as a business expense), whereas PV systems are more commonly sited on homes. More lending options are typically available to commercial than residential entities.

For fuel cells, the NYSERDA project managers argue that the NYSERDA incentives do not make the technology economically feasible or affordable, especially because the relatively important additional incentive previously provided by the U.S. Department of Defense has elapsed. NYSERDA has only funded ten fuel cells over the last eight years. The current funding structure offered through the CST of the RPS has only been in place for a short time. The incentives help decision makers move forward with an installation when other key drivers to project development also exist (i.e., PR), but the technology, even with the incentives, is not cost-effective. Project managers argue that fuel cells probably will not take a big step in penetration in the near term, because every installation is essentially “an experiment,” and fuel cell reliability is an issue.

For all technologies (except fuel cells), project managers do not think NYSERDA’s requirement to own the RECs for three years is burdensome; indeed, several project managers believe that customers generally install the technologies to support the environment or for public relations and prefer to see the RECs retired. One program manager argued that many applicants do not know what RECs are and a good tracking system does not exist anyway. Additionally, project managers would welcome third party financing (such as power purchase agreement arrangements) to help make the CST technologies more affordable. Program mangers state that such financing leverage may be increasing for ADG, small wind, and PV systems; however, no data is collected by program staff on these project details.

5.2.2 Installers[241]

A total of seven installers of equipment eligible for CST incentives were interviewed. This included two ADG installers (who represent the majority of NYSERDA-supported ADG activity in New York State), two small wind system installers, two PV system installers, and one fuel cell company. As with project managers, installers reported that the extent to which CST program incentives make renewable energy installations economically feasible varies from technology to technology.

Wind installers offer the most mixed assessment regarding the role of incentives in increasing the affordability of small wind systems. Of the two small wind system installers interviewed, one reported that the incentives only make the technology affordable for a very small niche market of customers. The second installer reported that incentives are substantial for the smaller turbines (10 kW or less), but not sufficient for larger turbines. According to the same respondent, the incentive covers roughly 30% to 38% of installed costs, while he estimates that the tipping point is closer to 50% (in terms of making the turbines affordable to a wider population). Both respondents believe that funding should be extended to include larger turbines, with one respondent adding that NYSERDA should consider issuing a new PON exclusively for larger turbines (over 100 kW).

ADG installers report that the incentives improve the affordability of the systems, with one respondent reporting that the incentives "make the systems possible." Both ADG installers also report that the maximum incentive is adequate for current projects.

In contrast to views expressed by project managers, the fuel cell installer reports that the incentives make fuel cells affordable and allow fuel cells to compete with other technologies on cost, in addition to competing on reliability and environmental factors.

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[241] A total of seven installers were interviewed for this portion of the report, two ADG installers, two PV installers, two small wind installers, and one fuel cell installer.

PV installers report that the incentives make PV systems affordable. However, one respondent notes that the program is limited to residential and small commercial, leaving a potentially substantial market for large scale commercial installations untapped. The current program design reflects the net metering rules that were in place until recently, which only allowed small residential systems to net meter.[242]

All of the installers, except for the fuel cell installer, believe that 10% or less of the current development would have occurred without NYSERDA's incentive programs (the fuel cell installer estimated that 70% of the current development would have occurred without the NYSERDA incentive program).

For wind, both installers believe that the market for RECs could have a significant impact on the adoption of small wind turbines as the ability to sell RECs will make wind projects more affordable. Under the current arrangement (with NYSERDA owning the RECs produced during the first three years), potential revenue from selling the RECs does not enter into a customer's calculations. Neither ADG installer nor the fuel cell installer offered a comment on the topic. Both PV installers believe that RECs have had very little, if any, impact to date on the market for customer-sited renewable in the State.

When asked to rate the importance of various types of potential financial incentives on the affordability of the technology to customers, wind installers rank subsidized loans and net metering as highly important, followed by federal and state tax incentives (Table 19). One ADG installer also ranked capacity based incentives as highly important. ADG installers rank power purchase agreements and performance based incentives as highly important, arguing that performance based incentives help prevent unqualified installers from entering the market. The fuel cell installer rated capacity based incentives as highly important, as well as future net metering rules and power purchasing agreements. Both PV installers rated power purchase agreements as important to affordability. One PV installer rated federal tax incentives and performance based incentives highly and the second installer rated capacity based incentives and net metering very highly.

[242] Database of State Incentives for Renewables and Efficiency (DSIRE). "New York Incentives for Renewable Energy – Net Metering." http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NY05R&state=NY&CurrentPageID=1. Accessed 10/29/08.

Table 19. Importance of Potential Types of Financial Incentives to Affordability of Technology[243]

	Type of Installer						
Financial Incentive	**Wind #1**	**Wind #2**	**ADG #1**	**ADG #2**	**Fuel Cell**	**PV #1**	**PV #2**
Federal tax incentives	4	4	3	2	3	2	5
State tax incentives	4	4	no comment	2	2	3	3
Capacity based incentives	3	5	5	3	5	5	2
Performance-base incentives	DK	DK	5	5	2	3	4
Subsidized loans	5	5	1	4	1	2	2
Net metering revenues	5	5	1	5	5	4	3
Power purchase agreements	DK	DK	5	5	2 (5 in future)	5	4

Source: Summit Blue interviews.

5.3 CURRENT MARKET CONDITIONS

This section describes current market activity, changes in the CST markets and impacts of the RPS, impact of the net metering rules, and barriers to development.

5.3.1 Current Market Activity

According to the RPS Program Performance Report, through June 30, 2008, the PV incentive program has received by far the highest number of contract applications (391, or 91% of all CST program applications), while ADG projects with pending contracts have the largest capacity of production (7.3 MW, or 68% of all CST capacity represented by pending contract) of all of the CST technologies (Table 20).[244] The average capacity of the PV projects approved, completed, or applications received by NYSERDA is 7.7 kW, with residential systems averaging 5.1 kW, commercial averaging 22.1 kW, and industrial averaging 41.8 kW. Only three fuel cell projects are pending, two of which are large (300 kW) and one of which is small (5

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[243] Respondents were asked to rate the importance of financial incentives to customer affordability on a scale of one to five, with one being not that important and five being highly important.

[244] NYSERDA. 2008. *New York State Renewable Portfolio Standard Performance Report Program Period Ending June 2008*. Albany, NY: NYSERDA.

kW), while ADG systems average 347 kW and small wind systems average 11 kW. It should be noted that a MW of ADG, at a capacity factor of about 0.80, will produce a lot more energy than other types of renewables, e.g. 1 MW of solar, which has a capacity factor of about 0.15.

Table 20. CST Projects Through June 30, 2008[245]

Customer Sited-Tier Program	Operating Plan Target Capacity by 12/31/09 (MW)	Pending Contracts (MW)	Contract Applications Received	Actual Installed Capacity (MW)	Operating Plan: Target Annual Generation by 12/31/09 (MWh)	Expected Production from Pending Contracts (MWh)	Actual Annual Production from Installed Capacity (MWh)	Expected Production from Pending Contracts + Actual as % of Annual Generation Target
Solar PV	3.5	2.657	391	0.361	4,533	3,445	468	86%
Fuel Cells	2.7	0.605	3	-	18,700	4,994	-	27%
ADG	3.7	7.294	24	-	25,700	53,625	-	209%
Small Wind	1.8	0.130	10	-	3,945	162	-	4%
Program Total	11.7	10.686	426	0.361	52,878	62,226	468	119%

Source: Summit Blue interviews.

PV installers report that they typically install systems ranging from two to six kW, the fuel cell installer typically installs small fuel cells of five kW and small wind installers typically install five kW or ten kW turbines.[246] There is greater variability in the system sizes that ADG installers complete. One installer typically installs 225 kW systems, while the second installer installs systems ranging from 125 kW to 3,000 kW.

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[245] Data source: NYSERDA. 2008. *New York State Renewable Portfolio Standard Performance Report Program Period Ending June 2008*. Albany, NY: NYSERDA.

[246] These comments reflect installation activity both within and outside the New York market. According to NYSERDA program records, as of June 30, 2008, two small wind systems had been approved under the CST program, and ten applications had been received.

Installers report that customers choose to install their technology for a variety of reasons and that there is rarely one single reason that drives the decision. Both wind installers believe that most people install small wind turbines for three reasons:

- It is good for the environment;
- It makes sense economically; and
- Because they are fascinated with the technology.

One installer adds that some residential customers install the turbines as a hedge against rising electricity prices, and that schools install turbines largely for educational purposes.

Both ADG installers, who work almost exclusively with farmers, report that farmers install ADG systems for the following reasons:

- As a hedge against rising electricity prices;
- Odor abatement;
- Bedding for barns; and
- For the liquid fertilizer that is a by-product of the ADG system.

Fuel cell customers install the equipment for two main reasons:

- Fuel cells used as backup power in remote locations are more reliable than the incumbent technologies (diesel and battery powered backup systems); and
- Environmental benefits.

Residential PV customers install PV systems for the following reasons:

- As a hedge against rising electricity prices;
- They are good for the environment and help prevent climate change;
- They are fascinated with the technology; and
- They reduce their reliance on the utilities.

Commercial customers install PV systems as a hedge against rising electricity prices, that is, to "green" their operations and for public relations benefits. One installer commonly uses a power purchase agreement with commercial customers and reports that the power purchase agreement (as a hedge against rising electricity prices) is a key reason for installing a PV system.

It appears that the companies that install customer-sited renewables in New York tend to focus all of their business on the renewable energy sector, though there is some overlap with other clean energy-related areas of business activity. Of the installers interviewed, both of the ADG and fuel cell installers, and one wind installer work exclusively on their respective technologies. One wind installer also installs PV and solar water pumping systems. One PV installer also works with solar hot water and solar space heating and the second PV installer works with load control and energy management systems. Both wind installers and one PV installer recommend installing energy conservation and efficiency measures, but none install energy efficiency measures. The PV installer describes his recommendations for implementing energy efficiency measures as follows:

> *When we talk about solar, we always talk about energy conservation measures. But it is not a precedent for installing solar. There are people out there who have no desire to conserve, but do have a desire, and the money, to do solar. But we find that after people put in solar, they are much more energized to do conservation because they are much more energy conscious. Those who did no conservation before now do some, and those who did some before do more [conservation].*

There is a great deal of variability across firms regarding the age and size of the firm (in terms of number of employees), the number and size of systems they install, and amount of installation work they sub-contract to other companies (Table 21). The estimated installed cost ranges from $4.44/W (ADG) to $9/W (small wind and PV). Both of the wind and PV installers complete all or nearly all of their installations with in-house labor, while the ADG and fuel cell installers complete 33% or less of a typical project with in-house labor. The ADG and fuel cell installers typically sub-contract out the site preparation, and the onsite assembly and installation of their equipment.

Table 21. CST Installer Characteristics

Type of Installer	Year Began Installing	Number of Employees	Number of Systems Installed (U.S.)	Total MW Installed	Installed Cost in NY	% of Project Completed In-House
Wind #1	1997	<5	87	0.7	$9 / W (under 5 kW turbine); $6.50 / W (5 to 25 kW); $5 / W (over 25 kW)	100%
Wind #2	2004	11-25	22	1.71	$6.50 / W	100% (NY)
ADG #1	2001 (2008 in NY)	11-25	30	DK	DK[247]	33%
ADG #2	1983	6-10	75	DK	$4.44 / W	33%
Fuel Cell	2000	>100	Over 200	1,000	$5 / W	25%
PV #1	1999	6-10	Over 200	6.0	$7.50 to $9 / W	100% (usually)
PV #2	2003	>100	Over 200	57.0	$7to $9 / W	Nearly 100%

Source: Summit Blue interviews.

Nearly all interviewed CST installers have installed projects in National Grid and NYSEG territories, while none have worked in Con Edison's territory (Table 22). All installers have worked in neighboring states, most commonly Pennsylvania, Massachusetts, and Connecticut.

[247] The ADG installer would not provide an estimated cost per watt because of the production limits imposed by the net metering rules.

Table 22. Utility Service Territories and States Where Installers Have Installed CST Technologies

Type of Installer	Place of Installation (Utility or State)													
	Central Hudson	**Con Ed.**	**O&R**	**Nat'l Grid**	**NYSEG**	**RG&E**	**LIPA**	**NJ**	**CT**	**VT**	**PA**	**MA**	**OH**	**Other States**
Wind #1				√	√						√			MI; NC
Wind #2	√			√	√	√						√		
ADG #1				√	√					√			√	WI; WA; IL; IN; MI; GA; ID; FL: MN
ADG #2	√		√	√	√	√	√			√	√			
Fuel Cell				√			√	√			√	√	√	CA; FL; TX
PV #1	√			√	√				√	√	√	√		MD; DE; VA; CA
PV #2								√	√					

Source: Summit Blue interviews.

5.3.2 Changes in CST Markets and Impacts of the RPS

Both wind installers report that market activity has increased since the RPS was introduced and market activity is high today. One installer described the change as follows:

> *The days of waiting for the phone to ring are long gone!*

Increased market activity is attributed to the RPS program, the Power Naturally website,[248] marketing, incentives, and general awareness of renewable energy. Despite increased market activity, project financing is still difficult and the number of supporting market actors, particularly installers, is insufficient. Another

[248] http://www.powernaturally.org/.

complaint is the cost of insurance, as well as NYSERDA's insurance requirements (the level of required coverage is seen as excessive). Some installers also expressed concern about the steps they must take to gain eligible installer status.[249] One respondent describes this as a "catch-22:"

> *A new installer needs hands on training, but he can't get any training without insurance, and he can't get any insurance coverage without any experience.*

One ADG installer reports that market activity has increased with the RPS, and the second reports increased interest in the technology. This installer notes that there are more installers active in the market, but the new installers are generally not very qualified:

> *Everybody and their third cousin is a digester engineer now. It's a problem [having new installers], because you have people out there who do not know what they are doing. What happens is that the other installers tell clients things that aren't accurate and we have to come in and tell them the truth.*

The fuel cell installer reports that there is more commercial interest due to the RPS. The federal tax credit and the New York state tax credit also contribute to increased market activity.

PV installers offer mixed feedback on the impact of the RPS on current market activity. One installer attributes increased market activity to a variety of factors, including rising electricity rates, consumer interest, the RPS program, and modifications to the net metering rules. The second installer believes that the market activity is not due to the RPS, but is instead due to rising electricity prices resulting from rising and more volatile fossil fuel prices, as well as concerns about climate change. He believes that there should be a solar "carve-out" in the RPS and preferably with a performance based incentive (PBI) like California. The same respondent believes that a PBI will encourage the broadest and most robust solar industry.

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[249] To assure quality installation of PV and small wind systems, NYSERDA requires that all funded PV and small wind projects be installed by an "Eligible Installer."

5.3.3 Impact of the New Net Metering Rules

New net metering rules passed in the legislature increase the allowable amount of kW that PV, wind, and ADG systems can net-meter.[250] The law expands the solar net metering to apply to businesses. It also increases the size of eligible solar PV systems from 10 to 25 kW for residential customers, and up to 2 MW or the customer's peak load (whichever is less) for non-residential customers. The law will also increase the maximum amount of electricity that the utility would be required to buy back through net metering from one-tenth of one percent to one percent of the load in its service territory. Additionally, the law will provide the Long Island Power Authority with authorization to implement non-residential solar electric net metering pursuant to Public Service Law requirements.

The law will authorize net metering for wind technology for all utility customer classes, including non-residential classes. Previous net metering rules authorized net metering for projects at residences and farm operations only. The law will also allow non-residential wind electric generators to net meter up to the lesser of their peak load or two MW, and increase the maximum size of wind facilities for farm operations from 125 kW to 500 kW. Caps on net-metering enrollment in utility service territories will also be increased. In addition, the size of a farm waste electric generation system that can be net metered will increase from 400 kW to 500 kW.

For all technologies except fuel cells (for which net metering is not applicable), project managers overwhelmingly thought the changes in the net metering laws would help market conditions. The market is also very sensitive to the funding levels, which are the signal for installers and manufacturers to invest in New York State. However, expanding the potential capacity of installations through improved net metering rules will also have a very positive impact on the market, as it will open the market to large commercial consumers.

Installers are also confident that the new net metering rules will substantially expand the market for technologies receiving incentives under the CST technologies. Wind installers believe that the new net metering rules will help, but suggest that the new rules will help larger turbines more than the smaller turbines. One installer believes that commercial installations (as opposed to residential and farm

[250] A series of bills (S.B. 7171, S.B. 8415, and S.B. 8481) enacted in August 2008 amended New York State's net metering laws. Database of State Incentives for Renewables and Efficiency (DSIRE). "New York Incentives for Renewable Energy – Net Metering." http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NY05R&state=NY&CurrentPageID=1. Accessed 10/29/08.

installations) will take off once the net metering rules are enacted. Both PV installers believe that the new net metering rules will have a positive impact on PV installations, though one installer added that the rule changes would have more of an impact if the incentives were increased to match the new net metering limits. When asked about the recent changes to the net metering rules and limits, one ADG installer stated that the limits were still too restrictive. He questioned why the state would want to limit energy production, especially when public funds are being used to support the energy production. The second installer opposed some of the changes, because he felt the new rules changed how a farmer's excess capacity is treated.

5.3.4 Barriers to Development

Project managers were asked to rate several potential barriers to the development of the technology for which their program was responsible (Table 23). For PV technologies, most barriers were rated at less than four on a five point scale in which five represented a "critical barrier to project development." Project managers rated customer awareness and knowledge with a four, because there is widespread misconception among consumers that PV systems are cheap or free. Project economics are also rated as a four, because a typical PV system requires a very long time horizon to pay back. Additional barriers for PV systems include the appearance of the system, the availability of modules and inverters that are UL listed, and lack of net metering for large systems and loads.[251]

The program manager for the small wind program noted barriers, including:

- The need for a simpler permitting process;
- The availability of sites with suitable technical conditions; and
- Customer awareness of what constitutes a suitable wind site —namely, sufficient wind resources.

As with PV, project economics are challenging for small wind systems. Other barriers mentioned include the lack of a certification system for installers of turbines and insufficient testing of commercially available products.

[251] For PV and commercial wind, the net metering barrier has been addressed through recent net metering rule changes.

Two barriers to greater penetration of ADG systems that were rated relatively high (four or higher) include the limited availability of WWTP facility project development opportunities (because of municipal ownership and jurisdictional issues), and unfavorable project economics for agricultural applications.

Fuel cell technologies face numerous additional barriers according to the project managers. Fuel cell technologies are very expensive and have limited suitable applications. In addition, unlike other clean technologies, such as PV, customers who install fuel cells rarely expand on the installation due to the high cost of the technology.[252]

[252] In contrast, program managers believe that customers that install other clean technologies, such as PV systems, commonly add capacity to their original installations.

Table 23. Barriers to Development Identified by Project Managers[253]

Barrier	Wind	PV	Fuel Cell	Farm ADG	WWTP ADG
Customer awareness and knowledge	4	4	2	3 (Technology) 1 (Program)	1
Interconnection costs and policies	2	2	4	1	2
Local opposition	2	2	0	0	1
Permitting process	4	2	1	1	0 (but 3 with pending air regulations)
Availability of parts and supplies (PV modules, turbines, etc.)	3	2	3	3	1 (engine backlog; otherwise 3)
Availability of qualified local workforce	4	3	1	3	1
Federal incentives uncertainty	1	1	2	1	Not applicable
Availability of suitable sites with sufficient renewable resources	4	3	0	1	5 (based on jurisdiction); 3(funding for large projects); 1 (technical barriers)
Project economics (i.e., insufficient level of financial incentive from NYSERDA to make project economics work)	3-4	4	1	5 (lack of funding—no per-project incentive)	1
NYSERDA’s ownership of RECs for first three years of system operation	0	1	0	DK	1
Compatibility of NY with neighboring regional REC tracking and trading	DK	DK	0	DK	1

Source: Summit Blue interviews.

[253] Respondents were asked to rate the barriers facing the market for their respective technology on a scale of one to five, with one being an insignificant barrier and five being a critical barrier to development.

Installers were also asked to rate barriers to the development of their respective technologies (Table 24). Nearly all installers believe that the upfront costs of equipment and local siting and zoning ordinances are serious or critical barriers to development. Similarly, nearly all installers rated several potential barriers as being relatively insignificant, including insufficient marketing and sales effort by the industry, lack of customer interest, and insufficient technical conditions or lack of suitable sites. In addition, wind, ADG, and PV installers identified policy deficiencies as a critical barrier.[254]

[254] Examples of policy deficiencies cited by wind installers include the difficult permitting and siting processes in New York, the current Environmental Quality Review process, and lack of federal and state tax incentives that apply to small wind project applications. The ADG installer suggested removing production limits and introducing a national policy for production and interconnection from ADG systems as ways to address insufficient policies. The PV installer identified the lack of a solar goal in the RPS, net metering rules (though this barrier is being addressed currently), current incentive levels, and interconnection rules in the ConEd service territory as policy-related barriers.

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Table 24. Barriers to Development Identified by Installers[255]

Barrier	Type of Installer					
	Wind #1	**Wind #2**	**ADG #1**	**ADG #2**	**Fuel Cell**	**PV #1**[256]
Uncertainty about equipment reliability and performance	5	3	1	2	1	1
Upfront cost of equipment	5	5	4	5	5	2
Insufficient return on investment over life of system	4	3	1	3	2	2
Payback period perceived as too long	4	3	Don't know	2	5	2
Lack of complementary financing (e.g., subsidized loans, power purchase agreements, third party ownership)	3	3	1	4	3	2
Lack of customer awareness	4.5	2	3	2	3	2
Lack of customer interest	0	1	2	1	3	2
Project logistics are too cumbersome	4	3	4	3	4	3
Insufficient marketing/sales efforts by the industry	1	2	1	1	1	2
Insufficient policies to support the market	5	4	4	1	2	5
Lack of widespread real-time pricing for electricity	Don't Know	3	5	Don't Know	1	4
Prevalence of insufficient technical conditions / lack of suitable sites	3	2	1	1	1	2
Lack of a qualified workforce	5	2	3	4	1	2
RPS application process too complicated	5	1	no comment	3	4	2
Interconnection requirements and inspections	3	1	5	3	2	4
Local Siting/zoning ordinances	5	4	5	3	5	3
NYSERDA's ownership of the RECs for the first 3 years after installation	4	2	1	1	Don't know	4

Source: Summit Blue interviews.

[255] Respondents were asked to rate the barriers facing the market for their respective technology on a scale of one to five, with one being an insignificant barrier and five being a critical barrier to development.

[256] Only one PV installer rated each of the listed barriers. The second PV installer provided more general commentary on barriers to development.

From the discussion of barriers, there are several recommendations to help move the market forward. Wind installers made recommendations on several issues, including streamlining the application process, easing siting rules and ordinances (one respondent noted that some communities are enacting zoning ordinances to essentially ban wind projects),[257] simplifying the requirements for the State Environmental Quality Review (which one respondent described as onerous), increasing the incentives to allow for larger turbines, and changing the payment structure of the incentives to an up-front payment in order to minimize the out of pocket costs to customers.

One ADG installer suggested increasing the net metering limits and developing more interconnection options to allow farmers to sell their excess production to more than one utility. The same installer gave an example of a farmer in another state that is flaring their excess gas rather than generating more electricity and selling to the local utility, because the local utility will not pay enough for the excess. In addition, the State should consider removing the net metering cap or further increasing the net metering cap to allow for larger ADG systems. The second ADG installer suggested developing a combined grant – loan financing program; it is currently difficult for ADG systems to obtain loans due to a history of failed ADG systems in the State. The installer also suggested improving the timeliness and responsiveness of the application process.

The fuel cell installer suggested making more investments in hydrogen infrastructure, especially beyond automotive hydrogen infrastructure. In addition, the fuel cell installer would like a clarification on the rules giving preference to critical infrastructure (which involves municipalities and government agencies), but restricting funding to entities that pay into the RPS (which many municipalities and government agencies do not do).

Both PV installers suggested that the goals for PV production and the PV budget need to be increased for PV installations, particularly because of the recent changes to the net metering rules. One installer suggested creating a solar carve-out in the RPS program, developing a PBI similar to the one used in California, streamlining the application process, and reconsidering the certified installer requirements if the market begins to grow quickly. The second installer suggested improving the interconnection rules in the

[257] NYSERDA has developed a model wind energy ordinance, along with other resources, for communities interested in developing wind energy. Power Naturally. "Community Resources for Wind Development. http://www.powernaturally.org/programs/wind/toolkit.asp. Accessed 10/29/08.

ConEd service territory, as current rules are impeding development. The installer also suggested committing long term funding to the program (arguing that the current three year cycle of funding is insufficient).

5.4 STRENGTHS AND WEAKNESSES OF THE CST PROGRAM

Installers were asked to identify the greatest strengths and weaknesses of the RPS program. Wind installers identified the existence of CST incentives as a key strength, and credited the program with helping to jump start the industry. ADG installers identify the initial capital investment offered by the program as a key strength, because outside financing is very difficult to obtain. One ADG installer focused on the performance based aspect of the program, noting that this helps tremendously with the quality of the ADG installations. The fuel cell installer reports that the greatest strengths are that both large and small systems are eligible, as well as continuous and back-up power applications. PV installers believe that the relative stability of the program is its greatest strength.

In terms of weaknesses, wind installers identified the level of bureaucracy associated with applying to the program and the lack of funding for larger turbines.[258] In addition, one wind installer felt that the program was not communicating very well with the industry nor seeking input from the industry when making decisions and changes to the program. ADG installers identified the production limits on funded projects, the requirement to net meter, and slow turnaround on program materials as the biggest weaknesses. The fuel cell installer did not identify any weaknesses and the PV installers identified the capacity limits and complexity of the application materials. One PV installer estimates the cap is too low by a factor of 40. The second PV installer argues against the cap as follows:

> *The limit on system eligibility is not sound. It excludes a large potential market and tends to concentrate on the most expensive systems that are not easily replicable. If NYSERDA wants a vibrant, sustainable market, they need to move into large commercial and institutional systems.*

[258] Due to the formula used for calculating incentives, and incentive caps for the small wind program, the program's incentives are generally not available to systems larger than 100 kW.

Program Procedures. Both wind installers were critical of the process for becoming an eligible installer, as well as insurance requirements.

Five installers across all technologies were dissatisfied with the project funding application process. However, several installers noted that the process has improved recently and blamed some of the problems with the application process on early bugs in the program and lack of staff.

Installers were asked if there were alternatives to distributing incentives on a first come, first served basis. Most installers believe that the system of distributing funds (assuming the applications meet all program requirements) is the easiest and most efficient system to implement. One wind installer felt that adding new decision factors would only serve to complicate the process and impede the market. One ADG installer would like a more competitive process, arguing that this will lead to better projects. One PV installer suggests that if the program increases in scale, an auction process or the market based process that New Jersey adopted would be helpful.

Budget Resources. Both wind installers believe that the current budget is inadequate to meet the RPS goals of 1.8 MW and also inadequate to transform the market. One installer is concerned that the cap on incentives is too small and that reductions in incentives threaten any progress made, because the market has not been convinced that small wind is viable. The same installer contrasted the incentives available in New York to those available in Massachusetts, where one of his large wind projects (1.5 MW) received close to $1.5 million.

Neither ADG installer believes the budget is adequate for transforming the market, but both believe it is adequate to meet the RPS goals of 3.7 MW.[259] Both installers believe that there is a waiting list for NYSERDA funding, while one installer estimates that an *annual* budget of $10 to $11 million (compared to current *total* budget of $11 million) over five years would effectively transform the market and result in installations of ADG on nearly all viable farms. The fuel cell installer is uncertain as to whether the budget

[259] According to the 2008 NYSERDA RPS progress report, the ADG has exceeded capacity goals in pending contracts.

is adequate to transform the market, but believes that the budget is adequate to meet the RPS goals of 2.7 MW of installed capacity. Neither PV installer believes the budget is adequate for transforming the market, while one believes it is adequate to meet the RPS goals of 3.5 MW. The second installer is very concerned about the adequacy of current program funds:

> *The incentive budget is about to run out. The solar industry will fold up without more money. It would be short sighted of NYSERDA, after spending millions of dollars to date, to have the industry collapse.*

Comparisons to Other State RPS Programs. Installers offer a number of insights into programs offered by other states. Both wind installers point to neighboring states as having better programs, but for different reasons. One installer prefers working in Massachusetts, because the incentives are larger, allowing his firm to work on larger projects. The second installer prefers Pennsylvania’s program, because the level of bureaucracy is smaller and the process is easier, including the zoning, siting, and environmental permitting requirements.

Both ADG installers believe that the NYSERDA program is one of the better ADG programs. However, two criticisms were raised. First, the application process is very time consuming compared to other states, such as Wisconsin. Second, the net metering rules limit the size of the projects, because their systems often have the capacity to produce beyond the 400 kW or 500 kW net metering limits. Instead of maximizing their electricity production, these projects will produce up to the net metering limits and flare the remaining gas. The installer describes this issue as follows:

> *On a well operated system, we'll produce three times the amount of electricity that the farm will use. Current rules restrict the amount of power that is produced, which also restricts the amount of heat that is produced, and we use the waste heat to keep the heat of the digester at the correct temperature (100 degrees). This [the temperature] is particularly important in the winter. From the standpoint of the state, why restrict the amount of power produced when you are spending public money? The balance is just flared off. There is a minimal increase in costs to produce 600kW [instead of 400kW], a*

> *50% increase in production. Why would New York State want to pay public money and only get 67% of the potential power? It's a stumbling block. The net metering does not offset the loss of 200 kw of production or heat loss.*

The fuel cell installer reports that the New York RPS support for fuel cells is better and broader than any other state's program, because it includes both large and small systems, allows for both base load and back-up power, and is not restrictive on fuels. In addition, the incentive is significant.

One PV installer commented that, compared to other states, NYSERDA's paperwork requirements are onerous and the capacity of eligible systems is more limited. The second installer is much more active in New Jersey than in New York for a variety of reasons, but largely because of the historically robust incentive program, the solar carve out in the RPS, and the specific targets and obligations that load serving entities have to meet. The same installer believes that NYSERDA has taken a strong leadership role compared to other states, particularly in developing market infrastructure and in the training of code officials and PV installers.

5.5 FINDINGS BY TECHNOLOGY TYPE

This section summarizes findings of the four technologies.

5.5.1 PV

- PV installed costs spanned the ranges seen in comparison states.
- NYSERDA's incentives are higher than other programs examined.
- Affordability of PV is a barrier. NYSERDA loans are helpful.
- Program design leaves large-scale commercial market untapped.
- PV is the technology with the greatest number of applicants.

- Installation is driven by interest in the environment, economics, technology fascination, and independence from utilities.

5.5.2 Small Wind

- Wind installed costs appear similar to those seen in comparison states.
- NYSERDA's incentives are higher than most programs examined, but incentives may not be sufficient for larger turbines.
- Small wind is often sited on farms and treated as a business expense.
- Installation is driven by interest in the environment, economics, and technology fascination.

5.5.3 Fuel Cells

- NYSERDA's incentives are similar to those offered by California and New Jersey – the two other states with programs indentified (California also offered a lower incentive).
- Additional incentives offered by the U.S. Department of Defense have recently elapsed.
- Installation is driven by backup needs and environmental benefits.

5.5.4 ADG

- NYSERDA's incentives are on the low end of the range of other programs examined.
- More applications have been received more recently than expected, indicating the program is still perceived as valuable.
- Other funding opportunities are available.
- ADG capacity is the most predominant in terms of CST capacity with pending contracts.
- ADG installation is driven by interest in a hedge against electricity prices and other factors, such as odor abatement.

Section 6

VOLUNTARY MARKET ACTIVITY

The voluntary renewable market exists in the context of a restructured (or competitive) retail electricity market in New York. In this market, electricity customers can purchase green power through competitive electricity supply companies or utility/distribution company programs. This chapter describes the market context, provides a summary of product offerings and product structures, characterizes voluntary market demand, and discusses the role of voluntary markets in driving large-scale development.

6.1 MARKET CONTEXT

The September 2004 PSC Order, which called for an increase in the portion of renewable energy included in the State's retail electricity mix from a baseline of 19% to 25% by 2013, specified that 1% of the 6% increase be from the voluntary renewable energy market.[260] To help facilitate that 1%, the RPS includes program elements meant to support the voluntary market. For example, Main Tier solicitations specify that the bid quantity percentage that is committed for sale to the RPS can be as low as 30%. Moreover, the RPS program caps maximum contracted bid quantities at 95% of the expected annual production of a bid facility so that, at a minimum, 5% of production is freed up for sales to voluntary or other markets. Also, developers with RPS contracts can elect to suspend contracts to sell the production credits to the New York voluntary market. The intention of these provisions is to permit and induce sales of environmental attributes to voluntary market programs. In fact, three wind projects with NYSERDA REC contracts are retaining 60% of eligible production for sale to other markets, which may include the New York voluntary green power market.[261]

In addition to the RPS program elements, Executive Order 111 provides support to the voluntary markets by requiring New York State agencies to procure 20% of their electricity from renewable sources by 2010.

[260] New York RPS Proceeding Home Page, "Retail Renewable Portfolio Standard, Case 03-E-0188." http://www.dps.state.ny.us/03e0188.htm.

New York State Energy Research and Development Authority (NYSERDA). 2008. *New York State Renewable Portfolio Standard Performance Report Program Period Ending June 2008*. Albany, NY: NYSERDA.

[261] Ibid.

As of the conclusion of program year 2007, the New York State Office of General Services reported that state agency purchases of clean energy in compliance with Executive Order 111 were estimated to be 261,000 MWh, or 83% of the 2007 target.[262] One green power provider who was familiar with Executive Order 111 believed it affects the voluntary green power market in a positive way, because it increases demand and adds credibility to the market, since the government is purchasing RECs.

The voluntary renewable market exists in the context of a restructured (or competitive) retail electricity market in New York. In this market, electricity customers can purchase green power through competitive electricity supply companies (ESCOs) or utility/distribution company programs. In general, green power marketers have formed business relationships with ESCOs and utilities to assist in selling green power. The ESCOs and utilities provide services such as billing and managing the conversion transactions needed to meet the environmental disclosure requirements. In some cases, the utility works with multiple marketers to provide green power to their customers, while in other cases, the utility works with a single marketer. One ESCO has developed its own green power offering.[263, 264]

Purchases of green power offerings were growing steadily when the RPS was implemented (this resulted from an SBC-funded program administered by NYSERDA). Enrollments increased from none in 2001 to 14,000 at the end of 2003, with 99% of enrollments being residential customers.[265] Enrollments have continued to grow in recent years.

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[262] Ibid.

[263] Bird, Lori, Leila Dagher and Blair Sweezey. 2007. *Green Power Marketing in the United States: A Status Report (Tenth Edition).* NREL/TP-670-42502. Golden, CO: National Renewable Energy Laboratory.

[264] Summit Blue Consulting and Skumatz Economic Research Associates. 2004. *Wholesale Renewable Energy Program Phase 1 Market Characterization, Assessment, and Causality (MCAC) Evaluation*. NYSERDA Project Number 7721.

[265] Ibid.

According to the PSC, there are currently 19 providers of green power throughout New York State.[266] Five providers were interviewed for this evaluation, representing approximately 217,660 MWh of green power sales.

6.2 SUMMARY OF PRODUCT OFFERINGS / PRODUCT STRUCTURES

The product offerings of the interviewed providers are either 100% wind or a mix of wind and small hydro (Table 25.). Eight of the ten product offerings are structured as a percentage of the customer's electricity use, while the remaining two product offerings are sold in 100 kWh blocks. The price premiums range from $0.01 per kWh to $0.025 per kWh; the size of the price premium tends to be associated with the percentage of wind included in the green power product, i.e., the price increases with the portion of wind included. It is not clear what eligibility requirements, including vintage, are associated with these products. These prices represent prices after consideration of subsidies provided by NYSERDA under its green marketing program.

Table 25. Green Power Product Offerings of Interviewed Green Power Providers

Structure of Product Offering	Resource Mix	Price Premium (cents / kWh)
Percentage of use (100% only)	35% wind, 65% small hydro	1.0
Percentage of use (50% or 100%)	60% wind, 40% small hydro	1.3
Percentage of use (100% only)	60% wind, 40% small hydro	1.3
Percentage of use (50%, 75%, or 100%)	50% wind, 50% small hydro	1.5
Percentage of use (100% only)	10% wind, 90% small hydro	1.6
100 kWh Blocks	50% wind, 50% small hydro	2.5
Percentage of use (100% only)	100% wind	2.5
Percentage of use (50% or 100%)	100% wind	2.5
Percentage of use (100% only)	100% wind	2.5
100 kWh Blocks (200kWh minimum)	100% wind	2.5

Source: Summit Blue interviews.

[266] New York PSC. "AskPSC: NY's Green Power Program." http://www.askpsc.com/askpsc/page/?PageAction=renderPageById&PageId=a8022193f892947a1d26b67506005183#top. Accessed 10/9/08. Note that the NREL report (Bird et al.) found only four active participants in the State – the PSC data likely includes smaller participants.

6.3 VOLUNTARY MARKET DEMAND

This section presents discussion related to:

- How voluntary market demand has changed since the RPS was first introduced;
- The price premium customers are willing to pay;
- The types of customers that are participating in the market;
- The resources customers are most interested in buying;
- The level of customer loyalty to in-state resources; and
- Customer motivations.

6.3.1 Changes in the Voluntary Market Demand

Green power providers were asked how the voluntary green power market has changed in New York over the past four years since the PSC Order pertaining to the RPS was issued in 2004. All respondents report that awareness and interest in green power and the market potential of green power has grown over the past four years. However, there is no consensus as to the level of growth in awareness and interest. Some respondents believe there has been substantial growth (in public awareness and interest) while others believe that growth has been low to moderate. One respondent who works with commercial and industrial customers points out that there are new sectors that are more aware and interested compared to four years ago, particularly big box stores, building owners, real estate developers, and the public sector. Another respondent commented that there have been supply constraints over the past 16 months, particularly for wind, because it is so popular with customers. However, they note that this constraint should be eased as projects currently under development come on line.

Four of five respondents report that sales of green power have grown since 2004, with increases ranging from 50% to 300% since 2004, though none of the respondents attributed this growth to the RPS program. Green power providers attribute growth to several factors, including increasing concern about climate change, and a desire to be “green.” One provider described the desire to be “green” as follows:

> *Everyone wants to be green, everyone wants to contribute to these types of causes, and this is a way to contribute. It's not a donation, but it's something everyone can feel good about because it's not that much, maybe $5 to $10 per month, which is justifiable now compared to before.*

One respondent commented that growth is approaching a ceiling because of several factors, including problems with the conversion transaction process and lack of cooperation from many of the utilities.

As noted above, enrollments in voluntary green power market programs in New York increased from none in 2001 to 14,000 at the end of 2003, with 99% of enrollments being residential customers.[267] According to surveys conducted by the DPS, as of March 2007, there were 54,568 customers in New York State purchasing approximately 55,292 MWh of renewable energy through voluntary green power programs. Enrollments grew to 59,603 customers consuming approximately 63,476 MWh as of September 2007.[268]

6.3.2 Price Premiums and Consumer Willingness to Pay

Green power providers that serve residential customers report that most customers will pay a $5 to $10 monthly premium for green power or, in percentage terms, a 10% to 12% premium on current monthly bills. One provider noted a difference between the premiums residents of New York City are willing to pay ($5 to $10 per month) compared to the rest of the State ($8 to $12 per month). In terms of a kWh premium, providers report that a 2.5 cent per kWh premium is the maximum premium most customers are willing to pay, with one provider noting that residential customers are willing to pay a 2.5 cent per kWh for wind power and 1 cent per kWh for a wind / small hydro mix.

Providers that serve commercial customers report that commercial customers are willing to pay from 0.4 cents to 1.0 cents per kWh and that most large commercial customers choose to purchase national RECs, which are cheaper than New York RECs. However, one provider noted that some commercial customers are buying New York-based wind RECs to cover 10% to 20% of their total electricity usage, often supplemented by cheaper national RECs, and then marketing their support for New York wind power.

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[267] Summit Blue Consulting and Skumatz Economic Research Associates. 2004. Wholesale Renewable Energy Program Phase 1 Market Characterization, Assessment, and Causality (MCAC) Evaluation. NYSERDA Project Number 7721.

[268] New York Department of Public Service, "New York State Voluntary Market for Green Power Statistics." September, 2007.

6.3.3 Types of Participating Customers

Three of the five green power providers interviewed serve both residential customers and commercial customers (i.e., businesses, governments, institutions). One of these firms serves primarily residential customers. The other two firms report that the number of residential customers is far higher than their commercial customers, but the commercial customers represent a larger percentage of total sales. One green power provider serves residential customers exclusively and the fifth serves commercial and industrial customers exclusively.

6.3.4 Resource Preferences

Only two of the five providers were willing or able to disclose details of enrollments in their various green power offerings.[269] Of those providers able to provide enrollment details, the most popular green power product is a 100% wind product (64% of the total sales) followed by a mix of 35% wind and 65% small hydro (35% of the total). Sixty-one percent of green power energy is sold through programs structured by a percentage of use, while 39% is sold through block programs.

When asked if there is a resource type that New York customers prefer, all respondents report that wind is the most preferred renewable energy source. Solar would be very popular among New York customers as well, but it is cost prohibitive according to all respondents (one respondent estimated the wholesale cost of solar RECs at $0.24 per kWh). Three of five respondents report that New York customers are generally favorable to small hydro, while two report that there is less support for biomass energy compared to wind, solar, and hydro. One respondent reports that there is also limited support for anaerobic digester gas (ADG) power.

Two respondents report that local renewable resources are important to their New York customers, particularly their residential customers. Both respondents observed that New York customers consider "local" in a tiered perspective, with in-state resources being the preferred "local" resource, but regionally produced resources (i.e., Northeastern U.S.) also preferred over national resources. One of the two respondents reports that New Yorkers prefer local resources, because of state pride and because they link renewable energy production to local economic development. In addition, some businesses want local

[269] A third provider estimated total green power sales of 27,000 MWh. However, the provider sells green power in several resource mixes in multiple utility service territories and did not break down the sales by resource mix or utility.

resources so that they can market their support of New York State resources. Two respondents report that there is no preference for local resources with one reporting that the two critical customer priorities are price and environmental benefit. The fifth respondent reports that approximately 25% of their commercial customers prefer in-state resources.

6.3.5 Customer Motivations

According to the respondents, customers are motivated to purchase green power for several reasons and these drivers differ between residential and commercial customers. Residential customers are motivated by a desire to contribute toward energy independence, support environmentally friendly power, fight climate change, and support local power. One provider described residential motivations as follows:

> *It [green power] is a feel good product and it's a tangible thing. People are putting their dollars toward a cause and they can see wind farms are being built in the region. People think it's the right thing to do and it's easy.*

Commercial customers are motivated by a variety of factors, including enhancing and differentiating their brand, demonstrating social responsibility to their customers and the public at large, supporting energy independence, supporting green jobs and the economic development benefits of green power, taking steps to meet what some commercial customers see as inevitable carbon compliance regulations, and responding to pressure from shareholders, customers, and their supply chain. In addition, some commercial customers, such as universities, purchase green power to fulfill a climate change commitment.

6.3.6 Expected Changes in the Voluntary Market

When asked how the market will change in the future, all respondents were hopeful for growth, identifying issues such as consumer awareness and concern for global warming and energy independence as drivers supporting the growth of green energy. One respondent believes that there could be 500,000 customers in the state if the market structure is adjusted. Two respondents believe that growth is dependent upon growth in the supply of wind energy as supply is the main constraint and wind is the most popular resource; one respondent adds that growth will take off if there are technological breakthroughs making renewable energy more competitively priced with traditional power sources. Another respondent believes that growth will be tied to greenhouse gas emission reductions in the future, resulting in a national renewable energy market.

When asked to estimate annual growth rate over the next few years, four of five respondents expect sales to grow, while one respondent could not provide an estimate of expected growth. Three respondents expect growth of 10% to 20% annually, while one expects 200% to 300%, driven largely by commercial customers.

When asked about the impact of the RPS main tier program on price and availability of RECs, respondents generally believe that the RPS tends to increase price by increasing demand for renewable energy. Furthermore, the average REC pricing under past New York RPS solicitations functions as a “target” price in the voluntary New York REC market. However, respondents also point out that the RPS increases supply, so that the increase in prices may be temporary. In addition, two providers note that projects developed under the RPS program increase awareness of green power, which, in turn, increases customer interest in the voluntary market.

6.3.7 Barriers to the Voluntary Market Growth

When asked to rank a variety of potential barriers facing the voluntary green power market, the most critical barriers identified by green power providers include the current attribute tracking and trading system, high REC prices and customer unwillingness to pay a premium for electricity, lack of customer awareness, insufficient policies to support the market, and insufficient marketing and sales efforts by green power providers (Table 26.). In addition, three providers identified the logistics of purchasing RECs or green power products as a critical barrier facing the voluntary green power market. Two respondents emphasized that lack of awareness and the policy and market structure are the two critical barriers facing the voluntary REC market. The same respondents identified the difficulties customers have in signing up for clean energy as the critical issue in terms of market structure. Other barriers identified by respondents include lack of utility support for renewable energy, particularly in terms of marketing voluntary programs, and insufficient federal policies in support of renewable energy.

A topic of some concern in the past has been whether there is still adequate renewable energy supply left to serve the voluntary market after New York’s RPS market needs are met. Four of five respondents believe that there is currently an adequate supply of RECs available to the voluntary market, but all respondents are concerned about future supplies. One provider who works with commercial and industrial (C&I) customers pointed out that C&I customers are sensitive to price, so that if demand becomes tight and price increases, C&I demand drops, leading to a price equilibrium. A second provider who works with commercial and industrial customers reports that they recommend to their customers that they purchase national RECs, rather than New York based RECs, because New York based supply is more difficult and expensive to procure. Another provider commented that it would be very helpful to be able to buy more renewable resources from other states without having to wheel the energy into the New York ISO. Energy delivery into New York is currently required as a pre-condition for New York's conversion transaction process, a process green power sales must go through in order to be reflected on consumers' Environmental Disclosure Labels in the State.

Table 26. Barriers to Advancing the Voluntary Green Power Market in NY

Barrier	Average Rating[270] (n = 5)
Current attribute tracking and trading system	4.1
REC prices are too high	3.8
Insufficient policies to support the market	3.5
Customers unwilling to pay any premium for electricity given rising electricity costs	3.4
Lack of customer awareness	3.4
Insufficient marketing / sales efforts by green power marketers	3.3
The logistics of purchasing RECs / green power products are too cumbersome (i.e., it is not part of the standard electric billing system and/or switching suppliers is too cumbersome)	3.2
Green power marketers / suppliers are unable to get access to enough RECs (i.e., because such a large volume is being sold to NYSERDA through the Main Tier RPS program)	2.8
Green power marketers / suppliers are unable to negotiate low enough long-term REC prices (i.e., due to the low volume they are able to commit to purchase from RE generators)	2.3
Lack of customer interest	2.2
Lack of trust for green power suppliers (i.e., doing business with new companies)	1.6
Lack of trust / credibility for the concept of RECs and buying "green power"	1.6

Source: Summit Blue interviews.

From the discussion of barriers, there are several recommendations to help move the market forward. First, there is nearly universal agreement among respondents for the need to increase outreach, education, and

[270] Respondents were asked to rank each barrier from one to five, where one meant the barrier was insignificant, three meant the barrier was a significant nuisance and added time or expense to the development process, and five meant the barrier posed a critical threat to a project's viability.

marketing efforts (four of five respondents suggested this). One provider suggested using high profile endorsements by prominent public officials in order to increase customer awareness and trust in renewable energy products. However, respondents did not agree as to how the outreach should be structured. Some suggest that NYSERDA should lead the marketing and outreach effort, while others believe the providers should be given more incentives and responsibility to conduct increased marketing and outreach activities.

A second recommendation is to simplify the enrollment process and improve utility cooperation with the program. Several respondents complained that the enrollment process is very cumbersome and impedes customer enrollments. Similarly, respondents complained that, with the exception of National Grid's GreenUp program, the utilities do very little to help promote green power. One respondent complained that some utilities seem to actively work to impede the development of the voluntary green power market.

A third recommendation that policy-makers should consider is to create a program similar to the Connecticut Clean Energy Option, which would entail developing a statewide green power program. All utilities would be mandated to adopt the program, open their program to multiple green power providers, and meet a one percent enrollment level (or face penalties). Another provider added that any program should be marketed under the utility's name, because customers are more familiar with their utility and have more confidence in a utility sponsored program.

Other recommendations include improving the siting rules in New York in order to increase the development of renewable energy supply, thus decreasing the price premium for the voluntary market offerings and making voluntary market participation more attractive for a broader range of potential customers.

6.4 THE ROLE OF VOLUNTARY MARKETS IN DRIVING LARGE-SCALE RENEWABLE ENERGY DEVELOPMENT

Developers interviewed for the market assessment universally expressed that the voluntary REC market is insufficient to drive large scale project development. Rather, developers characterized the voluntary REC market as "soft," noting that there really is not much of a secondary market for RECs in New York. Several developers explained that they cannot depend on this market to fulfill their revenue requirements, because

REC prices and procurement volumes are generally relatively low both in the New York and in the national voluntary REC markets.[271]

Reasons why voluntary market REC prices are low include:

- That they have been subsidized;
- Eligibility requirements are less strict;
- Prices are influenced by consumers' willingness to pay; and
- Retail green power product pricing must also build in a margin to cover marketing expenses, which can be significant.

Procurement volumes are low relative to RPS markets simply because demand is not mandated in voluntary markets; rather, it is subject to the whims of the consumer. With the exception of a limited number of ESCOs that have large, multi-year commitments from commercial customers, it would be too risky for most voluntary market players to enter into long-term contracts for a high volume of RECs. Demand for RECs in the voluntary market is also likely to suffer as a result of the financial crisis.

In its current manifestation, the voluntary market for RECs inherently lacks a key feature necessary to drive large-scale project development: an ability to enter into contracts for large volumes of REC in longer-term deals. In the future, however, a voluntary market for bundled renewable energy contracts (contracts for both energy and attributes from the same generator) may replace a voluntary market for RECs. Energy from renewable resources may become the most cost-effective resource, for example, in a greenhouse gas-constrained market. In such a scenario, load-serving entities would select energy from renewable resources before energy from fossil-fired resources, in effect "voluntarily" selecting renewable resources. The price of RECs would presumably go to zero, since no additional revenue would be required to make these projects cost effective. Assuming that RECs continue to be the mechanism for complying with the RPS, they would still need to be tracked, but there would be little if any cost associated with the attributes themselves. Hence, an active market for renewable energy would effectively supersede the voluntary market for RECs.

[271] The voluntary REC market discussed here refers to the wholesale market for RECs outside of RPS compliance markets. This voluntary REC market supplies RECs used in retail green power products. However, it is important to note that there is a distinction between the voluntary market for RECs at the wholesale level (discussed in this section), and the retail green power market discussed in the prior section.

Based on the findings described above, it would be impractical for New York to expect the voluntary green power market to replace RPS demand as a driver for future large-scale project development in the State in the near future. It appears that technological cost improvements or regulatory drivers, such as national carbon regulations, or possibly a national RPS, would be necessary to replace the state-level RPS as a key driver for large scale renewable energy development.[272]

6.5 SUMMARY

Enrollments in the various voluntary green power market offerings have grown steadily since 2004. All providers expect continued growth in the future, but see the potential for substantially more growth if a number of steps are taken.[273] First, program administrators and policy makers should consider increasing outreach, education, and marketing efforts, including using high profile endorsements by prominent public officials in order to increase customer awareness and trust in renewable energy products. Second, policy makers should develop an integrated regional attribute tracking and trading system and might consider providing more flexibility for providers to use non-NYISO green energy in the resource mixes providers offer to customers. The State should also take action to simplify the requirements placed on green power providers when enrolling new customers, and encourage utility cooperation with and support for voluntary green power market efforts. Policy makers could consider adopting a statewide program similar to the Connecticut Clean Energy Option in which all utilities would be mandated to adopt the program, open their program to multiple green power providers, and meet a minimum percentage enrollment level (or face penalties). Last, the State should continue to take steps to increase wind power production in the State, as this is the most popular green power source among residential customers.

The voluntary market for renewable energy in New York is currently insufficient in scale and financing structure (no long-term contracts) to function as a significant driver for large-scale renewable energy project development in the State. It would be inappropriate for New York to expect this market to replace the RPS market as a major driver of development in the near-term. However, over the longer term, changes in market conditions may occur (i.e., national greenhouse gas regulations, or a major decline in equipment

[272] A federal program might recognize and meld with state RPS programs

[273] Some providers estimate potential enrollment of 500,000 customers or 3% to 4% of the households in New York.

costs), which will make renewable energy more cost-competitive with conventional energy sources, making voluntary purchases of renewable energy a more substantive driver for project development.

Section 7

EFFORTS TO SUPPORT RENEWABLE ENERGY MANUFACTURING AND RELATED BUSINESS DEVELOPMENT IN NEW YORK

New York offers a number of programs to grow the businesses that make up the renewable energy industry. These efforts are critical for a variety of reasons. They help New York maximize the economic development benefits of renewable energy industry growth, starting with the upstream components of the market. In addition, they help establish a solid foundation for long-term market growth, and help New York remain competitive with other states that are also working to attract renewable energy business growth. This section first presents a summary of NYSERDA's programs targeted at industry development. Because renewable energy manufacturers have the potential to bring such important economic development benefits to the State, the section also discusses the elements renewable energy manufacturers look for when deciding where to locate their facilities.

7.1 NYSERDA PROGRAM EFFORTS TO SUPPORT RENEWABLE ENERGY BUSINESS DEVELOPMENT IN NEW YORK

CST staff were asked about a number of PONs that could help foster economic development and growth in the market for the CST technologies, as well as the infrastructure to support them. Specifically, the following PONs have been utilized to support such objectives:

1. PON 776: Entrepreneurial Business Networks and Incubators for Renewable and Clean Energy Technologies
2. PON 1118: Initial Prototype/Technology Development
3. PON 1124: Clean Energy Business Growth & Development
4. PON 1115 and 1176: Financial Support To Expand Manufacturing Capabilities in NY

All CST Program Staff recognize the value of NYSERDA's sponsorship of Research and Development (R&D) and economic development programs. One staff member focused, in particular, on the benefits of training educational institutions that in turn train the workforce for renewable energy technologies. The benefits of developing a certification process to evaluate the competence of the workforce were also cited.

Training and accreditation are very important for the CST technologies as they assure customers that the workforce installing the technologies is highly trained and skilled, and they ensure that ratepayer funds are being spent to support high-quality installations that will deliver the expected benefits.

Program staff were asked more detailed questions about the impacts of PONs 1124 and 1176. PON 1124 is targeted at business innovation and growth by helping firms explore different business plans and models to bring new technologies to market. Program staff have found that firms are using the funding from PON 1124 to leverage more financing, and using the review by NYSERDA to demonstrate to potential financiers that they have completed their due diligence required for funding. In addition, at least one funded project is helping to further train a qualified workforce by testing methods of installing PV panels more efficiently with the help of students from a local technical college.

PON 1176, targeted at helping firms expand manufacturing capabilities, has been more of a challenge according to the program staff because not all applicant technologies are commercially viable and because it is not clear whether funding should be focused on the business development aspect of the firm or towards the process of expanding manufacturing capabilities. With this in mind, the program staff suggests that the evaluation criteria for the PON may need to be modified, focusing less on metrics such as units manufactured, and emphasizing metrics more appropriate to the start-up stage of a company.

7.1.1 Program Results

Other program staff cited several occurrences of NYSERDA's sponsorship that resulted in positive gains for the market conditions of the CST technology they support. As an example, for small wind technologies, the program manager mentioned the Wind Resource Explorer, a product developed through the predecessor of PON 1118. The Wind Resource Explorer[274] predicts wind speed at potential sites. The solar program manager reported that NYSERDA's industry development programs are making a difference as well; an inverter manufacturer partnered with a NYSERDA R&D effort while a PV mounting product was also developed with NYSERDA's assistance. Additionally, support was provided for installation training schools, and NYSERDA re-issued a work force development PON which has raised the level of productivity and efficiency in the PV installation business.

[274] Windexplorer.com.

For ADG applications, several NYSERDA-sponsored products or programs are under development, but not yet used in the market. In the past, a number of potential ADG projects received funding through the Flex Tech Program. However, the policy of using that program for additional funding of CHP technologies has changed and funding has been eliminated.

For fuel cells, NYSERDA provided support for developing Plug Power, a small fuel cell manufacturer, and has sponsored a couple of New York companies developing fuel cells and related components. For example, MTI Micro Fuel Cell developed replacements for batteries in handheld devices (cell phones, etc.). Another solid oxide manufacturer is making a product for tractor trailers to supply electricity for refrigeration so cargo will stay cold when the truck's engine is off.

Program staff identified other programs that are helping to attract clean energy manufacturers, suppliers and qualified workforce to New York, such as the Empire State Development fund and PON 1216. PON 1216 is an incubator fund that will fund up to three clean energy start ups. In addition, Clinton Community College recently announced that it was starting a new two-year degree program in alternative energy. [275]

7.1.2 Program Opportunities and Barriers

Program staff mention a number of program gaps that could be addressed. Project managers for ADG technologies suggest the need for more technology transfer. For example, there are many case studies from projects currently being funded which will help in explaining the program and technology to future participants. Emerging small wind technologies may need some NYSERDA support, including testing centers for the technologies. For fuel cells, the project managers believe a trained work force is very important for any given CST program, but it is premature to be too concerned about developing a trained work force in the fuel cell industry, because the installation volume in New York is so low.

Program staff also identified several barriers to attracting clean energy businesses to the state. For PV, the insufficient amount of total incentives is an impediment as the large PV manufacturers and market participants tend to be in the states that have larger total incentive programs. For large scale wind, siting issues continue to be a problem. However, the respondent believes that the RPS is helping with siting

[275] Sarah Terry-Cobo, "Power in the Air," *Forbes*. July 22, 2008. http://www.forbes.com/2008/07/21/wind-power-pickens-tech-science-cx_stc_0721wind_print.html.

issues, particularly as developers and communities become more familiar with large scale wind projects. For small wind, cost and siting issues remain barriers. The main barrier for ADG is the lack of a trained workforce.

7.1.3 Summary

NYSERDA's sponsorship of research and development and economic development programs appear to have a number of beneficial impacts on New York States' ability to attract clean energy manufacturers and a qualified workforce. For example, programs have helped train the workforce for renewable energy technologies, assuring customers that the workforce installing the technologies is highly trained and skilled. Other programs have helped firms gain more financing to expand their operations and to develop new technologies for green power applications. There are also opportunities for several new NYSERDA programs, including support for emerging wind technologies and further training of the workforce for ADG and fuel cell technologies.

7.2 WHAT IS MOST IMPORTANT TO MANUFACTURERS AND WHAT FACTORS WILL AFFECT THEIR LIKELIHOOD OF LOCATING FACILITIES IN NEW YORK?

Manufacturers and distributors of renewable energy equipment have been seriously considering locating facilities in the United States for the first time in many years. Lingering concerns about the stability of the federal tax credits that drive the markets for renewable energy technologies, especially wind and PV, continue to complicate the decision. Investments in manufacturing facilities in the United States in recent years have been viewed as very risky in light of these uncertainties about key policies.

Yet, large players in the marketplace, especially those with European ties, are feeling more confident that the federal government, led by Congress, will soon adopt a stable federal renewable energy policy. Most anticipate that this federal policy will come in the form of longer extensions of the PTC and ITC, which will shore up the market for renewable energy technologies when combined with other market forces: state

RPS policies, pending carbon legislation, and growing consumer awareness about energy choices. Together with the weakened dollar, these forces are making the United States an attractive place to locate a renewable energy equipment manufacturing or distribution facility.

7.2.1 Primary Decision Point: Logistics

Once the decision to locate in the U.S. has been made, logistics is the primary driver behind manufacturers' and distributors' decisions to locate their facilities. A company's decision about where to locate a manufacturing or distribution facility is a major factor in the company's cost of doing business. Operating costs related to shipping, workforce training, procurement of relevant components, and general administrative costs are significantly affected by where the facility is located, especially relative to other companies in the supply chain.

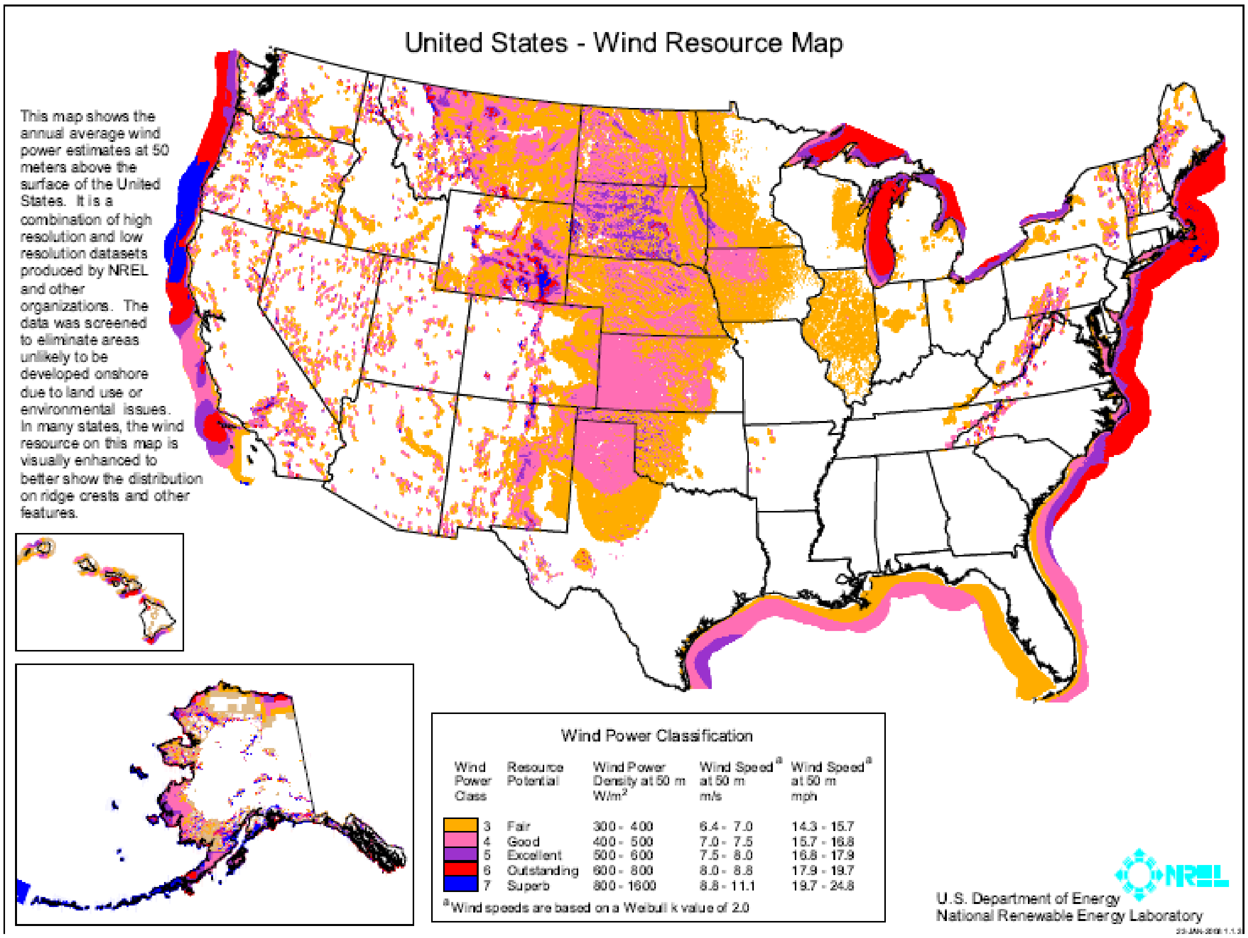
Within the logistics analysis, one factor is the most important: **the proximity of the facility to the end markets.** The cost of shipping the finished product to its point of use makes a significant impact on the bottom line. If a facility is located close to a very large market or to several strong markets, it can save a company millions – or tens of millions – of dollars in shipping costs each year.

The size of the end markets is determined by the policy drivers (i.e., RPS policies and incentive programs) and the achievable resource potential, which is affected by local siting and permitting policies, local receptivity to renewable energy (i.e., NIMBY issues), access to transmission, and other factors discussed in section 2.2.3 of this report. For wind, the primary markets are in the central and western parts of the United States, where resources are abundant and population is sparse. Figure 54 shows the nation's wind potential. For PV, the market is driven more by incentive levels; California is by far the largest market, and the markets in several other states, including Colorado and New Jersey, are expected to continue to grow.

State RPS policies are important to the extent that they contribute to creating markets for renewable energy. From an investor's perspective, policies that create markets come with binding targets, clear penalties for non-compliance, and a demonstrated commitment on the part of state government to sustain and enforce the policies. This often leads to incentive programs offered by the State or by the local utility to facilitate development of renewable energy projects in the states. While these incentive programs can come in many forms, the important aspect is that they are appropriate for the technology that is being considered. Especially for PV, these incentives are a critical component of making the project economics work.

Decisions to locate manufacturing or distribution technology are not driven by an RPS policy in just one state, however. Manufacturing and distribution facilities typically target markets in multiple states. Thus, the size of the total market created by RPS policies in several nearby states is considered when siting a facility. A single state's policy is not typically sufficient to justify locating a facility in that state, though California may be an exception to this rule.

Figure 54. Annual Average Wind Potential in the United States



Source: National Renewable Energy Laboratory, "United States – 50-Meter Wind Resource Map," January 2006, http://www.windpoweringamerica.gov/pdfs/wind_maps/us_windmap.pdf.

In addition to the proximity to markets, companies consider a potential facility's **access to transportation hubs**. It is more cost-effective to ship equipment by rail or by boat than it is to ship it by truck. Thus, proximity to a major rail tie-in or to inland waterways is also attractive. In some cases, however, transporting equipment by truck is unavoidable; for these scenarios, proximity to major interstates is a secondary consideration.

The proximity to major transportation hubs is also important because of the global nature of the renewable energy technology supply chain. While a company may opt to locate a wind gear box manufacturing plant in a given state, for example, the components that make up the gear box are manufactured in other states and in other countries. Once the gear box is completed, it must be shipped elsewhere to be assembled into the full turbine; in these later manufacturing stages typically the facilities are located closest to the markets that they serve. Thus, companies must look up and down the supply chain in order to fully assess the logistical implications of a facility locating decision.

Companies are looking to locate new wind manufacturing facilities **in the middle of the country** rather than close to the coasts. Most wind firms have existing manufacturing capacity in Europe and in Asia; these overseas facilities can typically service the wind projects in the coastal United States, including New York. Since these coastal markets are already served by existing capacity, the companies are seeking to locate plants in the middle of the country in order to service the inland projects. With such a large portion of achievable onshore wind potential in the central United States, these facilities are also located close to the primary markets that they will serve.

Finally, the logistics equation is also affected by the **location of a company's other facilities**. Beyond the consideration of existing manufacturing facilities in Europe and in Asia, companies will also consider the proximity of a new facility to other domestic corporate facilities. For example, one PV distributor interviewed for this report described the extra cost involved in locating a distribution facility in a different state than its existing sales/administrative offices. The farther that the distribution facility moves from the administrative offices, the more costs incurred in staffing, supervising, evaluating, and operating the facility. When a company has several administrative or sales offices distributed around the country, co-locating any new distribution facilities with these existing facilities can save hundreds of thousands of dollars per year per facility.

7.2.2 Secondary Considerations

After the logistics analysis is completed, manufacturers and distributors consider other factors that have strategic implications that affect the bottom line to a lesser extent. Since their impact is less than the impact of the logistics, these factors often do not surface until the options have been narrowed to a few states.

- When possible, manufacturers want to locate in areas with work forces familiar with the manufacturing processes that will be used at their facilities. Wind manufacturers can leverage capabilities learned from experience in the heavy manufacturing industry while PV manufacturers can leverage capabilities learned in the manufacture of silicon-based microprocessors and related equipment.
- Generally speaking, manufacturers and distributors tend to favor states with regulatory and policy regimes that are favorable to renewable energy. While RPS policies are one aspect of this area, companies are seeking to locate in areas with policy makers that are supportive of renewable energy in both its conceptual and implemented states.
- Once all of the other components of the analysis are completed, manufacturers and distributors will assess the effects of the financial incentives offered by the states that are still in the running. In some cases, the financial incentives can offset some of the differences in up-front costs, but cannot overcome the differences in long-term operating costs. In other cases, the state incentives can help to overcome differentials in work force preparedness by supporting the training of less-qualified workers. The outcome of this analysis varies from one situation to the next.

7.2.3 Attracting Renewable Energy Manufacturers and Distributors to New York

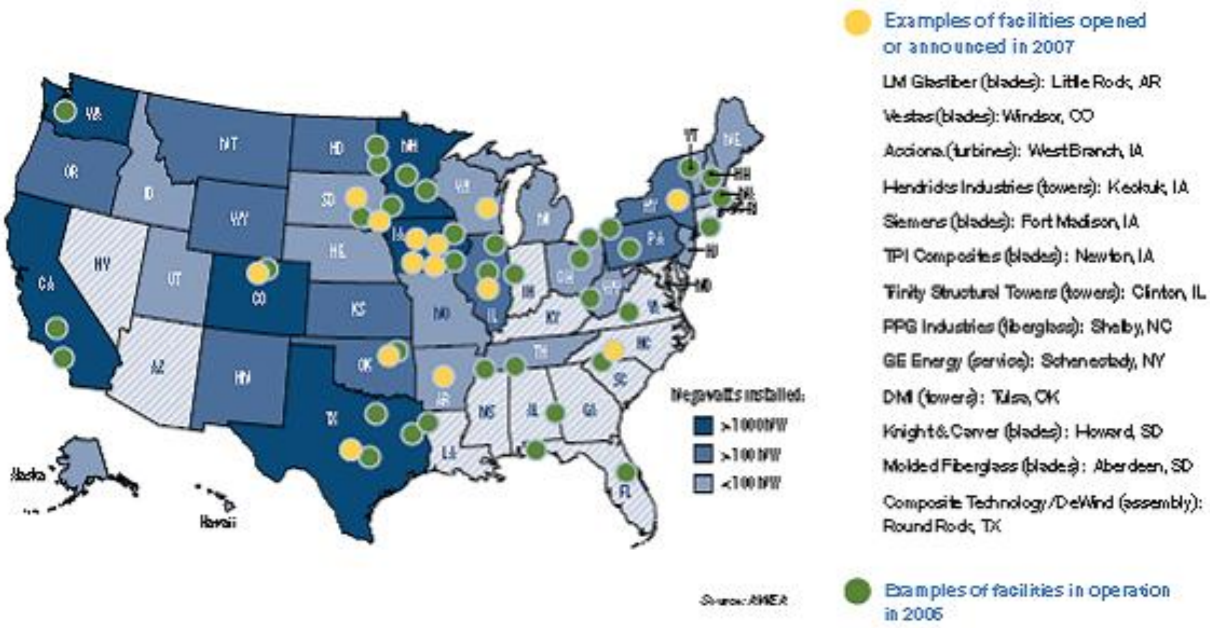
Like their decisions to locate elsewhere in the United States, the decisions that manufacturers and distributors make to locate in the state of New York are driven by logistics. Specifically, two factors detract from New York's ability to attract renewable energy manufacturers and distributors: (1) location on the East Coast; and (2) proximity to markets of scale. First, New York's proximity to ports on the East Coast makes it less attractive as a manufacturing or distribution base, because the New York market can largely be served by other corporate facilities in Europe. Larger companies are dominating the wind manufacturing space, and other larger companies are emerging in the PV space. Typically, these multinational firms served the European market prior to serving the United States market, and they already have facilities in Europe. As discussed previously, facility siting decisions in the United States tend to focus on the middle of the country. Thus, New York is at a disadvantage.

Second, New York's current market is considered too small to justify a wind manufacturing or PV distribution facility. Manufacturers and distributors discussed NYSERDA's budgets as a limiting factor growing the markets for wind and PV in the state. At a regional level, the market for wind in the Northeast is diminished by local opposition to wind development; the market for PV is reasonable, but several PV distribution facilities already exist in other states in the region. Any new facilities in New York must be justified by growth in shipping costs from other regional distribution centers to New York; that is, the annual operating costs of a new facility would need to be less than the cost of shipping equipment to New York to satisfy demand. As such, a facility in New York cannot compete with those in the middle and western parts of the country given the size of the state's market today.

As shown in Figure 55., most wind manufacturing-related facilities in the United States are in the middle of the country. New York does have one facility that American Wind Energy Association classifies as a wind manufacturing-related facility: GE's Wind Product Management and Customer Support Center. This facility will add professional rather than manufacturing jobs, however; it focuses on customer service, remote monitoring of deployed turbines and the identification of new markets for existing GE technologies.[276]

[276] GE Energy, "GE Energy Opens Customer Support Center in Schenectady, New York, to Support Rapid Growth of its Wind Energy Business," City of Schenectady, Press Release, July 26, 2007, http://cityofschenectady.com/press%20releases/Schenectady_Wind_Center.pdf.

Figure 55. Wind Manufacturing-Related Facilities in the United States



Source: American Wind Energy Association, "Wind Power Outlook 2008," 2008, http://www.awea.org/pubs/documents/Outlook_2008.pdf.

Despite these challenges, New York may have the opportunity to develop a base of manufacturers and distributors of the smaller components of wind turbines. Each wind turbine is made up of roughly 20 major components, subsets of which are assembled to create the larger parts of the turbine – the nacelle, rotor (including the blades), tower, and the balance of system.[277] While the larger parts of the turbines are typically assembled close to the end market, the components are often manufactured farther away. Further, the components are often manufactured as an add-on to an existing manufacturer's product line, rather than as a new stand-alone product for a new company. Thus, New York could build on its existing manufacturing and distribution bases to encourage a strengthening of the supply chain for renewable energy technologies.

In 2004, five companies with facilities in New York were manufacturing or distributing components of wind turbines. Table 27 describes their locations, the components produced in 2004, and the status of their operations as of September 2008. Each of these companies developed the renewable energy technologies as

[277] G. Sterzinger and M. Svrcek, *Wind Turbine Development: Location of Manufacturing Activity*, Renewable Energy Policy Project, Technical Report, September 2004.

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expansions of their existing product lines; their facilities had been located in New York State for years, and the renewable technologies were simply added to the scope of New York operations.

Table 27. Wind Turbine Component Manufacturers/Distributors in New York

Company Name	Location	Components Produced (2004)	2008 NY status
Hilliard Corporation	Elmira, NY	Brakes, Complete Wind Turbine	Distributor of brakes
Hitachi America, Ltd.	Tarrytown, NY	Generators, Power Electronics	Distributor of generators
Innovative Metal Products	Kenoza Lake, NY	Towers	Out of business
Peerless Winsmith, Inc.	Springville, NY	Gear Boxes	Discontinued gear boxes; exploring potential for concentrating solar technology
Telecom and Energy Cables	Floral Park, NY	Balance of System	Changed name, no longer manufacturing renewable-related equipment

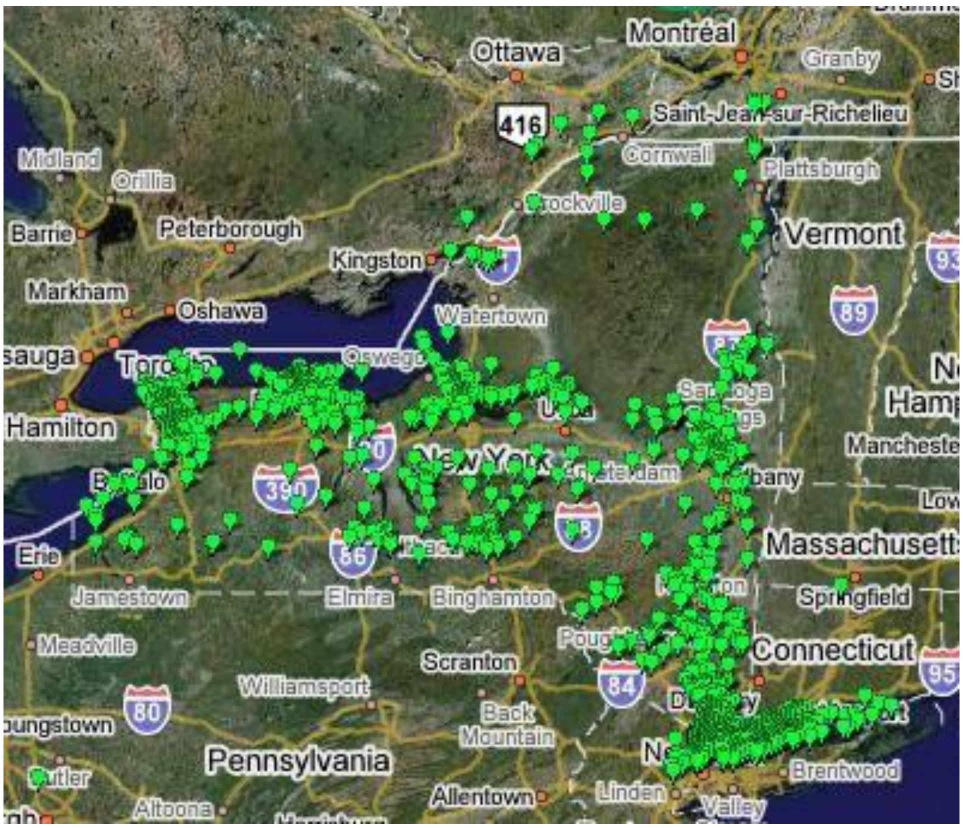
Source: First three columns: G. Sterzinger and M. Svrcek, Wind Turbine Development: Location of Manufacturing Activity, Renewable Energy Policy Project, Technical Report, September 2004.
Final column: Email correspondence, phone inquiries, web searches.

Since 2004, these companies have reacted to changes in the market differently:

- Innovative Metal Products closed its doors in 2007 due to a variety of factors, including the inability in to secure a long-term fixed-price contract for their towers and price competition from overseas manufacturers.
- Telecom and Energy Cables is now doing business as Taihan Electric USA Ltd. It no longer manufactures the equipment that it did in 2004.
- Peerless Winsmith, Inc. is no longer manufacturing the gear boxes for wind turbines, because the components became too large for the company's facilities to handle as the scale of turbines grew significantly. Peerless Winsmith is now in the process of developing a new renewable energy technology, tracker drives for concentrated solar power plants.
- Hilliard and Hitachi appear to continue to distribute renewable energy-related equipment, though not all of the same types that were distributed in 2004.

Moving forward, opportunity remains in New York to encourage more companies to expand their existing product lines to include renewable energy-related equipment. A recent study by the Blue-Green Alliance and the Renewable Energy Policy Project estimated that 457 existing companies in New York are active in industrial sectors that could also supply the components needed to achieve a 15% reduction in greenhouse gas emissions nationwide.[278] Figure 56 maps out the locations of the New York facilities with the ability to contribute components to the wind industry; Figure 57 identifies the facilities that could produce components in New York for the PV industry.

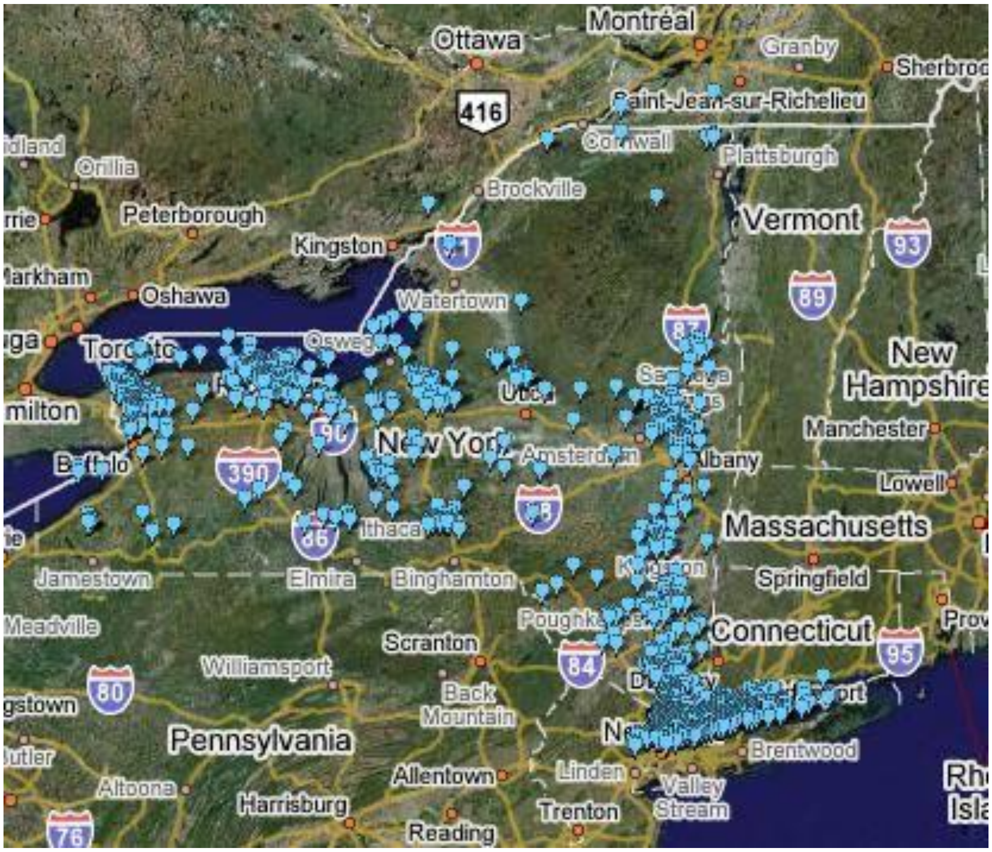
Figure 56. Locations of Existing Manufacturing Facilities with Potential to Produce Wind-Related Components



Source: Renewable Energy Policy Project, 2007, http://www.repp.org/images/New_York_Wind_Hybrid_Map.JPG.

[278] Blue Green Alliance and The Renewable Energy Policy Project, *New York's Road to Energy Independence*, Summary Report: New York, 2007, http://www.bluegreenalliance.org/site/c.enKIITNpEiG/b.3417259/k.BD27/Links.htm.

Figure 57. Locations of Existing Manufacturing Facilities with Potential to Produce PV-Related Components



Source: Renewable Energy Policy Project, 2007, http://www.repp.org/images/New_York_Solar_Hybrid_Map.JPG.

The state of New York could leverage these companies' current familiarity with the market to expand the State's renewable energy manufacturing base. These companies understand the current landscape for manufacturing in New York, including the benefits and strategies for overcoming the challenges. Some may need to make additional capital investment in facilities that are suitable for manufacturing renewable energy-related technologies, and they may recognize co-location with existing facilities as a benefit. Others may be able to utilize existing in-state facilities for the new product lines. There are fewer hurdles associated with convincing a company to remain or expand in New York State compared to recruiting a new one to locate in the state. Identifying strategies for encouraging the development of market-worthy renewable energy technologies is an opportunity that the state can consider.

7.2.4 Summary of Renewable Energy Manufacturers' Decision Drivers and Opportunities for New York State. Manufacturers that serve the renewable energy market place logistics at the center of their facility-locating decisions. The cost of transporting the subsystems of renewable energy systems (e.g., wind blades, wind towers) are a primary expense for these companies. Accordingly, they prefer to locate manufacturing facilities as near as possible to their end markets at sites with access to transportation hubs. Renewable energy manufacturers must also take into account the location of their other facilities, both domestically and internationally. In the wind industry, this often results in locating new facilities in the middle of the country, close to the vast wind resources in the Midwest and Western United States; the mid-country location also enables these companies to serve markets that are too far from coastal ports for their international facilities to serve. Beyond these logistical considerations, renewable energy manufacturers and distributors will also consider the local work force qualifications and the states' political and regulatory attitude toward renewable energy. Finally, after all of the other factors have been taken into account, these companies will examine the financial and tax incentives offered by the states that have made it into their final round of consideration.

Moving forward, New York is well positioned to leverage its existing manufacturing base to expand the state's presence in the manufacture of renewable energy technologies. Existing manufacturers are engaged in technologies that can be adapted to the renewable energy market in the form of sub-components. That is, rather than manufacturing turbine blades, New York manufacturers could expand an existing product line to manufacture wind turbine brakes or gear shafts. Some existing manufacturers in New York have already begun down this path but may require assistance in entering the market at a reasonable scale.

Section 8

STEPS TO TRANSITION NEW YORK'S RPS TO A MORE MARKET BASED SYSTEM

New York's RPS program was designed to address needs that existed in the marketplace in 2004, when the program was introduced. The PSC recognized that developers needed revenue certainty in order to get projects financed, and deemed a centrally organized system for offering long-term REC contracts as an appropriate means of addressing this need.[279] The PSC understood that market conditions may change going forward, and that different approaches may become more suitable for building a durable, long-term renewable energy market. Therefore, in its 2004 Order, the PSC called for an evaluation of the RPS program in 2009 to explore the ongoing effectiveness of the current approach.

The PSC also requested that the 2009 evaluation address the steps necessary to transition to a more market-based approach in the future. In its 2004 Order, the Commission stated, "[T]his Commission desires that, ultimately, competitive markets will sustain renewable resource development, and we expect that as part of the 2009 Review NYSERDA will submit a proposed plan for transitioning this effort to a more market-based approach over time."[280] The current system is market-based in the sense that it provides a place for buyers (represented by NYSERDA and green power marketers or ESCOs) and renewable energy sellers to exchange goods (i.e., buy and sell RECs), A more market based system would be one less driven by a government compliance standard and abetted by public funds.

The Order also stated that the aim of the RPS was "establishing a viable, self-sustaining competitive renewable generation market."[281] "Self-sustaining" is not defined in the Order, but can be defined as "maintaining or able to maintain oneself or itself by independent effort."[282] The Order established the program elements oriented towards the voluntary market with the specific intention of enhancing the voluntary markets.[283] For the purposes of this assessment, it is assumed that a self-sustaining renewable

[279] State of New York Public Service Commission. "Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard: Order Regarding Retail Renewable Portfolio Standard." Case 03-E-0188. Issued September 24, 2004. P. 51.

[280] Ibid., p. 7.

[281] Ibid., p. 23.

[282] Merriam-Webster's on-line dictionary. 2008.

[283] P. 12. "An approach that incorporates and supports the growth of competitive retail markets and customer choice for renewables will have a greater chance of producing a self-sustaining renewables

market could be considered at two levels: at best, it is a market in which no premium payments or RECS are needed, secondly, it could be a market in which no ratepayer-funded incentives are required because the premiums paid through the voluntary market activity are able to sustain the renewable energy industry. A functioning “market-based system" is an essential step in the process of eventually achieving a self-sustaining market.

In support of the Order’s requirement for the 2009 RPS program review to address the topic of planning for a market-based system, this chapter highlights the elements necessary to build a successful market-based system, and explores the extent to which New York’s renewable energy market currently possesses these elements. This section also discusses challenges and opportunities that face New York’s renewable energy market going forward.

This section discusses the renewable energy markets as a whole, making some references to the needs that are specific to large-scale renewables, but little distinction regarding the needs for smaller-scale renewables. This is due to the fact that the small scale market would benefit from many of the same changes suggested for the market as a whole, and the fact that the primary focus of our efforts was the main tier program / large scale renewable energy market.

8.1 ELEMENTS NECESSARY FOR ACHIEVING A MORE MARKET-BASED SYSTEM TO SUPPORT RENEWABLE ENERGY GROWTH

Based on interviews with stakeholders in the New York marketplace, as well as on secondary research, the most fundamental elements necessary for achieving a more market-based system to support renewable energy development in New York are:

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industry that can build upon any success in developing renewable resources through the RPS. Therefore, it is in keeping with our mission to be responsive to the concerns expressed by several parties to design the program in a manner that enhances voluntary green markets.

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- Long term certainty;
- Open, liquid markets;
- Limited barriers to participation;
- Existence of market drivers to achieve target level of market activity; and
- Transparency.

These fundamental elements of a more robust market-based system are summarized below.

Ultimately, to foster a self-sustaining market for renewable energy in which no premium payments or RECs are needed to ensure a return on investment, higher energy revenues and lower capital and site development costs would be essential conditions.

8.1.1 Long Term Market Certainty

By far, the most common and basic need expressed by market participants in New York and elsewhere is for long-term market certainty. From developers to manufacturers, companies are better able to grow and help build the market if they can reasonably predict the volume of supply the market will demand, and can plan for several years into the future. While long-term contracts provide revenue certainty at the project level for those developers able to secure such contracts, several features of the New York market make it difficult for market participants to plan for the future of their business activity in the State.

First, several developers entered the New York market based on assumptions about the level of demand for renewables that would result from the RPS. However, because NYSERDA's REC procurements are budget-constrained by fixed collections authorized by the PSC, the agency has not procured as many RECs as are needed to meet annual targets. Uncertainty around the number of RECs NYSERDA will procure in a given year makes it hard for market participants to gauge the balance between the supply of and demand for RECs in the State and therefore set their bid price based on the demand.

In contrast, in other states, load serving entities are responsible for complying with RPS requirements. Several states possess "hard targets" in which load serving entities must pay alternative compliance or penalty fees for falling short on REC procurements to meet an annual RPS requirement. In addition, several states post lists of renewable energy generators that have been certified as eligible for their RPS. In those states, developers and project owners can more readily assess where their project fits into the state's REC market. One interviewee explained, “In other markets it’s easier for businesses to size up their opportunities…, but with a lack of firm requirements in New York it’s harder to participate in the market.”

Developers also expressed concern about the inconsistent timing of RPS solicitations. Interviewees requested a clear schedule of when future RPS solicitations will take place for the next several years. Market participants would like to know whether they can plan around an annual solicitation process, and when specifically in the year the solicitations would take place.

Most developers felt that the current RPS targets were achievable given the renewable resources available in the State. Increasing the State’s RPS commitments and setting a longer-term compliance schedule would provide greater market certainty and would facilitate the realization of more of the State’s renewable energy potential.

Another area of concern for developers was general regulatory uncertainty. When rules change midstream (i.e., new resources become eligible or the compliance approach changes), this shifts the balance between supply and demand and can undermine the business decisions made by existing market participants. For these reasons, New York should be cautious about introducing changes to its current market system. However, any changes that bring about more long-term certainty would be a net gain for renewable energy market participants in New York.

Uncertainty regarding the PTC is a major issue for the renewable energy industry. This uncertainty was reduced in October 2008, when the PTC was extended through the end of 2009. However, future extensions remain uncertain; this has been an ongoing problem for the industry. If the State had hard targets for renewables, this would reduce uncertainty for developers. The party responsible for compliance (NYSERDA or other designees) would still be required to obtain enough renewable energy to meet the RPS targets, despite the higher costs. As a result, REC prices would be expected to rise if the PTC were to expire.

A potential alternative to the PTC would be a stringent regional or federal greenhouse gas regulation. Several respondents made reference to this as a key to ultimately achieving a sustainable market. Such regulation would impose a cost (through allowances or carbon tax) on greenhouse gas emissions, which would result in higher electricity prices. The higher electricity prices would provide more revenue to renewable generators, offsetting the need for a PTC. A $40 per ton cost of CO_2 would likely offset the

$20/MWh PTC.[284] This level of allowance cost is substantially higher than the $3.07/ton realized in the recent RGGI auction.[285] While this market would obviously be driven by government policies with respect to carbon, it would be more market-based with respect to renewable demand than a government-specified target.

8.1.2 Open, Liquid Markets

As a general rule, markets are most successful when there is a diversity of buyers and sellers and these market participants have the flexibility to negotiate contract terms that suit the characteristics of each deal. This was confirmed through interviews with developers. Developers wish to conduct their business according to the development timeline of their specific project(s), and they prefer to have backup options if they are unable to secure a NYSERDA REC contract, or if they end up with excess supply[286]. Developers do not currently find these features in the New York REC market.

Many developers described NYSERDA as the "only buyer" in the New York REC marketplace. Renewable energy generators in New York have the ability to sell RECs to buyers in other states; they have limited opportunity to sell RECs and energy to LIPA; and they are encouraged through the New York RPS program design to sell RECs to the voluntary green power market in the State. However, developers view these alternatives as far inferior to a NYSERDA REC contract. There are costs associated with exporting energy and RECs outside the NYISO control area; LIPA has largely relied on landfill gas and small hydro projects to fulfill its REC procurement needs[287]; and the voluntary market has REC prices that are too low, has too little volume certainty, and lacks long-term contracts with credit-worthy entities for it to function as a driver for project development.

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[284] Conservatively assuming an average emissions rate of 0.5 tonnes per MWh. The emission rate for natural gas power plants is approximately 0.5 metric tonnes of CO_2/MWh, while the emission rate for coal-fired power plants is about double, at 1.0 metric tonnes CO_2/MWh. U.S. Environmental Protection Agency. 2000. eGRID.

[285] http://www.rggi.org/co2-auctions/results. Downloaded October 22, 2008.

[286] Note that if the 25% goal is the same but divided proportionately among six utilities, it would not be a bigger market demand. It would be more buyers for smaller amounts.

[287] In 2008, LIPA issued an RFP for bundled renewable energy and RECs. In the RFP, LIPA sought a total of 350 GWh.

The ability of a project to secure a NYSERDA REC contract can have a considerable impact on its economics. Without any alternative buyers of substantial scale in New York, and given that developers need to invest so much in a project before they know whether they will secure a NYSERDA REC contract, developers of renewable energy projects in New York are exposed to significant risk.

A number of developers explained that the timing of the solicitations also limits market liquidity. Failure to secure a REC contract in one year may mean they need to wait for the next NYSERDA RPS solicitation in order to move ahead with their project. They have fairly limited control over many of the moving parts in the development process (i.e., permitting, turbine supply, interconnection costs resulting from their class year status, etc.) and having to wait another year or more could add great expense to their development process. NYSERDA is unable to buy short term or "balance" the market. Additional RECs may become available that NYSERDA might be able to use to meet the RPS goals, if the policies allowed such procurement. The risk of failing to secure a contract with NYSERDA is exacerbated by the program's limited funding due to the collections set by the PSC.

Several developers noted that the New York RPS should be structured such that it is more consistent with "real world market conditions." A preferred scenario for developers of most technologies would be for them to have the ability to enter into long-term REC contracts with a variety of different potential buyers at the time when their project is ready to enter into such a deal, because this could give them more flexibility and options. However, having a variety of buyers is inconsistent with the current central procurement structure on which the Main Tier component of the New York RPS is based.

Policy makers should consider various options to providing a more open, liquid market. More frequent procurements and more flexible contract terms are two approaches. Another is for load serving entities to take on the responsibility of meeting a portion of the RPS target, while maintaining the central procurement approach for a subset of the RPS target. This could provide a robust in-state secondary market for RECs for those projects unable to secure NYSERDA contracts. It would also help establish market infrastructure for a time when the State no longer provides long-term contracts through NYSERDA. Firm requirements with compliance penalties would be an important feature to include in any requirements that would be placed on load serving entities. Firm requirements are strong drivers that could be applied to the central procurement model as long as there ratepayer collections to support the procurements. However, compliance payments are not applicable to the central procurement model. In a LSE /central procurement hybrid model, compliance payments from LSEs signal a lack of progress toward the RPS goal, and so these funds could be allocated to the central procurement fund.

An alternative means of providing market participants with greater flexibility in the timing of their receipt of incentives and also providing greater market certainty would be to shift to a “standard offer” incentive approach in which a fixed price REC offer was available to any qualifying projects on a first-come first served basis until funding is exhausted. However, as with any “feed-in tariff” type approach, it is difficult to achieve economic efficiency in setting incentive levels, because prices are not set by the market. This approach would also likely provide less contract term flexibility and may come at a higher cost. While several developers expressed support for a feed-in tariff or standard offer approach, most developers felt that political challenges would make such an approach unfeasible. Furthermore, this is inconsistent with the PSC’s goal to move to a market-based system.

In either of the two scenarios described above, the result may be less favorable for ratepayers than the current program structure. If load serving entities were responsible for meeting a portion of the RPS target, and compliance penalties are in place, a short supply scenario would cause load serving entities to pay more for RECs and would result in higher compliance costs without any progress towards bringing new resources on line. Furthermore, if LSE or utilities were to rate base the cost of renewables, New York could stand to lose the element of transparency regarding the costs of the program. This approach may increase administrative costs and consequently be detrimental to ratepayers. If a standard offer approach were used, the fixed price REC offer would inevitably over or under-subsidize some projects. However, if the priority is to achieve a more open-market structure than currently exists, the PSC will need to determine which tradeoffs the State should make to achieve that goal. A contracts-for-differences approach could address changing market conditions. These approaches require further study.

Market liquidity in New York is also limited by the fact that the State does not have an appropriate attribute tracking system conducive for trading with RECS in neighboring markets. Adopting a new attribute tracking system would benefit the full range of market participants by helping to facilitate more expeditious REC trades, as well as inter-regional trade. It would also avoid double counting of attributes. This is something that the State is already addressing, and efforts to adopt a new system in the near-term should continue. Attribute tracking could also prove valuable for ADG systems in that it might also enable sale of methane avoidance or destruction credit, sold on the Chicago Climate Exchange.

8.1.3 Limited Barriers to Participation

Reducing barriers to participation in the New York renewable energy market will help facilitate growth of a functional market system. As discussed in Section 4.2.3, key barriers to large-scale renewable energy development in New York in which the State can play some role to help mitigate include transmission capacity constraints, siting and permitting. In addition, the incompatibility of New York's attribute tracking system with those in neighboring regions presents a barrier to voluntary green power marketers and renewable energy developers alike.

The State's existing transmission capacity is insufficient to support all of the potential development of New York's renewable energy resources, much of which exists at a distance from the load centers. The State should take steps to ensure that limitations on transmission capacity do not stand in the way of the New York's ability to realize its renewable energy development potential. In particular, contentious decisions about cost allocation among developers, T&D owners, and ratepayers for new infrastructure are a barrier to new development. The State should look to the innovative approaches being used by several different states for examples of opportunities for minimizing this barrier in the New York market. Some of these approaches are summarized in Section 4.2.3.

Passage of an Article X siting law would help reduce uncertainty in the permitting process and streamline the project development process. In addition, the State could help by identifying the most favorable areas for renewable energy development, taking into consideration local ordinances and the level of community support for development in addition to resource potential. The State could encourage or reward communities that develop "shovel-ready" sites that have generic permit approvals ready to go. Finally, as noted above, adopting an attribute tracking system that is compatible with neighboring regions would help minimize barriers to market activity in New York.

8.1.4 Market Drivers Sufficient to Achieve Target Level of Market Activity

Renewable energy projects need to deliver a sufficient return on investment in order to be built. Renewable energy market drivers that have historically delivered this return on investment have included federal tax incentives, state-level financial incentives, demand from state RPS requirements and electricity market prices. In the future, carbon markets are likely to affect electricity market prices and play a role in driving more renewable energy development as well. If one of these market drivers goes away, like federal tax incentives, project development will wane if other drivers do not fill in the gap and provide the needed return on investment.

Many developers believe that REC prices resulting from past NYSERDA RPS solicitations are too low to support development of a number of potential projects, and that projects are likely to need higher REC revenues in the future given market conditions. Increased demand for RECs would help provide projects with the REC revenue they need.

If New York wishes to see long-term sustained growth in its renewable energy markets it is important for the State to clearly define its long term goals and objectives, and to establish funding and oversight mechanisms to ensure those targets are met. Specifically, the State should consider increasing its RPS targets to levels which reflect economic potential for renewable energy development, strengthening its commitment to achieve the targets, and, potentially, diversifying the entities responsible for compliance with the RPS.[288] New York should revisit the approach of "set collections" and inflexible procurement schedules to increase liquidity and opportunities for developers to get contracts. RPS demand and funding is one market driver which the State can control, and pursuing an RPS framework is consistent with the PSC's goal of achieving a market-based system.

For smaller-scale project development, direct financial incentives such as rebates and grants may be a more appropriate market driver than a REC-based RPS because they are easier for small players than responding to RFPs. Financial incentives could continue to be provided through the CST of the RPS, but should receive the level of funding necessary to achieve program targets.

8.1.5 <u>Transparency</u>

Another key feature in a successful market is availability of information. Developers expressed an interest in receiving more information about the outcome of the solicitations, and to receive the information more promptly. They requested more detailed information about winning bid prices and the rationale behind

[288] Although New York has not achieved its annual RPS targets to date, this is due primarily to budget and program ramp-up issues. Based on New York's renewable energy resource development potential, a substantial increase in long-term RPS targets should be feasible. The feasibility of increased targets that are in the form of "percentage of total electricity sales" would be further enhanced by the fact that New York's electricity demand should decrease as a result of the Energy Efficiency Portfolio Standard.

NYSERDA's procurements. For example, they would like to know whether the shortfall on REC procurement was due to too many bids coming in above the bid ceiling price or whether it was a result of a budget shortfall. Information on current market-clearing REC price is available for several other states from REC brokers. Developers explained that more information about the state of the market would help bidders better prepare to submit winning bids in future solicitations, or whether to continue development activity in New York. These desires need to be weighed against the possibility of collusion and manipulation– issuing more pricing information may benefit developers at ratepayer expense.

While several interviewees thought the market was too small to warrant use of such a system, about one third of the participating developers interviewed preferred the use of a declining clock auction system for future NYSERDA REC procurements. Increased transparency was the primary reason given by those who preferred the declining clock auction system, as market clearing REC prices would be readily available to market participants (as opposed to the weighted average prices now available).

As noted in Section 4.3.4, several developers were frustrated with NYSERDA's use of an undisclosed bid ceiling price in its selection of winning bidders. These developers thought the use of a ceiling price was unnecessary, that it affected bidding behavior and that it detracted from the transparency of the marketplace because they were not provided information that could affect their possibility of winning a contract.

It should be noted that in the State, the pool of bidders is relatively small and most know each other and the state of their respective development activities. That is a primary reason a clock auction approach was rejected by DPS/NYSERDA after an extensive analysis. Withholding the bid ceiling price information from this pool fosters stronger competition among bidders and simulates a larger market; otherwise if the bid ceiling price was disclosed, it is possible that all bidders would drift up to the bid ceiling price to maximize profits regardless of their cost basis.

Given the current program structure, there are some limitations on NYSERDA's ability to provide detailed information to the market. NYSERDA needs to be cautious about releasing too much information about winning bids in order to protect bidders' confidentiality and protect against collusion and manipulation. And disclosing the bid ceiling price would affect bidding behavior and likely result in bids at or near the ceiling. However, NYSERDA should look for opportunities to share more information with market participants to facilitate a more transparent market (i.e. averages or ranges of REC prices bid by technology).

8.1.6 Summary

The key elements necessary to support sustainable market-based renewable energy growth in the State are:

- Long-term market certainty;
- Open, liquid markets;
- Limited barriers to participation;
- The existence of market drivers sufficient to achieve the target level of market activity; and
- Transparency.

To help establish these elements in the New York renewable energy markets, the State will need to first clearly define its long-term goals and objectives for the future of renewable energy growth, beyond those already in place for 2013. Further, it will need to establish the funding and oversight mechanisms needed to achieve those targets. To the extent that the State continues the current RPS program structure, the timing of solicitations and the volume of RECs that will be procured in each solicitation should be better communicated to market participants. New York should also consider placing some portion of the RPS procurement responsibilities on load serving entities to expand the marketplace for RECs in New York and to move toward a more traditional market-based system. However, adding more buyers, but retaining the same amount of funds and RPS demand may lead to higher REC prices but not more renewable development. If New York adds more REC buyers under the LSE model, it should be done in concert with an increase in the RPS goal and RPS funds authorized to be collected from ratepayers, so that the pace of new renewable energy development continues.

The State should take steps to minimize barriers to participation in the market, such as transmission capacity constraints, cost allocation issues, and uncertainty in the permitting process. In addition, the State should adopt an attribute tracking system that is compatible with those in neighboring regions. Finally, the State should encourage, at the federal level, long-term policies to provide a more stable investment environment. This is more critically important than ever before, given the uncertain and volatile financial credit conditions.

8.2 NEW YORK'S PROGRESS TOWARD ACHIEVING SELF-SUSTAINING RENEWABLE ENERGY MARKETS

Summit Blue's research indicates that the New York renewable energy markets have made progress toward achieving self sustaining renewable energy markets, but that the State still has a long way to go. Some indicators of the State's progress to date include the fact that a substantial amount of renewable energy projects are getting built in response to the RPS demand. Furthermore, this development is happening at a relatively low cost to ratepayers and the price of RECs has been declining. Though much of the generation contracted for through the Main Tier RPS REC contracts is yet to come online, New York has shown success in its ability to drive new in-state project development.

The CST of the RPS is also achieving strong results, though the programs are substantially limited by budget constraints. The fact that NYSERDA's PV and ADG programs are fully subscribed demonstrates that these markets stand ready to respond if additional support is made available through funding increases. The PV, ADG and small wind markets will also benefit significantly from new net metering rules.

NYSERDA's industry development efforts have made important contributions to the long-term sustainability of the renewable energy markets in the State as well. Several companies have received the head-start they need to serve the State's renewable energy industry. Furthermore, the State's leadership in installer training programs is also helping to build a qualified workforce that can deliver high quality renewable energy installations over the long-term.

New York's renewable energy markets will also benefit from the RGGI and likely federal climate change policy. Though it will take time for the markets to feel the effects of these policies and the level of impact they will have on the markets is uncertain, these carbon regulations have the potential to increase electricity revenue streams for renewable energy projects, and ultimately decrease these projects' dependence on RECs and other incentives.

On a parallel track, New York's voluntary market for RECs has also grown in recent years. This market is still insufficient in scale to function as a significant driver of large-scale renewable energy project development in the State, and it is unlikely that this market will become a major driver within the next few years. However, over the longer-term, changes in market conditions (i.e., national carbon regulations, or a substantial decline in equipment costs) could make the voluntary market for renewables more robust.

All of the factors noted above highlight the important progress New York has made in its efforts to lay the groundwork for self-sustaining renewable energy markets. However, a number of factors currently limit the State's ability to realize its market growth potential over the long-term. As discussed in the previous section, key elements of a market based system will help New York move closer to a self-sustaining market, but are not fully present in the market at this time. Interview results from the full range of stakeholders indicate that it is far too early for New York's renewable energy markets to sustain themselves in the absence of state level incentives. This is due to factors both within and outside the control of the State.

8.2.1 Internal Factors

While New York's RPS program offers long-term certainty at the project level for those projects that are able to secure REC contracts with NYSERDA, there is little certainty in New York at the market level. This is due primary to two factors discussed earlier: 1) the program is budget constrained, making it hard for market participants to project market demand going forward; and 2) inconsistency and uncertainty around the timing of future RPS solicitations. It should be noted that budget constraints currently limit the RPS program's ability to meet targets both in the Main Tier and CST.

As a result of the RPS program structure, there is also limited liquidity and transparency in New York's renewable energy market. NYSERDA functions as the primary buyer of renewable energy attributes to fulfill the State's RPS demand, and this procurement is done through relatively infrequent solicitations. In addition, market participants do not have access to detailed information on competitive REC pricing. REC pricing data released to the public is limited to the weighted average REC prices submitted by winning bidders. Market clearing prices are not available.

Another important component in a market based system is the presence of sufficient drivers to achieve the target level of market activity. The current target level of market activity, defined through the RPS, is to achieve 25% renewable energy supply by 2013. While it appears that the State possesses ample renewable resources to achieve this target, the limited RPS program funding is currently constraining the State's ability to meet interim annual procurement targets.[289]

[289] The ability to meet annual targets is also affected by the ramp up time necessary to get projects built.

There is discussion among stakeholders about potentially increasing the RPS target in New York. And if the State seeks to advance emerging technologies, such as hydro-kinetic power, additional drivers beyond and RPS will be needed to foster the advancement of certain technologies. Because of the volatility in energy and financial markets, a key challenge for the State as it plans for the future will be to structure program funding mechanisms and to design programs in a way that can sustain project activity despite fluctuations in other market drivers.

Other policy drivers, such as favorable net metering rules for on-site generators, favorable cost allocations for T&D upgrades, and streamlined permitting rules, can help facilitate market growth to achieve targets as well.

8.2.2 External Factors

Several interviewees noted that there would be little hope of the market sustaining itself until there is national greenhouse gas regulation or a national RPS. The expectations for passage of either or both of these regulations has been increasing in recent years, although the recent credit crisis has injected some uncertainty into whether such policies will sustain support, and has made it difficult for renewable projects to get financing.

A long-term extension of the PTC, currently set to expire at the end of 2009, would also help to create a self-sustaining market. If the PTC expires at the end of 2009, it is likely that future REC prices for new projects would need to be higher and the amount that could be acquired with current budgets lower.

A significant, permanent decrease in capital costs for renewable energy would also help create a self-sustaining market. Recently, long-term trends in wind costs reversed, and costs have risen. However, the construction of numerous manufacturing facilities in the U.S. should help restore historical trends, as will the recent decline in commodity costs.

8.3 REMAINING CHALLENGES AND OPPORTUNITIES

This section briefly summarizes key issues that are likely to present challenges and opportunities to NYSERDA and the State in the future. The intent of this section is to highlight issues for the State to monitor and/or engage in going forward, recognizing there are limitations on any effort to predict future market activity.

8.3.1 Increasing REC Prices

For a variety of reasons, projects bidding into future Main Tier solicitations may command higher REC prices than they have in the past. First, some of the projects that have secured REC contracts to date have benefited from favorable turbine supply agreements and equipment pricing that is unlikely to exist for other projects in the near-term. In addition, as the State approaches transmission capacity limits, it will become more expensive for developers to connect their projects to the transmission system. REC prices may need to reflect constraints on delivery of energy.

The credit crisis, along with falling oil and gas prices, is also making it difficult for new renewable energy projects to get financing right now. In addition, the PTC is set to expire at the end of 2009 which will remove a key source of revenue for projects.

In the longer term, limitations on the availability of favorable development sites will come into play as well. According to interviewees, some of the most favorable locations for wind and hydro development have already been claimed or developed.

It is possible that the RGGI market and potential future national carbon regulations will mitigate these influences noted above by increasing electricity revenues for renewable energy projects. However, the State should prepare for the likelihood that REC prices will increase in the future by budgeting accordingly and/or building flexibility into the funding mechanism used for RPS compliance going forward.

8.3.2 Transmission Capacity Constraints

In addition to contributing to higher REC prices, transmission capacity constraints have the potential to delay project development and deter developers from pursuing projects in New York. Transmission capacity upgrades can take several years to implement. Therefore, it is important for the State to take proactive steps in the near-term to ensure that transmission does not stand in the way of future market growth. Also, the state could encourage the siting of facilities east of the congestion interface to alleviate congestion costs and ease transmission to load centers in the downstate region.

8.3.3 Siting and Permitting

As discussed in Section 2.2.3, New York's current siting and permitting procedures can cause delays in the development process, adding significantly to development expenses. While the amount of wind capacity in the NYISO queue (over 8,000 MW[290]) indicates that this is not currently deterring developers from pursuing projects in New York, it may put the State at a competitive disadvantage in the future as developers consider which states should be the focus of their development activity.

Passage of an Article X siting law that incorporates substantial opportunity for public input would go a long way toward minimizing siting and permitting challenges in the State. In addition, NYSERDA or the State should take steps to identify and highlight areas of the state that are most favorable for project development activity, both due to favorable local ordinances and community support, as well as favorable resource availability. Increased efforts to inform the public about the State's renewable energy development targets, and to serve as an unbiased source of information about the benefits and drawbacks of renewable energy development would also likely reduce local opposition to project development.

Many other states face serious siting and permitting challenges like New York. While circumstances in each state are somewhat different, New York should monitor efforts by other states to address siting and permitting challenges.

[290] NYISO. *Interconnection Requests And Transmission Projects / New York Control Area*. July 10, 2008. Summit Blue Consulting analysis.

8.3.4 Lack of an Appropriate Attribute Tracking System

As discussed in Section 2.2.3, New York's current method of accounting REC conversions through the Environmental Disclosure Label program is inappropriate for REC trading. This limits market liquidity and presents barriers to a wide range of market participants, particularly those in the voluntary green power market. New York is already taking steps to address this issue and these efforts should continue.

8.3.5 Interaction of RPS with RGGI and Potential National Carbon Markets

RGGI is being implemented in the northeast, and there is increasing likelihood that national carbon regulations will come into play within the next few years. Many developers are optimistic that higher electricity prices resulting from these carbon regulations will foster renewable energy market growth, and will ultimately reduce the REC revenue requirements for projects. However, most developers also conveyed that they are still trying to understand how carbon markets will affect their business, and that the RGGI market and potential for future carbon markets have not affected their NYSERDA RPS bidding strategy to date. A few developers explained that RGGI is likely to affect their future potential to participate in the New York RPS program. One developer noted that a key reason for co-firing biomass at a coal plant is to reduce carbon emissions and, ideally, the cost of complying with carbon regulation. In the future, this developer will want to preserve opportunities to use biomass generation as a carbon mitigation strategy. They will be cautious about selling RECs through the New York RPS program because the RPS attribute definition includes emissions offsets, thus prohibiting a bid facility from also using the biomass generation as a RGGI compliance strategy.

Another developer said that they anticipate seeing significant value in carbon markets. Recognizing that NYSERDA's RPS attribute definition prohibits them from participating in both the RPS REC market and the carbon market for the same units of renewable generation, they will think twice about selling attributes to NYSERDA with this alternative revenue potential.

As indicated above, developer concerns are rooted in the RPS attributes definition; when a facility participates in the RPS program and sells attributes/RECs to NYSERDA, NYSERDA takes ownership of the emissions offset attributes associated with the renewable generation and these attributes cannot be used for participation in the RGGI market. Based on New York's draft RGGI regulations, our research indicates that the only types of renewable energy generators whose future RPS participation is likely to be affected by the presence of the RGGI market are landfill gas generators and coal-fired generators that co-fire with biomass fuel.[291]

Landfill gas generators are the only electric generating facilities that can qualify to produce offsets that can be sold in the RGGI compliance market. RGGI rules that are discussed further in Appendix E would prohibit the generator from also participating in the New York RPS market. Coal-fired generators that co-fire with biomass fuel can use this biomass generation as a RGGI compliance strategy. However, doing so would prohibit them from selling RECs associated with that same biomass generation to the New York RPS program. These and other areas of interaction between RGGI and the RPS program are detailed further in Appendix E.

8.3.6 New Net Metering Laws

New York enacted new net metering laws in August 2008. New York's previous net metering rules placed significant limitations on the potential for onsite renewable energy development in the State. The new laws will effectively launch a new era of growth for onsite renewable energy applications in New York, particularly in the area of PV and small wind, as non-residential PV and small wind projects will be able to net meter up to 2 MW of onsite generation. The New York City area has been largely unable to benefit from renewable energy development and RPS financial incentives to date due to its inappropriate characteristics for many types of large-scale renewable energy applications. The fact that the new net metering rules allow net metering for commercial PV installations represents a significant new opportunity for PV market growth in this part of the State, and it will enable ratepayers in this part of the State to take greater advantage of the financial incentives offered through the RPS CST. However, the potential for growth in on-site projects, both residential and commercial, will likely be significantly limited by the financial crisis as credit is harder to come by and there is less discretionary income available to homes and businesses than in recent years.

To maximize potential growth in these new market sectors, the State is considering a number of options to make more financial incentives available to the CST technologies, and in particular, to the downstate PV

[291] 6 NYCRR Part 242, available at http://www.dec.ny.gov/regulations/43598.html . These draft regulations are based on the RGGI Model Rule.

market. These efforts, and the new net metering rules in general, will significantly alter the landscape for the CST incentive programs going forward.

8.3.7 Complementary Role of Demand-Side Management and Energy Efficiency Initiatives

In May 2007, the PSC initiated a proceeding to establish electricity and natural gas energy efficiency targets through a new Energy Efficiency Portfolio Standard (EEPS). Rules were adopted for the new EEPS in June 2008. The EEPS calls for a reversal in the State's load growth pattern, with a goal of achieving a 15% reduction in forecast electricity usage by 2015.[292] One of the most substantial effects the EEPS will have on the RPS program is that the resulting reduction in the State's electricity demand will reduce the MWh-equivalent of the State's RPS targets, as well as demand for development of new generation sources in general. In fact, the DPS projects that the EEPS will effectively obviate the need for additional RPS contracts to be secured in order for the State to meet its 2013 RPS targets.[293] If this translates into a termination of any future RPS solicitations, it could effectively halt the near-term market growth of the large-scale renewable energy market in the State. The State could counter this effect, and deliver additional long-term stability to the renewable energy market in the State by increasing the RPS targets and adding new targets extending several years beyond the existing 2013 date.

In interviews with conducted as part of this evaluation, utilities were asked what strategies the State could employ to coordinate the RPS and EEPS initiatives. Respondents expressed strong support for coordinating the two efforts. One respondent suggested rolling the CST component of the RPS program into the EEPS since onsite generation can be viewed as another form of load reduction. The respondents had mixed views with regard to whether the SBC and RPS surcharges should be listed as separate line items on the electric bill. Two of the five respondents thought they should be merged, because having too many different line items confuses consumers. Two respondents expressed that it does not make a big difference to have two separate line items on the bill, and they should be recorded separately.

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[292] New York Public Service Commission. "Order Establishing Energy Efficiency Portfolio Standard and Approving Programs". Case 07-M-0548. June 23, 2008.

[293] New York DPS. 2008 Price Suppression Study.

Section 9

KEY FINDINGS AND RECOMMENDATIONS

The Main Tier component of New York's RPS has played a critical role in facilitating large-scale renewable energy development in the State since the RPS was introduced in 2004. The CST of the RPS has made strides in developing the markets for small-scale renewables as well, though the impact of the CST program has, to date, been limited by budget constraints and unfavorable net metering policies. This section presents the key findings and recommendations identified through this market conditions assessment.

9.1 KEY FINDINGS

9.1.1 Findings for Main Tier RPS

The greatest strengths of the Main Tier RPS program with respect to building renewable energy markets include:[294]

- ***Long-term Contracts***

  The majority of interviewees look favorably upon the long-term contracts NYSERDA offers under the Main Tier component of the RPS as these contracts help mitigate revenue risk and facilitate project financing for those that are able to secure them.

- ***New In-State Project Development***

  The vast majority of projects holding RPS REC contracts are located in New York, meaning that New York ratepayers' investment in the RPS is creating economic growth within the State.

[294] Program process-related issues are discussed in KEMA's report on program process and impacts.

- ***Ability to Leverage Non-Funded Capacity Growth***

  The RPS program allows for partial bidding and encourages program participants to sell a portion of their RECs into the New York voluntary green power market. A few large wind projects are, in fact, selling less than half of their RECs to NYSERDA and retaining the rest for sale to other markets. Therefore, the State is leveraging development of renewable generation over and above the volume of RECs it is purchasing, and is reaping the economic development benefits that result from this in-state capacity growth.

- ***Limited Program Costs***

  The program benefits ratepayers in that compliance costs are certain; they are limited by the collections from the RPS surcharge. From the perspective of meeting the targets, or from a developer, this is a weakness.

However, some features of the Main Tier RPS program limit the potential for renewable energy market growth. These limitations are related to uncertainty, market liquidity and transparency. Market growth is also limited by barriers to development that are not directly related to the RPS program, as discussed in Section 4.2.3.

The primary limitations of the Main Tier RPS program with respect to building renewable energy markets include:

- ***Uncertainty about the presence and timing of future RPS solicitations***
  - There is no long-term schedule of future RPS REC procurements. This makes it difficult for developers to understand the potential market opportunity that exists for their project(s) in New York, and can complicate the timing of project development.

- ***Uncertainty about long-term demand for renewables in New York***
  - Because the RPS targets only extend through 2013, the market lacks certainty about whether and to what extent demand for renewables will continue to grow in New York over the long-term. Furthermore, implementation of New York's Energy Efficiency Portfolio Standard will decrease the energy required by the 25% renewable supply target in place for 2013. This adds further uncertainty to the future level of demand for renewables in the New York marketplace.

- ***Lack of market liquidity***
    - NYSERDA's RPS REC solicitations occur infrequently. Since NYSERDA is the primary buyer of RECs for RPS compliance in the State, this constrains liquidity in the REC marketplace. The lack of an attribute tracking system further limits liquidity as the State's current environmental accounting practice functions on a slow schedule and is inconsistent with systems in place in neighboring regions.

- ***Lack of funding flexibility to respond to changing market conditions***
    - Market conditions will inevitably change relative those that exist when a program cost study is performed since there is significant uncertainty around many of the inputs (i.e. equipment costs, electricity market pricing, etc.). These changes may increase or decrease projects' REC revenue requirements. This is a significant barrier to ensuring New York meets its RPS targets.

- ***Limited transparency***
    - Due to the confidential nature of the sealed bid solicitation approach used for the RPS program, little information is made available to market participants to enable them to understand the status of the market. This has been intentional, to an extent, due to the limited pool of bidders in the State and in an effort to minimize ratepayers' costs and reduce opportunities for collusion and manipulation. Data on REC pricing is of particular importance, though knowledge of the total number of eligible bidders and other data points are also important. While many of the program bidders are sophisticated wind companies with a presence in several states and a strong understanding of their competitors, other developers are less well-equipped to gather market data on their own. In other states, market participants benefit from state-maintained lists of generators that have been registered as RPS eligible, and data on REC pricing available through REC brokers.
    - NYSERDA's REC procurements are limited by the amount of funding collected from ratepayers through the RPS surcharge. Therefore, the volume of RECs to be purchased in a given solicitation is uncertain. Furthermore, solicitations occur infrequently and market participants are provided with little detailed data on winning bid values from prior procurements[295]. These factors make it more difficult for developers in New York to "size up" their project's place in the market and set bid prices accordingly.

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[295] This is not unique to New York – data on winning bids have not been available in California.

- ***Poor conditions for fostering resource diversity***
  - New York's Main Tier RPS is designed such that all technologies compete with one another for the same limited funds. While this structure ensures that the State secures the highest volume of RECs at the lowest cost, technologies other than onshore wind and hydro upgrade projects have limited opportunities for success under this model and wind has dominated. To the extent that that State seeks to achieve diversity among the renewable resources funded through the RPS, this is a notable program limitation. It should be recognized that resource diversity would come at a higher cost.

Based on these key findings, some overarching factors for the PSC and NYSERDA to consider in decision-making related to the RPS program and renewable energy markets in the State more broadly include:

1. ***New York's competitiveness relative to other states*** that are also aggressively pursuing renewable energy market growth;
2. ***Potential future changes in market conditions***, specifically the potential for national greenhouse gas regulations and the effects of changing financial markets; and
3. ***Market certainty.***

Renewable energy development is now a major national priority, and many states continue to increase their commitments to growing renewable energy supply. Renewable energy companies will take their business to the states that can offer them the greatest opportunities. When making future program and market design decisions, decision-makers should recognize that the State is one piece of a dynamic national marketplace for renewables, and that marketplace will become increasingly competitive.

The potential is high for the introduction of national greenhouse gas regulations within the next four years. These regulations, coupled with existing RGGI regulations, could cause a significant increase in electricity market prices. This could function as a major driver for renewable energy project development, effectively obviating the need for specific renewable energy targets over the long-term. However, much will depend on the timing, stringency, and details of the regulations. In addition, there are already indications that renewable energy project developers will face much greater challenges in securing project finance due to the financial crisis.[296]

Because it is impossible to predict the net effect of these and other unforeseen market changes, it is important for New York to clearly define its priorities with respect to renewable energy market development so that outcomes are not left to chance. If New York is serious about ensuring that a certain level of market development occurs, and wants to provide market certainty that will help it compete with other states in attracting renewable energy business activity, then it is important for the State to set clear, firm targets for renewable energy growth over the long-term and appropriate the necessary funding. In addition, it is important for the market to have the flexibility to respond to changing conditions.

9.1.2 Findings for CST

The greatest strengths of the CST RPS program include:

- ***Program incentives***
    - Across all of the CST technologies, there is agreement that the program incentive is the greatest strength of the program. Program incentives provide vital funding to the CST technologies, particularly because third party financing is currently difficult to secure. The stability and predictability of the funding is also a strength of the program.
- ***Program design***
    - Some aspects of the CST program are well designed to meet the particular needs of each technology and to complement some of NYSERDA's other renewable energy programs. For example, support for the training of PV installers and code officials created the market infrastructure needed for PV installations through the CST program, while the performance based aspect of the ADG incentive helps ensure that high quality systems

[296] Krauss, C. 2008. "Alternative Energy Suddenly Faces Headwinds." *The New York Times*. October 20. In addition, interviews with some developers indicated that the credit crisis is beginning to make project finance more difficult.

are installed (and helps overcome customer and bank concerns due to the existence of older, failed ADG systems around the state). However, some aspects of program design represent opportunities for program improvement as well, as discussed below.

- ***Program marketing and the Power Naturally website***
    - NYSERDA program marketing and the Power Naturally website have contributed significantly to increased customer awareness of and demand for nearly all CST technologies.

Key areas for improvement for the CST RPS programs include:

- ***Program application process and approval***
    - Nearly all CST installers point to the program application and approval process as a major weakness, particularly in comparison to similar programs offered in neighboring states.
- ***Program requirements for small wind installers***
    - Small wind installers face barriers when attempting to enter the market; the insurance requirements for program participation are significant and there are limited opportunities for new installers to gain the experience they need to secure insurance to meet the program's requirements.
- ***Limits on the project size eligible for incentives***

9.2 RECOMMENDATIONS

In the 2004 Order authorizing the RPS, the PSC called for a transition to a more market-based approach over the long term, and requested a review of the program in 2009 to identify changes that could help facilitate that transition. Based on an analysis of market conditions, a set of key recommendations was developed for consideration by the PSC and NYSERDA. One should review the recommendations with recognition that there is no perfect means of creating a market-based approach to support renewable energy development while minimizing ratepayer impacts. Rather, the State should reflect on the findings and recommendations presented in this report and consider which tradeoffs are appropriate as the State works to balance several important priorities. A number of the recommendations presented here, such as considering increasing the RPS standard and demonstrating New York's long-term commitment to the expansion of renewable energy industries in the State, are consistent with recommendations presented in the first report of New York's Renewable Energy Task force to, then Lieutenant Governor, David A. Patterson.[297]

The Main Tier component of the RPS was the primary focus of this market conditions assessment. Therefore, the recommendations pertaining to the Main Tier are presented in greater detail than those for the CST Programs.

9.2.1 Recommendations for Advancing Markets for Main Tier Technologies

This section provides recommendations for advancing markets for large-scale renewable energy development in New York.

1. ***Increase Market Certainty***
    - Set a schedule for future RPS procurements that extends three to five years into the future to facilitate planning by market participants.
    - Compliance with this schedule should be ensured through sufficient budgeting.
    - Communicate plans for the future of New York RPS beyond 2013 (i.e., program structure, compliance mechanisms, entities responsible for procuring attributes, etc.).
    - Encourage long-term policy stability at the federal level to provide a more favorable investment environment.

[297] State of New York Renewable Energy Task Force. 2008. "Clean, Secure Energy and Economic Growth: A Commitment to Renewable Energy and Enhanced Energy Independence." The First Report of the Renewable Energy Task Force to Lieutenant Governor David A. Patterson.

2. ***Increase Market Liquidity***
   - Increase frequency of procurements.
   - Consider options for facilitating the development of a robust secondary market for RECs in the State.
   - Allow for and provide flexibility for spot market purchases
   - Adopt an attribute tracking system that is compatible with those in place in the ISO-NE and PJM control areas.

3. ***Ensure RPS Targets are Met***
   - Incorporate elements of flexibility in RPS funding so that RPS targets do not go unmet if developers' REC revenue requirements are higher than anticipated. For example, it may be appropriate to allow for the opportunity to collect additional RPS funds up to a certain limit if a "high cost scenario" plays out, or to allow for utility cost-recovery up to a certain cap if utilities become engaged in RPS compliance. While the current funding approach is beneficial in that it ensures a certain amount of funding will be available and enables NYSERDA to offer secure long-term contracts, there is no flexibility for the funding to go higher if market conditions change.
   - If load serving entities are required to fulfill a portion of RPS targets through their own direct REC procurements, introduce penalty provisions for non-compliance / alternative compliance mechanisms, and present clear plans to enforce compliance. This would provide certainty related to demand.

4. ***Facilitate Growth in Transmission Capacity***
   - Consider adopting approaches used in other states to facilitate coordinated planning and funding for expansion of transmission infrastructure. For example:
     - Identify areas of the state in greatest need of transmission capacity expansion to facilitate renewable energy project development.
     - Consider implementing innovative cost allocation and cost-sharing approaches for transmission expansion in the most favorable renewable energy development zones.
     - Consider adopting resource commitment and/or market settlement practices at the NYISO that allow renewable resources to reasonably predict energy production and project revenues.

- NYSERDA and/or the PSC should be actively engaged in the NYISO's reliability and transmission planning initiatives to ensure that all opportunities for facilitating rapid renewable energy growth are realized.
- Consider adopting streamlined permitting processes for transmission projects that will benefit areas of the State with the greatest renewable energy development potential.
- Another reason why the LSE approach should be considered is that if they are also a T&D owner, they may be better positioned to foster the siting of new facilities east of the congestion interface.

5. Facilitate More Efficient Siting and Permitting of Renewable Energy Projects

- Adopt a revised Article X siting law that allows for ample public participation and a thorough review of project impacts, but also sets forth a clear timeline and process for resolving disputes.
- Develop a set of criteria for more objectively evaluating the conditions within which visual, noise, and other impacts associated with wind projects should be deemed "reasonable." This should be carried out through a stakeholder process with representation from a diverse set of interests.
- Establish maps that indicate which areas of the State are most suitable for renewable energy development based both on resource availability, local ordinances and the local community's expressed interest in welcoming renewable energy development.
- Conduct outreach to communities to inform them of the State's renewable energy development targets, the benefits and drawbacks of hosting renewable energy development in their community, and steps they can take to facilitate development in their community.
- NYSERDA and the State should monitor approaches being used in other states to facilitate permitting of proposed renewable energy projects without sacrificing public input.

6. ***Increase Market Transparency***
   - Provide market participants with information about the specific volume of RECs that NYSERDA plans to procure in a given solicitation.[298]
   - Provide more data on past program outcomes (i.e., the total number and type of bidders, average REC bid prices and winning prices by technology, etc.).
   - Register facilities as "RPS eligible in New York" and post lists of eligible facilities.
   - Foster development of a secondary market for RECs that would result in another source of data on REC transactions.

7. ***Build Manufacturing Capacity for Renewable Energy Components***
   - The State can build on the successful model already employed by some of New York's manufacturers. The State should provide existing manufacturers with information and financial resources to help them adapt current processes or technologies to renewable energy-specific applications or lines of business.

8. ***Conduct Targeted Public Education and Outreach Activities***
   - NYSERDA does conduct public education and outreach (such as its. Wind Energy Toolkit), and should continue to play a valuable role as a source of unbiased information. In areas of the State most likely see future development activity, make presentations communicating the State's commitment to renewable energy development and provide information kits that can be distributed to interested residents. Education and outreach materials should focus on communicating facts and directly addressing the most common concerns about renewable energy development.
   - Facilitate the transfer of information and knowledge across communities that are considering present or future renewable energy development (i.e., information on PILOTs, model ordinances, etc.).

9. ***Encourage growth in the voluntary market for RECs***
   - Develop an attribute tracking system that is compatible with those in neighboring regions, and eliminates the need to use the current conversion transaction process to complete REC sales in New York.

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[298] This would require some other program changes to be made, such that the volume of RECs was not limited by budget. In addition, if bid ceiling prices remain in place, it would need to refer to the volume NYSERDA seeks to purchase at prices that fall below the bid ceiling price.

- Increase outreach, education and marketing efforts, including using high profile endorsements by prominent public officials in order to raise customer awareness and trust in green power offerings.
- Consider taking action to simplify the protocols for enrolling in green power offerings to reduce barriers to participation.
- Consider adopting a statewide program similar to the Connecticut Clean Energy Option in which all utilities would be mandated to adopt the program, open their program to multiple green power providers, and meet a minimum percentage enrollment level (or face penalties).
- Focus on steps to increase wind power production in the State, such as facilitating siting and transmission, as this is the most popular green power source among residential customers.
- Consider creating a green marketing committee or working group that includes green power providers and convenes regularly to discuss developments in the marketplace.

10. Foster diversity of market participation

- Consider providing separate project-level financial incentives to support large-scale applications of technologies that are less well-positioned to be competitive under the RPS program structure (e.g., offshore wind, tidal, hydrokinetic). This will help advance these technologies and ensure they are ready for more rapid, large-scale deployment when onshore wind development opportunities diminish.[299] The increased costs of advancing technologies must be weighed against existing challenges in meeting the targets.
- Consider including resource tiers in the RPS targets to provide limited opportunities for participation by more expensive technologies.
- Develop a biomass technology working group to create a forum for discussion among biomass developers and help them identify opportunities to collaborate in their efforts to address the unique and diverse challenges they face. For example, they may explore opportunities to build a stronger market for biomass fuel sources and/or exchange information regarding the feasibility of developing closed-loop biomass operations.

Table 27 links the recommendations provided in this section with the list of key elements necessary to achieve a more market based system to support renewable energy growth, presented in Chapter 8.

[299] This would mean amending program rules to allow projects that receive other state funding to still participate in the RPS program.

Table 28. Summary of Key Elements for a Market Based System and Corresponding Recommendations

Key Elements	Recommendations
Long-Term Market Certainty	• Define State's long-term goals and objectives for the future of renewable energy growth, beyond those already in place for 2013. • Establish the funding and oversight mechanisms needed to achieve those targets. • Provide a schedule for future RPS procurements.
Open, Liquid Markets	• Consider options for facilitating the development of a robust secondary market for RECs in the State with due consideration of ratepayer costs.. • Adopt an attribute tracking system that is compatible with those in place in the ISO-NE and PJM control areas.
Limited Barriers to Participation	• Implement strategies to address transmission capacity constraints, building on models in use in other states. • Address siting and permitting issues by adopting an Article X siting law, developing criteria for more objectively evaluating visual and noise impacts of wind projects, highlighting areas of the State that welcome renewable energy development, conducting community outreach, and monitoring approaches used in other states. • Develop attribute tracking system that is compatible with those in neighboring regions.
Market Drivers Sufficient to Achieve the Target Level of Market Activity	• Sustain demand for RECs by defining State's long term renewable energy goals and objectives, and establishing funding and oversight mechanisms to ensure those targets are met. • Encourage long-term policy stability at the federal level to provide a more favorable investment environment. • Encourage more companies to expand their existing product lines to include renewable energy-related equipment.
Transparency	• Provide market participants with information about the volume of RECs that New York plans to procure in a given solicitation. • Provide more data on past program outcomes (i.e., the total number and type of bidders, average REC bid prices and winning prices by technology, etc.). • Register facilities as "RPS eligible in New York" and post lists of eligible facilities. • Foster development of a secondary market for RECs that would result in another source of data on REC transactions.

Source: Summit Blue Consulting.

9.2.2 Recommendations for Advancing Markets for CST Technologies

- Increase program budgets
  - Increase budgets for the small wind, ADG and PV programs to facilitate a volume of development that will achieve RPS targets for the CST.

- Simplify and streamline program processes
  - Simplify application processes.
  - Consider revising the requirements to become an eligible installer for wind systems and reduce the level of insurance required for eligible installers.

- Adjust format for some program incentives
  - Increase the maximum incentive for PV systems to match the new net metering limits.
  - Consider dividing small wind projects into two tiers: 1) small turbines (under 100 kW capacity); and 2) large turbines (100 kW and larger) projects, and making more funding available to the larger turbine tier.
  - Consider developing a PBI for PV systems.
  - Consider allowing small wind turbines to sell RECs.

- Improve permitting conditions for small wind systems
  - Increase outreach to communities to increase the number of communities that adopt NYSERDA's model wind energy ordinance.[300]
  - Consider developing a more streamlined permitting process for small wind projects.

- Improve conditions for ADG development
  - Consider helping ADG systems secure third party financing, perhaps through a combined grant – loan financing system.

- Consider adding specific technology carve-outs to the RPS in order to incentivize more development of certain technologies that are high priorities for market growth.

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[300] Power Naturally. "Community Resources for Wind Development. http://www.powernaturally.org/programs/wind/toolkit.asp Accessed 10/29/08.

- Consider adjusting incentives. With comparatively higher incentive levels and oversubscription for PV, NYSERDA should consider lowering incentives and /accelerating the transition to production based incentives to better leverage funds. Consider increasing overall program funds.

Section 10

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Appendix A:

INTERVIEW GUIDE DEVELOPERS- PARTICIPATING[301]

I. NYSERDA PROGRAM HISTORY AND COMPANY BACKGROUND

[To be completed by interviewer prior to interview to extent possible.]

1. NYSERDA RPS Program History: To be Filled out Prior to Interview

Roll Up Summary by Solicitation

Solicitation	# of bids submitted	# of contracts awarded
916		
1037		
1168		

Project-Level Summary

Project Name	Solicitations Bid Into	MW (total nameplate capacity)	Technology	% project output sold to NYSERDA	# of bid %s submitted per RFP

2. Company's non-program activity in NY and elsewhere (do not discuss during interview- only collect as background / context)

Details	NY Projects (Non-RPS)	Projects in Other States
Technology Types		
Project Names (i.e., used in interconnection queue)		
Location(s) (county/town)		
MW		
Status as of 6/08		

[301] Minor changes were made to this guide to tailor it for use with non-participating developers.

Expected Completion		

3. What is your role in the company (title, responsibilities):

4. What business areas is your company active in (development, brokering RECs, O&M, finance, etc.)? [**Address which technologies they work with**.]

II. PROJECT FINANCE

5. In general, how do you finance your projects (Structures: leveraged flip with deferred equity, leveraged flip with upfront equity, leveraged lease, PPA pre-payment, all equity, unlevered flip with upfront equity, hedging to manage electricity price risks)?

6. Does the RPS funded project (financing package- partners and structure) depart from what is typical for your projects? If so, how?

7. Who are the major energy and REC offtakers for your New York projects and to what extent do you have long-term agreements with these entities?

8. How essential are REC revenues to your project economics?

III. PROGRAM ATTRIBUTION

9. [**FOR WINNING BIDDERS**] How valuable was the NYSERDA RECs contract in helping you finance your project(s)?

   [**FOR NON-WINNING BIDDERS**] How valuable are the NYSERDA REC contracts in helping projects get financed?

   ___Critical to project financing

   ___Of significant value

   ___Of little or no value

   ___An obstacle to project finance

10. [**FOR WINNING BIDDERS**] In the absence of the NYSERDA REC contract, would your development plan have been different in any way (would project have been developed in NY, same size project, timing of construction, etc.)?

11. Does the NYSERDA program affect the RE market in NY as a whole (i.e. effect on REC prices, making NY more favorable for development relative to other states, or in other ways)?

IV. BARRIERS

12. What are the most significant barriers to your project development efforts in New York?

[ASK TO RANK ON SCALE OF 1-5 WITH 1 BEING "INSIGNIFICANT" AND 5 BEING "CRITICAL BARRIER TO DEVELOPMENT".]

__ transmission constraints

__ interconnection costs and processes (specify which was focus of respondent feedback)

__ cost of doing business in NY

__ cost of supplies and raw materials (increased by falling value of U.S$)

__ local opposition (NIMBYism)

__ permitting process

__ property taxes and/or payments in lieu of taxes

__ lack of compatibility of NY with regional REC tracking and trading systems

__ availability of parts and supplies (turbines, gearboxes, etc.) and / or qualified work force to perform O&M

__ uncertainty about federal tax incentives

__availability of suitable sites with adequate renewable resources

__ other ____

13. Do the barriers you face in NY differ from those you have encountered in other states (i.e., less burdensome, same, more burdensome)? How are they different, specifically?

14. Are the barriers facing [your technology] more or less substantial than those facing other technologies?

15. What additional assistance could NYSERDA or the State provide to overcome or minimize these barriers?

V. NYSERDA RPS PROGRAM COMPONENTS

Economic Development Benefits

16. Bidders were required to report the project's expected economic development benefits. Did this requirement affect bid price or bid quantity? If so, how?

17. Were any of the economic benefits categories difficult to estimate?

    a. Short-term jobs?
    b. Long-term jobs?
    c. Payments to localities/state?
    d. Access to resources?
    e. In-state purchase of goods/services?

Contract Duration

18. What would be your optimal contract term and why?

Bid Quantities and Partial Bidding

[*Min of 30% and Max 95% of REC output can be sold to NYSERDA*]

19. The program requires facilities to set aside at least 5% for voluntary markets outside the RPS program, with a minimum bid of 30% of a facility's output. Would you have bid 100% if you were allowed to do so?

20. How did your REC pricing bid in NY compare with the REC prices you've secured in:

    a. Other states with RPS policies.

    b. The voluntary REC market?

Out of State Facilities' Hourly Matching Requirement

21. Did any of NYSERDA's requirements regarding delivery of energy to the NY control area from e facilities affect your interest in bidding and/or your bid price and why/how? [DO NOT READ BELOW UNLESS THEY REQUEST EXAMPLES.]

    a. Hourly matching requirement

    b. Event of default if Seller of intermittent facility attribute fails to meet delivery requirements during 90% of hours in a Contract Year

    c. Verification requirements for attributes.

    d. Seller must be the financially responsible party to the delivery point (New York border)

RPS Attributes [*For participants in any of the 3 rounds*]

22. Did the definition of "RPS Attributes" (RECs) and the requirements for certification, verification and conveyance to NYSERDA cause any concerns when you submitted your bid proposal?

23. How will the RGGI market affect your projects going forward, and the likelihood that you would bid into future NYSERDA RPS solicitations?

Interconnection

24. Did the cost and process of interconnecting to the grid affect any of the following?

    a. Your REC/bid price?
    b. Your siting location (i.e., are there significant differences in interconnection costs across the different NY-ISO zones? different states?)
    c. Your on-line date?
    d. Were there problems or delays that could be avoided?
    e. Was the electric utility helpful or difficult to work with?

VI. PROGRAM PROCESS AND STRUCTURE / TARGETS

Project Selection Process

25. The project selection process scores projects based on price and economic development benefits to the state, with price weighted at 70% and economic development weighted at 30%. Do you believe this is an appropriate scoring approach?

26. The Public Service Commission's original implementation plan established three solicitation approaches: declining clock auction (DCA), a standard financial offer, and a sealed-bid RFP system. Thus far, only the RFP approach has been used. Do you think that this is the most effective, appropriate method of meeting New York's RPS goals? Why/why not?

27. When you compare your experience in New York to that in other states, are there particular benefits or problems with New York's approach to meeting its RPS requirements, or with the NYSERDA solicitation process?

28. [**FOR WINNING BIDDERS**] Have there been any major contracting issues that could have been handled better? If so please explain.

29. [**FOR LOSING BIDDERS**]:

    a. Have you received any feedback as to why your project was not selected in the solicitation?

    b. Is it your intention to continue to submit the same or other projects into additional rounds of the RPS program?

VII. GENERAL MARKET CONDITIONS

30. Which market factors have the greatest influence on REC prices (i.e., wholesale price of electricity, prices being offered by other REC suppliers, equipment pricing and availability, project financing structure, etc.)?

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31. Describe how market conditions have changed since NY first introduced its RPS (2004), (i.e., project finance strategies, types of market players who are most active, equipment

pricing and procurement strategies) and what future changes you anticipate in the marketplace.

VIII. STEPS TO A SUSTAINABLE MARKET

32. How would you define a "sustainable RE market" in NY, and how close is New York to achieving those conditions?

33. Of all the different policy and market design options available to policy-makers to lay the groundwork for developing a sustainable renewable energy market in New York, which are most essential? By sustainable here, I mean a market that will sustain at least 25% RE supply in NY without state incentives.

    a. RPS
    b. Regional attribute tracking system,
    c. Other financing methods, such as feed-in tariffs
    d. PPA requirements for utilities / Load-Serving Entities
    e. Other

IX. WRAP UP

34. If there were three (3) things you could change about the NYSERDA RPS program or New York's renewable energy policies what would they be?

1.____

2.____

3.____

Appendix B:

INTERVIEW GUIDE FOR FINANCIAL COMMUNITY

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1. INTERVIEWER TO RESEARCH AND COMPLETE BEFORE INTERVIEW

(*IF UNABLE TO COMPLETE, ASK INTERVIEWEE*)

1.1. This company is best categorized as a:

- Tax equity investor
- Lender
- Other

1.2. How many years has the company been investing in the U.S. renewable energy markets?

1.3. Is the company a subsidiary of a larger corporation? If so, is the parent company based in the U.S. or abroad?

2. BACKGROUND QUESTIONS – COMPANY OVERVIEW

2.1. Does your company have any involvement with the renewable energy industry besides financing projects (e.g., developer, REC broker)?

2.2. How does your company view its renewables investments – e.g., a hedge against risk from other investments, a strategic investment, a complement to existing lines of business?

3. COMPANY ROLE IN NEW YORK MARKET

3.1. Has your company financed past or prospective projects in the State of New York

3.1.1. If yes:

Technology (wind, hydro, biomass)	MW	Year Deal Closed	Project Received NYSERDA RPS REC contract (or pre-RPS SBC funding from NYSERDA)?		What was the term (years) of the financing offered by your company for this project?[302]
			Y/N	RPS or SBC funding?	

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[302] Note: Mental note about how this term compares to the term of RPS or SBC funding.

3.1.2. What was your role in the financing decisions? (elicit familiarity with the RFP and standard contract)

3.1.3. *A probe for high-level information*: Are there any partners with which you typically work (e.g., tax equity investors, sponsors, lenders, power purchasers, REC purchasers, land owners, transmission company, biomass provider, construction contractor, turbine provider, O&M provider, etc.)?

3.2. Were there other projects in which your company intended to invest had its bid won in one of the three solicitations?

3.2.1. If so, how large?

3.2.2. If so, did you still invest in that project without the REC funds?

3.3. Does your company have specific objectives or targets related to New York's renewable energy market?

4. NY MARKET-SPECIFIC QUESTIONS

4.1. When evaluating whether to invest in New York or in one of the neighboring markets (e.g., NE ISO, PJM), what are your critical decision points (e.g., energy prices, supply-demand balance, REC market structure)?

4.2. How important/valuable is the NYSERDA REC / attribute contract in helping you decide to finance a project(s)?

- Critical to project financing
- Highly valuable
- Somewhat valuable
- Of minimal value
- An obstacle to project finance

4.3. How would investment in large-scale renewables in New York differ in the absence of the NYSERDA 10-year REC contracts?

4.3.1. If there were no long-term REC contracts, by how much would your firm reduce its investment in projects developed in New York? (% or MW)

4.3.2. What other entities (if any) might fill the role of long-term REC purchaser?

4.4. In addition to helping developers secure project financing, what additional effects (if any) does the NYSERDA program have on the market as a whole, either positive or negative (i.e., lowers risk, makes NY more favorable for development relative to other states, etc.)?

4.5. What are the greatest barriers to renewables development in New York?

4.6. Are there any additional activities you recommend NYSERDA undertake to address these barriers?

5. **SHIFTS IN THE MARKETPLACE**

5.1. What factors in the marketplace have the greatest influence on REC prices? [*Ask as open-ended and use table below for probing on specific factors as appropriate.*]

5.2. How have market conditions changed since NY first introduced its RPS (2004):

[Instructions: Ask as an open-ended question but probe on as many of the following topic areas as appropriate. Try to get interviewee to specify "minimal v. substantial" when probing on specific topic areas. If they say "substantial" ask to describe further, including how the factor affects NYSERDA bid prices.]

Topic	**Effect on REC Prices** (***note which ones interviewee cites as most influential***)	**Amount of change since 2004 (minimal v. substantial)**	**Additional comments re: impact on REC prices, if changes are substantial**
a. Project finance strategies and deal structures			
b. Ability to use various risk mitigation strategies for electricity price			
i. hedging / contracts for differences (CFDs)			
ii. availability of entities willing to enter into long-term energy off-take or REC agreements			

d. Price and availability of equipment (esp. turbines) / raw materials			
e. Transmission constraints			
f. Competitive advantage of intermittent v. baseload (biomass) facilities (i.e. can participate in capacity market)			
g. Status of voluntary REC market (REC pricing, level of demand, ability to use voluntary market demand to get projects financed- investor perceptions of merchant REC market)			
h. Ability to sell into other Northeast RPS compliance markets			
i. Uncertainty about PTC renewal			
j. Price of electricity			

6. IDEAL PROJECT STATISTICS

{THIS SECTION IS DESIGNED TO GET A SENSE OF THE FINANCIER'S IDEAL PROJECT PROFILE AND DETERMINE IF IT IS DIFFERENT THAN THE PORTFOLIO OF PROJECTS IN WHICH THE ENTITY PREVIOUSLY INVESTED. THAT IS, WE SEEK TO DETERMINE IF THERE HAS BEEN A SHIFT IN THE MARKET.}

In this section, ask interviewee to differentiate amongst different technologies (e.g., wind, biomass, hydro).

6.1. When considering projects **today**, what are you looking for in these areas:

	Ideal	Does this differ from your existing portfolio of projects? If so, why?
Debt-to-equity ratio (___% debt / ___% equity)		
PPA term length (years)		
Turbine supply agreement (Y/N)		
Status of project development (site control, permitting approved / in process / not started)		
Return on Investment (%IRR)		
Approach to hedging energy prices (bi-lateral contract, derivatives / contracts for differences, etc.)		
RPS REC revenues (% of total project cashflows, length of contract)		
Voluntary REC revenues (How are these treated? Discounted? Counted at all?)		
Number of additional investors		
Other factors?		

6.2 Are you considering investments in emerging technologies, such as off-shore wind or tidal power?

7. MAKING NY'S RENEWABLES MARKET SUSTAINABLE

7.1. What policies and market design elements (e.g., incentive programs) are necessary to develop a sustainable renewable energy market?

7.2. Where does the NY market stand on the path toward achieving a self-sustaining renewable energy market, and what are the remaining challenges NY must overcome in order to achieve a sustainable market?

7.3. What must happen in the marketplace in order to overcome those challenges?

7.4. Do you think the market can do that without assistance from NYSERDA?

7.4.1. If not, what is needed from NYSERDA to facilitate those market changes?

Appendix C:

INTERVIEW GUIDE DISTRIBUTION UTILITIES

Note: Certain sections of this guide are tailored to the specific circumstances of a particular interviewee and were asked only of that interviewee.

ALL INTERVIEWEES

1. What is your title and what are your primary responsibilities?

Voluntary Green Power Programs / Market

GREEN POWER PROGRAM STAFF ONLY

2. [IF APPLICABLE] I see from your website that your company offers **XYZ** green power program (briefly summarize our understanding of the program; fill in table below prior to interview). [Ask interviewee to clarify program details as needed.

[Complete prior to interview to extent possible]

[Green Power Product / Program Name]	Details
(A) Utility takes title to RE attributes (either bundled with energy or not) and resells to customers OR (B) utility grants REC suppliers marketing access to their customers	
Targeted to which customer classes (res, commercial, other)?	
(A) Sold as % of load OR (B) in blocks OR (C) other format	
Resource mix (i.e., % wind, hydro, biomass, etc.)	
Price premium	
(A) Utility has exclusive relationship with one REC supplier OR (B) Utility allows multiple REC suppliers to participate in program (ask interviewee to explain how REC suppliers are selected for program)	

3. Is or was your company required to offer green energy, or do you provide it voluntarily?

4. For how many years have your offered this product / program?

5. What is the customer participation rate for your green power program?
   a. Did the participation rate change after the RPS surcharge went into effect in 2005?
   b. Are there other factors that may have affected the participation rate in the last few years?

6. Why do you think customers are willing to pay a price premium?
   a. Has this willingness to pay a premium changed since the RPS went into effect?

Attribute Tracking System

7. What are the greatest strengths and weaknesses of the current Environmental Disclosure Label Program, and conversion transaction processes administered by the Department of Public Service?

   a. Are you concerned about the possibility of double-counting attributes under the existing system?

   b. Does the system limit the type of market transactions that can take place in any way?

8. Please describe any key differences between NY's conversion transaction system and the attribute tracking systems used in New England and PJM (NE-Generation Information System and PJM-Generation Attribute Tracking System) in terms of ensuring integrity in the voluntary and compliance REC markets in NY.

9. Would you prefer to use an electronic attribute tracking system (similar to those used in New England or PJM) instead of the Environmental Disclosure Label Program / Conversion Transaction Approach?

10. If NY were to implement a system similar to the systems in place in New England and PJM, are there any things you would like to see done differently in NY?

ONLY for utilities taking title to RE (direct purchase of RE; not just allowing GP provider to sell RECs/Attributes to utilities customers)

11. How does the price premium you pay for wholesale RE compare to the attribute/REC prices being paid by NYSERDA in the RPS program (For comparison, the weighted average price the RPS paid in 2007 was $15/MWh).

   a. Can you say what prices you are paying for the renewable attributes?

12. How do you think the NY RPS program affects the supply and price of RE that your company can purchase for its customers?

13. From what resource types are you purchasing energy? For each type, can you describe:

    a. Where are these facilities located?

    b. What is the contract length?

    c. What mechanisms (contractual provisions or other) are you using to manage risk with regard to these contracts?

14. Do you think the RE development occurring in NY is suppressing wholesale electricity prices? Why or why not?

NYS RPS Program and Renewable Generation Capacity

ALL INTERVIEWEES

15. Do you think the NYS RPS program is helping to get renewable energy capacity built in the State, or do you think it would be happening anyway?

    a. In the absence of the RPS program, what % of the current large-scale renewable energy development activity would still be taking place?

16. What are your views on the approach used by the NYS RPS program, which centralizes the purchase of attributes for the RPS program under long-term contracts issued by NYSERDA?

    a. What are the strengths and weaknesses of the RPS centralized program in terms of fostering the development of a sustainable renewable energy market in NY?

    b. Has your company's position on this issue changed since the RPS initially went into effect?

    c. NYSERDA has not procured enough attributes to meet its annual targets. In other states, LSE's pay an "Alternative Compliance Payment" if they fail to meet annual RPS targets. What steps do you think NY could take to ensure that the state meets its annual RPS targets?

        i. [ASK ONLY IF DOESN'T COME UP IN RESPONSE TO MAIN QUESTION] Do you think it would be practical for the state to move to a system of "hard targets" with some sort of penalty for non-compliance, and if so, what type of enforcement approach would be appropriate?

17. How do you think utility companies can better coordinate with NYSERDA on achieving the RPS goals?

18. What is your company's experience with collecting the RPS surcharge?

    a. Do you think it should continue to be collected jointly with the Systems Benefits Charge (SBC) or separated?

19. Do you have any recommendations for how the State should integrate the Energy Efficiency Portfolio Standard program with the RPS program and surcharge?

20. Does the RPS surcharge affect energy sales or the public image of the utilities in any way?

    a. Do you think the RPS surcharge is equitably distributed among ratepayer classes? (Currently large manufacturers do not pay the RPS/SBC surcharge. Do you think this is justified?)

    b. For a typical residential customer, what is the typical annual RPS surcharge?

21. Have any of the following RPS-related factors had a positive or negative impact on reliability or costs?

    a. Integration of distributed generation into the grid
    b. Integration of intermittent generation resources into the grid
    c. Interconnection of renewables
    d. Net metering
    e. Other

22. Does your company have or are you forming proposals for ratemaking changes to better account for the value and quality of renewable energy, taking into consideration such factors as:
    a. contributions to peak load
    b. intermittency
    c. reliability of supply forecasting
    d. capacity factor

23. [ONLY IF COMPANY DOES NOT CURRENTLY OFFER A VOLUNTARY GREEN POWER PROGRAM] Do you plan to offer a green power program for your customers in the future?

Impact on the Grid

UTILITY INTERCONNECTION / TECHNICAL CONTACT ONLY

24. Are you seeing any impacts that RE projects are having on the grid in New York or in your service territory specifically?

a. How do these impacts differ between projects over 1 MW and under 1 MW? (1 MW is the threshold used in the RPS to define Main Tier projects vs. DG or "Customer-sited" projects.)

25. How is your company handling these impacts? Does your company need new equipment or operational systems to accommodate the growth of:

    a. Renewable generation
    b. Distributed generation
    c. Intermittent resources

26. From a T&D planning perspective, is there a threshold you use to differentiate between large-scale vs. small-scale projects?

27. How do you think interconnection and related grid improvement costs should be shared among ratepayers, utilities and RE project developers:

    a. For Main Tier resources (including those located far from existing infrastructure)?

    b. For RPS Distributed Generation/CST resources?

28. We've heard from some developers that different utilities require developers to bear different portions of interconnection costs and that the lack of standardization across utilities is a development barrier.

    a. How does your company determine how much cost should be borne by the developer?

    b. Do you know of any "gray areas" in the interconnection tariff that have led to ongoing disputes between utilities and developers about who has to bear specific interconnection costs?

    c. What kind of standardization across utility territories would be feasible or appropriate?

29. How important is it to encourage RE generation to locate near load centers or pockets and how would you recommend incentivizing this?

30. Are the ISO and the State adequately addressing intermittency issues associated with wind and solar generation on the NY power grid?

31. Do you think that NYSERDA and/or the utilities should fund research and deployment of technologies that help integrate large renewable energy projects into the grid, such as advanced energy storage systems and improved wind forecasting systems?

32. Advocates of particular renewable energy technologies have claimed transmission-related benefits that are specific to their technologies. What effects do you think the following technologies will have on the grid??

   a. PV and offshore wind, which tend to generate the most power during periods of peak demand, but are also intermittent.
   b. Pumped hydro, which can be used for energy storage.
   c. Any other renewable technologies that you can think of.

CON ED ONLY

The City of NY has issued an RFP for 2 MW of PV to be installed in the City.

33. How will your company accommodate this requirement for additional solar supply?

34. What are the advantages or problems with an RFP approach to new generation in your service territory?

35. Can you explain why your "network" grid poses more interconnection/disconnection difficulties than other service territories?

    a. How should the RPS accommodate these constraints?

LIPA ONLY

37. We recognize that LIPA is not required to meet any specific RPS targets presented in the 2004 PSC Order that established the RPS, but that LIPA has voluntarily established a goal of 24% RE by 2013. This is 1% lower than the statewide RPS, but represents an 8-10% incremental increase, which is higher than the 6% statewide. We're aware of your Solar Pioneers program, as well as your 50 MW Solar RFP and your RFP for 10 year contracts renewable energy contracts.

    a. Do you offer any additional renewable energy programs that we haven't noted here?
    b. Could you describe your progress to date toward achieving LIPA's RE target, and the kind of response you've received to your RE programs so far?
    c. We've seen reference to a $355 million Clean Energy Initiative. Does this budget include all renewable energy efforts you have underway? If so, what portion of the budget is allocated to renewable energy efforts?

38. Whereas NYSERDA only purchases unbundled attributes, LIPA's December 2007 RFP solicited bundled renewable energy contracts. What do you see as the advantages and disadvantages of making a bundled purchase, as opposed to just buying attributes only?

39. It's our understanding that the NYSERDA and LIPA rebates for PV are similar in amount (NYSERDA offers a $3-$5/Watt rebate and that LIPA offers $3.50/Watt for private projects and up to $4.50/W for public projects). Are there any key differences between the two programs that we should be aware of (i.e. budget- how many systems does LIPA think it can support with its budget)?

40. Does LIPA own the attributes associated with PV projects installed through the Solar Pioneers Program or for the small wind projects that have been installed in LIPA territory?

41. How important is it for LIPA and its customers to have a regionally compatible tracking and trading system for Renewable Energy Credits?

42. What are the strengths and weaknesses of the RPS central procurement approach being implemented for the rest of New York in terms of fostering the development of a sustainable renewable energy market in NY?

    a. How do you think the market would have responded if NY had structured its RPS the way most other northeastern states have, by requiring utilities to secure a set % of RE resources?

43. Do you think LIPA's RE program could be better coordinated with NYSERDA's and take advantage of synergies?
    a. What about collaboration on offshore wind projects or other mutually beneficial projects that could serve the downstate region, including both NYC and Long Island?

44. Is New York adequately addressing intermittent resource issues (i.e., the capacity value of PV to contribute supply at peak times) and the need for added transmission capacity?
    a. Is LIPA taking any specific steps to address these issues?

NYPA ONLY

45. We recognize that NYPA is not subject to the Public Service Commission's regulatory purview, and therefore is not required to meet any specific RPS targets presented in the 2004 PSC Order (see pg 11 of Order), though they are strongly encouraged to implement comparable programs to increase renewable energy supply.

    a. Is NYPA working to achieve the specific RE supply target by 2013, as encouraged by the 2004 PSC Order?
    b. We recognize that hydro comprises a significant percentage of NYPA's supply portfolio. Does NYPA purchase generation from any other renewables for the purpose of increasing its RE supply, or do you plan to do so in the future?
    c. We're aware of NYPA's success installing over 600 kW of PV, and a number of fuel cells (4 operational and 6 others in pipeline). What additional efforts are underway?

46. What type of incentive or finance structure do you use for PV, anaerobic digesters and fuel cell projects? How much of the installation is paid for by the host site?

47. Is NYPA's RE program sufficiently coordinated with NYSERDA's RPS program?

48. Do you see a role for NYSERDA or NYPA in promoting advanced technologies, such as storage, to help with integration of large renewable projects into the grid?

49. Which RE technologies are the most promising as investments for your government customers to save on energy costs?

50. Do you see a future role for aggregators of municipally owned attributes?

51. How important is it for New York to have a REC tracking system that is compatible with neighboring regions?

52. Is New York adequately addressing intermittent resource issues (i.e., the capacity value of PV to contribute supply at peak times) and the need for added transmission capacity?

All Interviewees

BOTH GREEN POWER AND GRID/INTERCONNECTION CONTACTS

Barriers to Renewable Energy Development -

53. What are the greatest barriers to utility-scale RE development in NY in general and in your service territory specifically? [*Rank each barrier from 1-5, "1" meaning the barrier is insignificant, "3" meaning the barrier is a significant nuisance and added time or expense to the development process, and "5" meaning the barrier poses a critical threat to your project's viability.]*

NYS	*Service Territory or ISO ZONE*	
__	__	lack of availability of long-term REC or energy contracts
__	__	transmission constraints
__	__	interconnection costs and processes
__	__	cost of doing business in NY
__	__	cost of supplies and raw materials (increased by falling value of U.S.$)
__	__	local opposition (NIMBYism)
__	__	permitting process
__	__	property taxes and/or payments in lieu of taxes
__	__	NY's lack of compatibility with regional REC tracking & trading systems
__	__	availability of parts and supplies (turbines, gearboxes, etc.)
__	__	availability of qualified local workforce to perform O&M
__	__	federal incentives uncertainty
__	__	availability of suitable sites with adequate renewable resources
__	__	other ____

54. How do these barriers differ by technology?

55. What additional steps could or should the utility companies take to minimize these barriers?

56. What additional steps should NY State take to minimize these barriers?

Market Conditions

57. Which market factors have the greatest influence on energy and REC prices (i.e., wholesale price of electricity, prices being offered by other REC suppliers, equipment pricing and availability, project financing structure, etc.)?

58. Describe how RE market conditions have changed since NY first introduced its RPS (2004), (i.e., project finance strategies, types of market players who are most active, equipment pricing and procurement strategies) and what future changes you anticipate in the marketplace.

Steps to a Sustainable Market

59. How would you define a "sustainable RE market" in NY, and how close is New York to achieving those conditions?

60. Of all the different policy and market design options available to policy-makers to lay the groundwork for developing a sustainable renewable energy market in New York, which are most essential? By sustainable, I mean a market that will sustain at least 25% RE supply in NY without state incentives.

    a. Specifically, what is your opinion on using Feed-In Tariffs to incentive RE, instead of the RPS?

61. How do you think a carbon cap and trade market will affect the RE market and the RPS in New York? Please comment both on the RGGI market as well as a possible future national market.

62. Can the voluntary market grow to the scale necessary to support 25+% renewables supply in the state going forward?

Appendix D:

PENNSYLVANIA WIND SITING INITIATIVES

Pennsylvania's local governments have control over local land use planning and regulation. Thus, communities have the authority to impose unfavorable wind-related ordinances and permitting requirements if they wish. However, Pennsylvania has taken a proactive approach on wind siting at the state-level. Examples of Pennsylvania's state-level leadership include:

- **The Pennsylvania Wind Farms and Wildlife Collaborative**: Governor Rendell convened this stakeholder working group to "engage federal and state environmental agencies, nongovernmental conservation organizations, and the wind industry in a collaborative, consensus-based process to collect, share, review, and use the best available science, data, and professional expertise to address how best to assist in the development of wind energy in Pennsylvania in an environmentally responsible manner."[303] Led by the Pennsylvania Department of Conservation and Natural Resources, the group of wind industry, state agency and non-government conservation organization representatives has worked since 2006 to develop best management practices, guidelines and other tools to assess and mitigate risks to habitat and wildlife that result from wind farm development. The Collaborative functions as an active forum for exchanging information and ideas among a diverse set of stakeholders.
- **Model Wind Ordinance**: The ordinance, completed in 2006, helps guide communities by providing template language for addressing complex issues like visual impacts, sound levels, shadow flicker, minimum property setbacks, interference with communications devices, protection of public roads, liability insurance, decommissioning and dispute resolution.
- **The Pennsylvania Game Commission's "Wind Energy Voluntary Cooperation Agreements"(WEVCA)**: In 2007, the Pennsylvania Game Commission introduced the WEVCA concept as a means of standardizing pre and post-construction wildlife monitoring and impact review procedures for windfarms. A number of wind developers have signed agreements through which they agree to have the Commission gather data and assess wildlife impacts at the proposed development site well in advance of construction during a specified review period. The review process can help identify areas where wind development should and should not be taking place, enabling developers to adapt their development plans or potentially abandon an unfavorable site before it becomes the subject of opposition by local and environmental groups. A summary of data gathered during the first year of the reviews conducted under these voluntary agreements is expected to be published in early 2009.[304]

While Pennsylvania's communities can and will still likely challenge some wind project development, the state-level efforts are helping to mitigate potential conflicts and facilitate more effective and efficient wind project siting and permitting.

[303] Pennsylvania Windfarms and Wildlife Collaborative mission statement. Available at http://www.dcnr.state.pa.us/wind/index.aspx.

[304] Personal communication, Kerry Campbell, Energy Program Specialist, Pennsylvania Department of Environmental Protection, November 10, 2008.

Appendix E:

RGGI INTERACTION ISSUES

Summit Blue identified four areas of potential interaction between the RPS and RGGI markets in New York:

1. Offsets for LFG generation
2. Accounting for biomass co-firing
3. Early reduction allowances
4. Effect of RGGI on power prices.

These are discussed below.

Offsets for LFG generation

The RGGI rule adopted by New York specifically excludes almost all renewable generation as a CO_2 offset. The following types of offset projects are eligible for the award of CO_2 offset allowances:

(i) Landfill methane capture and destruction;

(ii) Reduction in emissions of sulfur hexafluoride (SF6);

(iii) Sequestration of carbon due to afforestation;

(iv) Reduction or avoidance of CO_2 emissions from natural gas, oil, or propane end-use combustion due to end-use energy efficiency; and

(v) Avoided methane emissions from agricultural manure management operations.[305]

[305] Department of Environmental Conservation, Express Terms, Part 242 CO2 Budget Trading Program. Section 10.3(d)(2).

The only renewable generation type that would be eligible would be related to landfill methane capture and destruction. However the rule further states that an offset project that includes an electric generation component must transfer legal rights to any and all attribute credits generated from the operation of the offset project (other than the CO_2 offset allowances awarded to the generator through 242-10.7 of the RGGI rules) to the DEC or its agent.

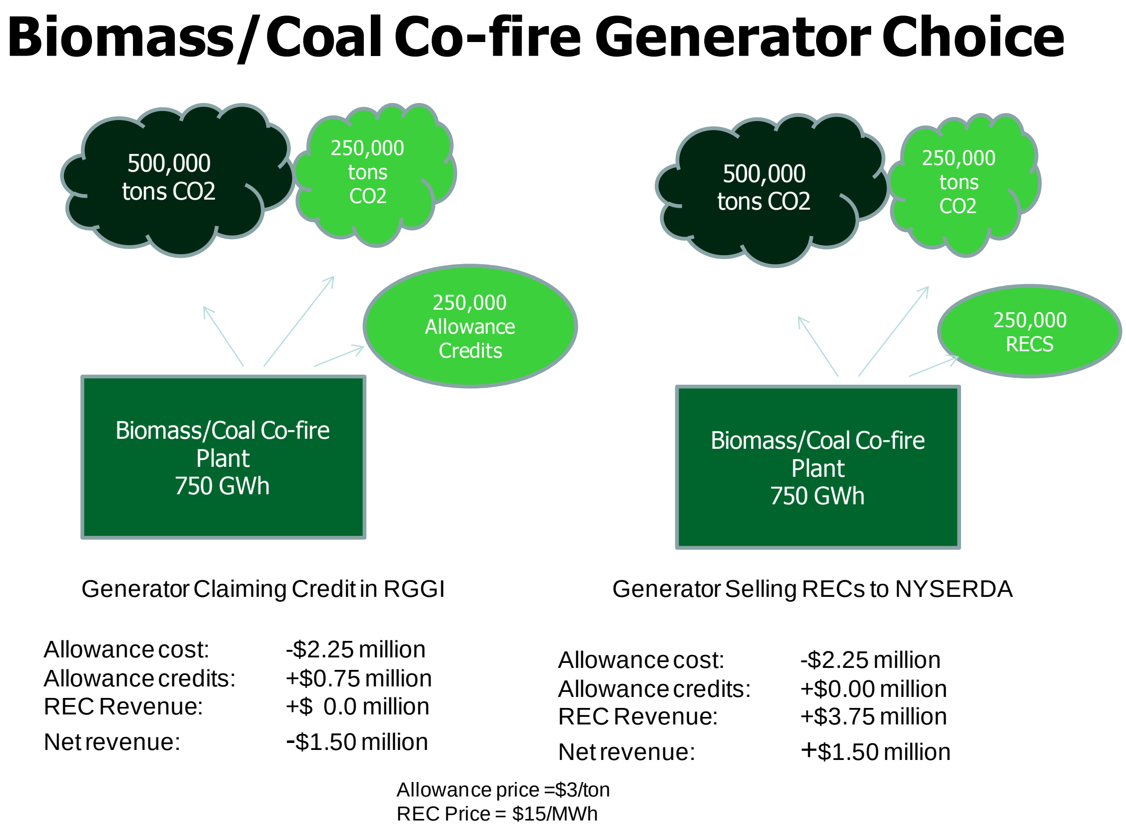
Accounting for biomass co-firing

Section 242-8.7 of the draft regulation provides the carbon accounting rules CO_2 budget units must follow to enable DEC to determine how much of the CO_2 emitted from a co-fired unit is from coal and how much is from biomass. The generators will have to buy allowances for the coal-fired CO_2 emissions, but not for the biomass-fired emissions (per Section 242-6.5 (b)(1).

Based on discussions with NYSERDA staff, the fact that the NYSERDA RPS attribute definition includes emissions offsets would preclude a coal-fired CO_2 budget unit from using biomass generation as a RGGI compliance mechanism if they have already sold RECs to NYSERDA during the compliance period. The rationale behind this is that the same biomass generation can't be applied both for the purposes of complying with RGGI and for sale in the RPS market. One might take issue with this, however, since the biomass portion of the CO_2 budget unit's generation is only being subtracted out from the unit's total generation to determine its coal-related compliance obligation. Since the biomass generation from the co-fired plant is playing such a limited role in the RGGI framework (i.e., simply to determine coal-related compliance requirements), it may not be necessary to deem the attributes of that generation as being "used up" and, therefore, unavailable for use in the RPS market.

This situation requires that co-fire biomass/coal plants make a market choice. This issue is illustrated in Figure 1 below. This figure shows two identical co-fire generator owners. One sells RECs to NYSERDA, the other accounts for carbon credits with RGGI. In this scenario, using current prices, the generator selling RECs to NYSERDA is \$3 million better off than the other generator. Different REC price and CO_2 prices would result differently.

Co-firing biomass with coal represents an opportunity to leverage cost-effective renewable generating capacity growth in the State. Furthermore, co-firing biomass at a coal generator enables the State to add renewable generation in existing power plant locations where transmission capacity constraints and environmental permitting barriers will not encumber the development cost or schedule.



Source: Summit Blue Consulting

Early reduction allowances

The DEC may award early reduction CO_2 allowances to a co-firing biomass generator for reductions in the CO_2 budget source's CO_2 emissions that are achieved by the source during the early reduction period (2006, 2007, and 2008)[306]. Cofiring during this period would generate allowances that could be used after the cap goes into effect on January 1, 2009. However, the NYSERDA REC contract would prevent that since NYSERDA retains ownership of the environmental attributes. This interaction will not have any significance on units participating in the RPS program going forward.

Effect of RGGI on power prices

When a generator has to pay to emit a pollutant, the generator will consider that cost in deciding whether to dispatch a unit. This cost then becomes reflected in the marginal price of electricity. This has been the case with SO_2 and NO_x emissions in the U.S., and with CO_2 emissions under the European Trading Scheme. In deregulated markets, such as those found in the New York, the emission costs will be largely passed through to customers. In Europe, under Phase 1 of the ETS, generators were allocated 100% of baseline emissions, passed through 60 to 100% of the emission costs in prices, and as a result received windfall profits.[307]

Increases in the market price for electricity would translate into higher electricity revenues for renewable energy generators and, lower REC revenue requirements. However, this assumes that all of the other factors affecting project economics remain unchanged. If renewable energy development drivers, such as federal tax incentives, were to go away, this would diminish the benefits associated with increased electricity revenues.

[306] Department of Environmental Conservation, Express Terms, Part 242 CO2 Budget Trading Program. Section 5.3(b).

[307] Sijm, J., Neuhoff, K., Chen, Y., 2006. "CO2 cost pass through and windfall profits in the power sector." *Electricity Policy*.

Appendix F:
REGRESSION ANALYSIS TASKS

The **historical** regression analysis consisted of the following tasks:

a) Assemble a database of historical hourly market electricity price data and hourly loads for 2005, 2006, and 2007 for all NYISO zones (A to K) and normalize all years to start on a Monday;

b) Combine electricity price data for each region into mega-zones 1, 2, and 3, using an average weighted by the total load in each region as a share of the total load in the mega-zone;

c) Add load in each region to get hourly load for each mega-zone;

d) Put natural gas price data in an 8760 format for 2005, 2006, and 2007 using monthly values from EIA (same in each hour within the month);

e) Put reserve margin data in 8760 format for 2005, 2006, and 2007 (same in each hour within each year);

f) Put renewable generation in 8760 format for the years 2005 to 2010 by the following process:

    a. Determine the months in which accepted projects will come on line, between January 2005 and December 2010, by looking at Date of Commercial Operation for all accepted projects

    b. Determine yearly generation by looking at Bid Quantity (MWh/year);

    c. Determine mega-zone in which renewable energy will be generated by looking at County and City name;

    d. Estimate monthly output, for each year of the Contract Term, for each mega-zone, and from each project, using a monthly weighting based on the technology – biomass (equal in each month), wind (from wind shape data), and hydro (based on stream flow data for northern NY State);

    e. Create 8760 generation values for renewable generation in each mega-zone for 2005, 2006, 2007, and 2010, estimating hourly output from wind using wind shape data;

g) Calculate Net Load for each mega-zone by subtracting renewable generation from total load for each hour in the year;

h) Put all data into SAS software to perform regression analysis, as described above, first taking the log of all the dependent and independent variables;

i) Run single-zone and multi-zone models, as described in section 0.

j) Check SAS results for statistical significance with the T-test[308] and then extract coefficients for use in the forecast analysis.

The **forecast** analysis consisted of the following tasks:

a) Calculate load forecasts by multiplying 2007 load data with NYISO load projections for growth from 2007 to 2010 (multiply hourly load by % increase in total energy);

b) Extract renewable energy generation forecasts for 2010 from step 1-g above;

c) Put reserve margin forecast in 8760 format for the year 2010;

d) Create 8760 gas price forecasts by the following method:

   i. Compare historical (2005 to 2007) Henry Hub prices with historical prices for gas supplied to electric power consumers in NY to get an average difference;

   ii. Adjust Henry Hub monthly price forecasts to 2010 with the average difference calculated to get estimated NY gas prices to the end of 2010; and

   iii. Put in 8760 format using monthly values.

e) For both models – single-zone and multi-zone – and each mega-zone, use coefficients from the historical regression combined with forecasted load, net load, gas prices, and reserve margin to calculate forecast prices for two cases:

   i. "With renewables" (using Net Load, which is load forecast minus renewable generation forecast); and

   ii. "Without renewables" (using load forecast).

f) Calculate total electric price per hour by multiplying the load forecast for each mega-zone by the two price forecasts (with and without renewable generation); and

---

[308] This test examines if a coefficient is significantly different from zero. The t-statistic calculated is often measured against a value of 1.96, and if the absolute value is greater than 1.96, then the hypothesis is rejected and the coefficient is said to be "statistically significant."

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g) Total price suppression for each mega-zone is equal to the difference in total price over the whole year when calculated using the two different price forecasts.

8.3 DATA SOURCES

Table F-1 shows the data sources that were used for the analysis, and what resolution they have in terms of time and areas covered.

Table F-1. Data Sources for the Analysis

Data Type	Time Resolution	Location Resolution	Available Years	Data Source
Market Electric Prices (LBMP)	Hourly	NYISO Zonal	2005,2006,2007	NYISO website
Natural Gas Prices	Monthly	NYISO	2005,2006,2007	EIA Price of natural gas for electric generation
Gas Price Forecast	Monthly	National	All years to 2013	NYMEX website (Henry Hub price forecast)
Load	Hourly	NYISO Zonal	2005,2006,2007	NYISO website
Load Forecast	Yearly	NYISO	All years to 2017	NYISO Gold Book 2008
Reserve Margin	Yearly	NYISO	2005,2006,2007, projections for 2010	NYISO gold books (2005,2006,2007,2008)
Renewable Generation related to RPS	Monthly	NYISO Zonal	All RPS contracts through 2008	NYSERDA
Wind Generation Shape	Hourly	NYISO Zonal	2005	GE Study (NYISO)

REGRESSION ANALYSIS

The regression analysis of years 2005 to 2007 was done with the SAS statistical software package.[309] The dependent variables are the market price of electricity, and the independent variables are: natural gas price, load, RE generation, and reserve margin. The outputs of the model are the coefficients of each term in the regression formula.

A log-log functional form was used. It is common to use a log-log functional form for models that relate demand to price because the log-log model can fit both linear and non-linear relationships. In the case of demand and price, when demand reaches very high levels prices tend to spike, and this indicates a non-linear relationship.

The regression was approached in two ways:

1. **Three separate zonal models.** In this case, the dependent and independent variables were related only within each mega-zone, and any effects on price coming from the other mega-zones were not included. This approach was used to see if the dollar savings per increased renewable percentage are different in each zone.

   The formulas used in the single-zone approach were:

   $$NL_{r,h} = L_{r,h} - W_{r,h} - H_{r,h} - B_{r,h}$$

   $$\ln(P_{1,y,h}) = b_0 + b_1 * \ln(NL_{1,y,h}) + b_2 * \ln(NGP_{y,m}) + b_3 * \ln(RM_y)$$

   $$\ln(P_{2,y,h}) = b_4 + b_5 * \ln(NL_{2,y,h}) + b_6 * \ln(NGP_{y,m}) + b_7 * \ln(RM_y)$$

   $$\ln(P_{3,y,h}) = b_8 + b_9 * \ln(NL_{3,y,h}) + b_{10} * \ln(NGP_{y,m}) + b_{11} * \ln(RM_y)$$

   Where:

   - b_o to b_{11} are unique coefficients
   - ln() is the natural log function

[309] www.sas.com.

- y = yearly
- m = monthly
- h = hourly
- r = mega-zone
- 1, 2, and 3 are the mega-zones in the NYISO
- L = load
- W = wind generation added from the first three procurements
- H = hydro generation added from the first three procurements
- B = biomass generation added from the first three procurements
- NL = load net of renewable generation added in the first three procurements
- NGP = natural gas price
- RM = reserve margin

2. **Combined three-zone models.** In this case, the dependent variable (the price in one mega-zone) was related with the independent variables from all three zones, to include any possible effects on price from changes in load in the other two mega-zones. This approach was used because the NYISO operates as a large trading area and one can expect that there will be some influence from the other zones in the trading area on each individual zone. Multi-collinearity was considered a possible problem with this approach, but was determined to not be an issue.[310]

   The formulas used in the multi-zone approach were:

   $NL_{r,h} = L_{r,h} - W_{r,h} - H_{r,h} - B_{r,h}$

   $\ln(P_{1,y,h}) = b_0 + b_1 * \ln(NL_{1,y,h}) + b_2 * \ln(NL_{2,y,h}) + b_3 * \ln(NL_{3,y,h}) + b_4 * \ln(NGP_{y,m}) + b_5 * \ln(RM_y)$

   $\ln(P_{2,y,h}) = b_6 + b_7 * \ln(NL_{1,y,h}) + b_8 * \ln(NL_{2,y,h}) + b_9 * \ln(NL_{3,y,h}) + b_{10} * \ln(NGP_{y,m}) + b_{11} * \ln(RM_y)$

   $\ln(P_{3,y,h}) = b_{12} + b_{13} * \ln(NL_{1,y,h}) + b_{14} * \ln(NL_{2,y,h}) + b_{15} * \ln(NL_{3,y,h}) + b_{16} * \ln(NGP_{y,m}) + b_{17} * \ln(RM_y)$

[310] There may be multi-collinearity problems from including all three zone loads in each model, but given the way this model is being used it isn't a big concern. If there is multi-collinearity between variables, it means the model may be assigning dependence on one variable when it should really be on another. This is a problem if the model coefficients are the answer to the research question; however, in this case, the coefficients are not being used as the answer. Instead the entire model to used to predict future values. If one coefficient is off compared to another, but the effect is still captured in the other because they are correlated, there is no loss of information in the overall model results.

Where:

- b_o to b_{17} are unique coefficients
- ln() is the natural log function
- y = yearly
- m = monthly
- h = hourly
- r = mega-zone
- 1, 2, and 3 are the mega-zones in the NYISO
- L = load
- W = wind generation added from the first three procurements
- H = hydro generation added from the first three procurements
- B = biomass generation added from the first three procurements
- NL = load net of renewable generation added in the first three procurements
- NGP = natural gas price
- RM = reserve margin

SUMMARY OF INPUT DATA

Prices

Average monthly LBMP prices for 2005 to 2007, for the three mega-zones, are shown in Figure below. Zone 3 consistently has the highest prices, followed by Zone 2, and then Zone 1 with the lowest prices.

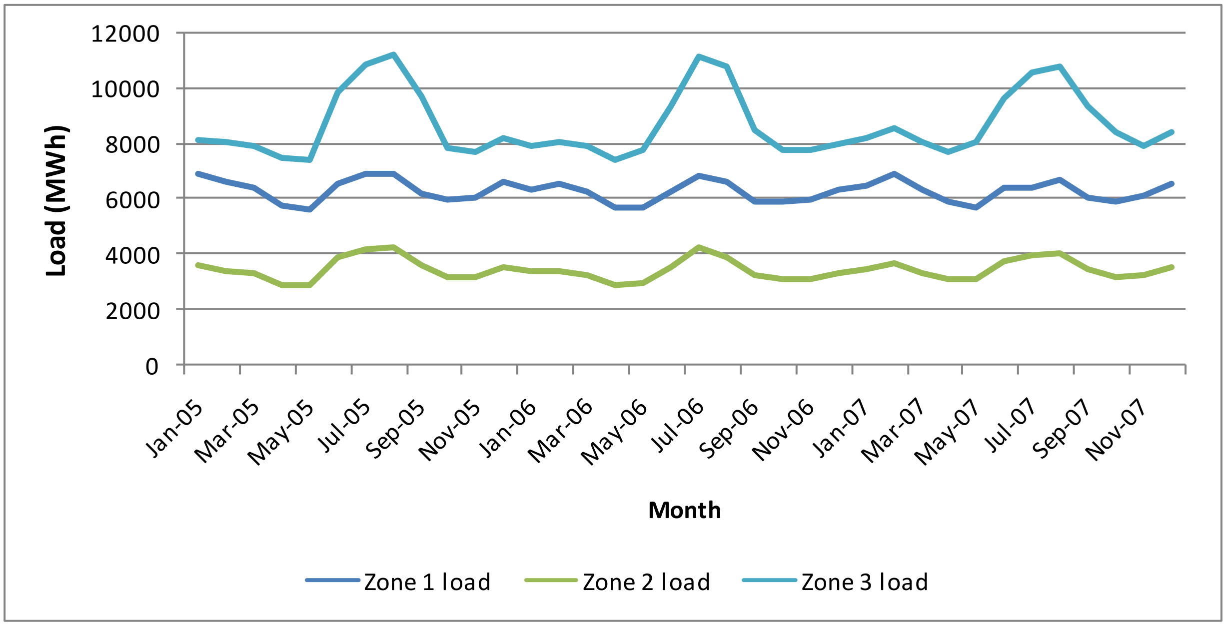
Figure F-1: Average Price by Month and Mega-Zone

Source: Summit Blue analysis of NYISO data

<u>Load</u>

Historical load for each mega-zone is shown in Figure F-2 below. Load is highest in Zone 3, followed by Zone 1, and then Zone 2 with the lowest load.

Figure F-2: Average Load by Month in Each Mega-Zone

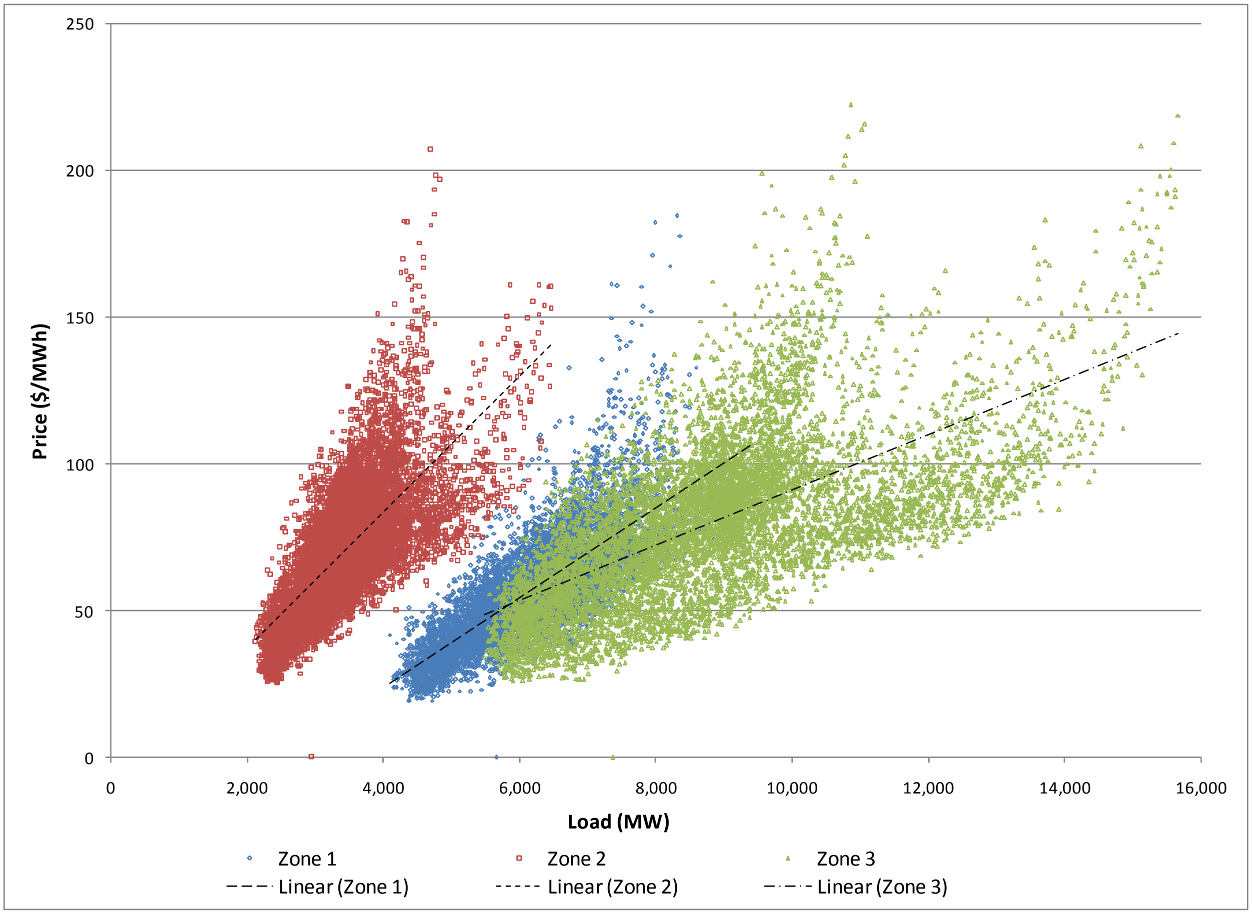


Source: Summit Blue analysis of NYISO data

Price Responsiveness

The scatter plot in Figure F-3 below shows price responsiveness for the three mega-zones in 2007. The trend lines show how much the price in each mega-zone responds to increases or decreases in load in that zone. Zone 2 has the lowest total load and the highest price responsiveness. Zone 3 has the highest total load, the lowest price responsiveness, and the highest average prices.

Figure F-3: Price Responsiveness Scatter Plot (2007 data)

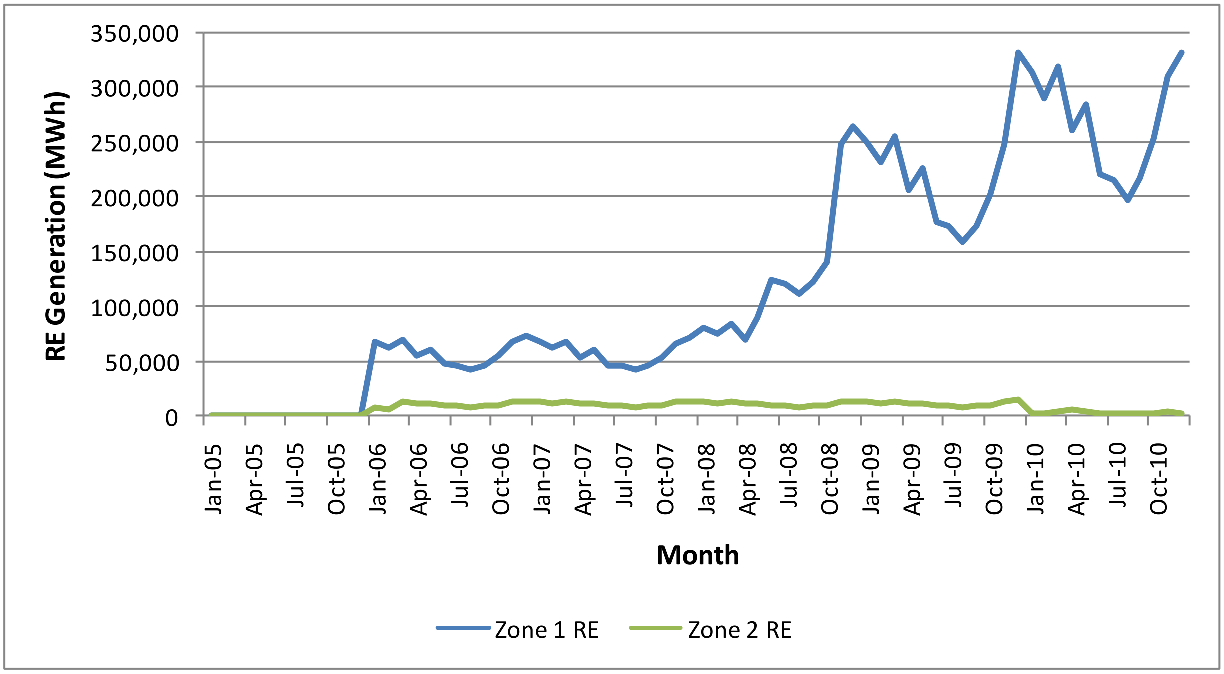


Source: Summit Blue analysis of NYISO data

Renewable Generation

Estimated historical and projected renewable generation in each zone is shown in Figure (Note: Zone 3 has no generation). This includes wind, hydro, and biomass. Note that the generation for each contract only lasts as long as the contract length.

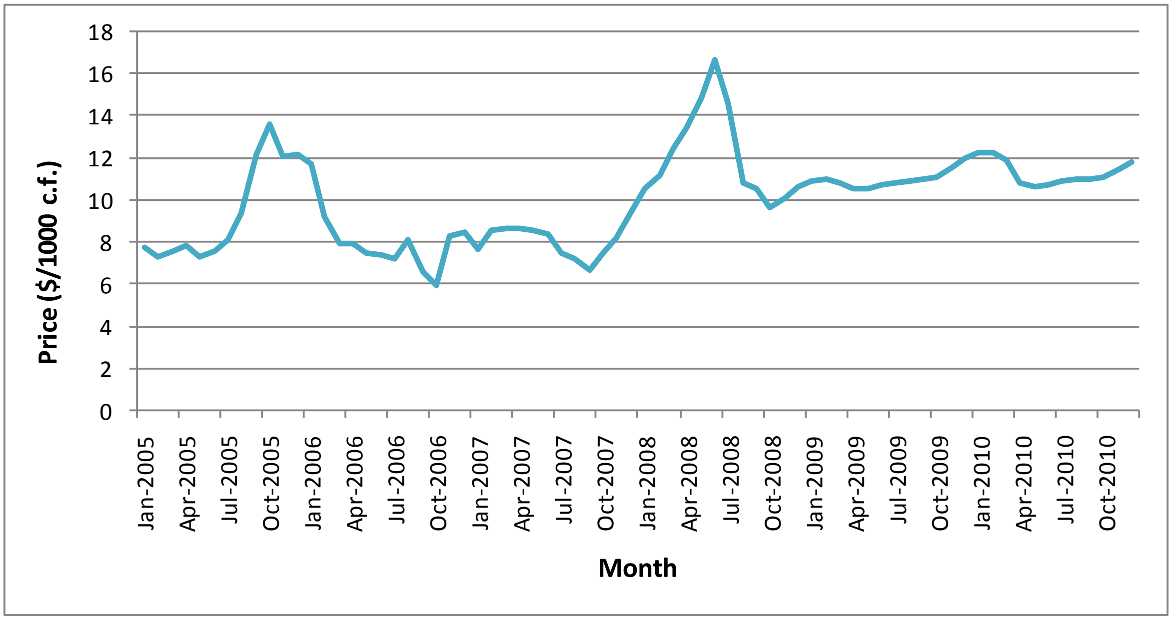
Figure F-4: Average RE Generation by Month to 2010



Source: Summit Blue analysis of NYSERDA data

Historical and forecasted natural gas prices are shown in Figure F-5 below. Prices for 2005 to 2007 are taken from the EIA website (category: NY Natural Gas Price Sold to Electric Power Consumers) and prices for 2008 to 2010 are derived from Henry Hub short and long-term forecasts, adjusted to NY Electric Power prices.

Figure F-5: Historical and Forecasted Natural Gas Prices



Source: EIA historical prices and NYMEX short- and long-term forecasts

The reserve margin values used in the analysis are shown in Table below. These values were taken from the NYISO Load and Capacity Data reports for 2005, 2006, 2007, and 2008.

Table F-2. Reserve Margin Values

Year	Summer Capability - Adjusted Reserve Margin %	Source
2005	23.7%	NYISO 2005 Load and Capacity Data (Gold book)
2006	21.3%	NYISO 2006 Load and Capacity Data (Gold book)
2007	22.7%	NYISO 2007 Load and Capacity Data (Gold book)
2010	20.9%	NYISO 2008 Load and Capacity Data (Gold book)

Source: NYISO Load and Capacity Data reports

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REGRESSION ANALYSIS RESULTS

All of the coefficients in the single-zone model were statistically valid. Almost all of the coefficients in the multi-zone model were statistically valid (the exception being the coefficient for load in Zone 3 when related to Zone 1 price).

As expected, the coefficient for load in each zone is the highest when related to the price in the same zone. The reserve margin coefficient was expected to be negative, but this is the case only in Zone 2.

A comparison was done between the predicted and actual price. A predicted price value was calculated by putting the independent variables back into the regression formulas generated with SAS, and then these values were compared with the original price values. The average difference between actual and predicted was 2% for the multi-zone model and 4% for the single-zone model. This shows that the regression formula is a good approximation of the actual relationship between price and the independent variables, and that the multi-zone model is generally more accurate than the single-zone model.

The full results of the regression analysis are given below in Table F-3, Table F-4, and Figure F-6.

Table F-3. Regression Analysis Output – Single-Zone Model

Variable	DF	Parameter	Standard	t Value	Pr > |t|
Zone 1					
Intercept1	1	-61.329	4.09964	-14.96	<.0001
NetLoad1	1	0.014	0.00008531	159.1	<.0001
Gas1	1	5.307	0.04735	112.08	<.0001
ResMar1	1	-39.842	17.70554	-2.25	0.0244
Zone 2					
Intercept2	1	12.603	4.80197	2.62	0.0087
NetLoad2	1	0.023	0.00012982	179.2	<.0001
Gas2	1	6.532	0.05526	118.19	<.0001
ResMar2	1	-330.914	20.6666	-16.01	<.0001
Zone 3					
Intercept3	1	-131.437	6.98489	-18.82	<.0001
Load3	1	0.011	0.00006981	159.39	<.0001
Gas3	1	8.169	0.08061	101.34	<.0001
ResMar3	1	208.669	30.06772	6.94	<.0001

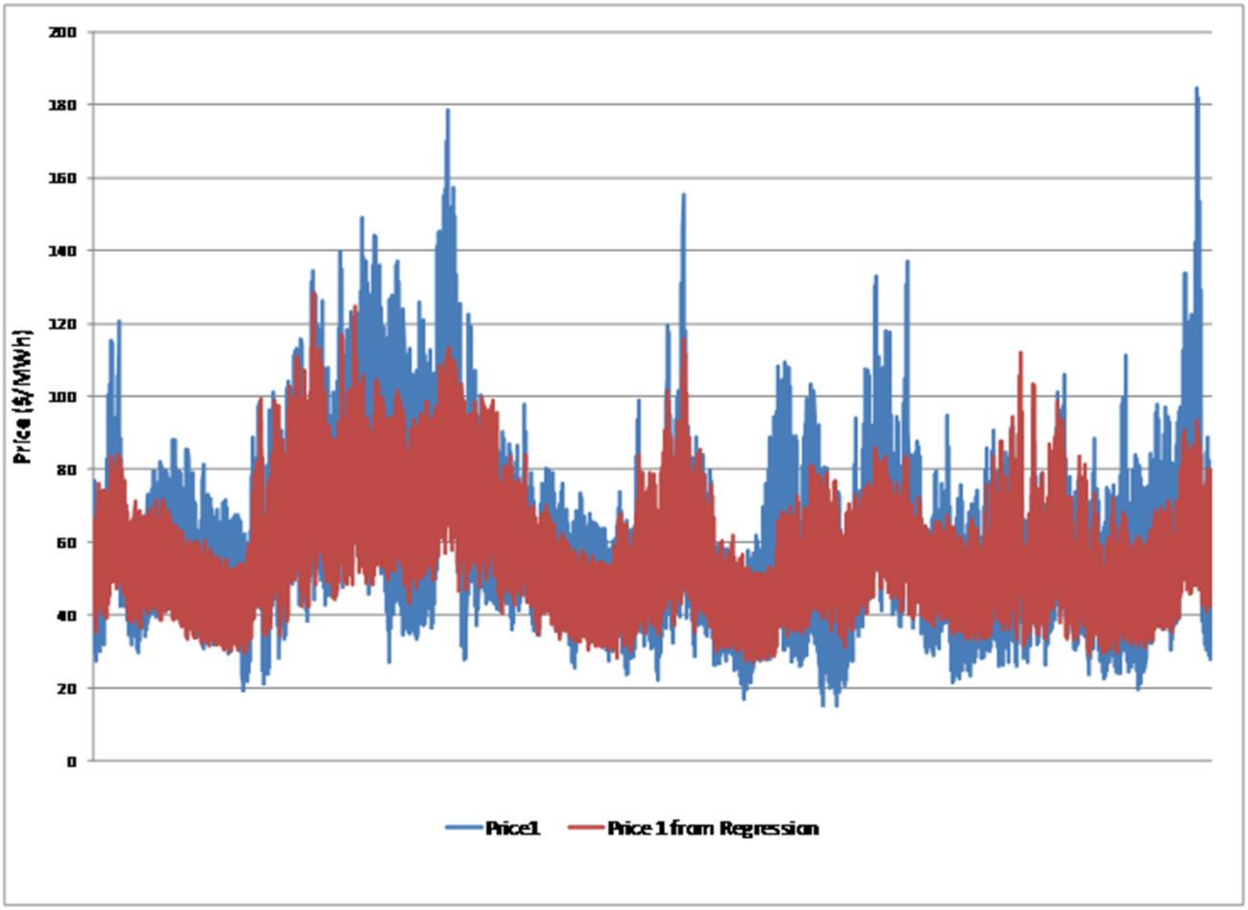
Source: Summit Blue regression analysis

Table F-4. Regression Analysis Output – Multi-Zone Model

Variable	DF	Parameter	Standard	t Value	Pr > |t|
Zone 1					
Intercept	1	-7.26237	0.15204	-47.76	<.0001
lnNetLoad1	1	0.47898	0.02584	18.54	<.0001
lnNetLoad2	1	0.80842	0.03258	24.81	<.0001
lnLoad3	1	-0.011	0.02012	-0.55	0.5844
lnGas1	1	0.72655	0.00714	101.73	<.0001
lnResMar1	1	0.61968	0.0655	9.46	<.0001
Zone 2					
Intercept	1	-9.96248	0.14338	-69.48	<.0001
lnNetLoad1	1	0.40833	0.02437	16.76	<.0001
lnNetLoad2	1	1.03209	0.03072	33.59	<.0001
lnLoad3	1	-0.1271	0.01897	-6.7	<.0001
lnGas2	1	0.77715	0.00674	115.39	<.0001
lnResMar2	1	-1.18046	0.06176	-19.11	<.0001
Zone 3					
Intercept	1	-8.19014	0.14881	-55.04	<.0001
lnNetLoad1	1	0.28267	0.02529	11.18	<.0001
lnNetLoad2	1	0.96449	0.03189	30.25	<.0001
lnLoad3	1	0.1472	0.01969	7.48	<.0001
lnGas3	1	0.7897	0.00699	112.98	<.0001
lnResMar3	1	0.52676	0.0641	8.22	<.0001

Source: Summit Blue regression analysis

Figure F-6: Predicted Versus Actual Hourly Prices, 2005 to 2007 – Multi-Zone Model, Zone 1



Source: Summit Blue regression analysis

Appendix G:

SUPPORTING NOTES FOR THE REPRESENTATIVE SYSTEMS ANALYSIS

Table G-1. Supporting notes for the representative PV systems analysis

PV Program Name	Residential Assumptions	Commercial Assumptions	Notes
NYSERDA PV Incentive Program	Residential system.	Non-residential system.	Incentive for residential is $4/W up to 5kW, then $3/W for each additional kW. Incentive for non-residential is$4/W up to 25kW, then $3/W 25-50kW.
Long Island Power Authority (LIPA) Solar Pioneer Program			Incentives are $3.50/W DC.
California Solar Initiative	System in PG&E territory (Step 4) accepting EPBB payments.	System in PG&E territory (Step 5) accepting EPBB payments. Note that 50kW systems are on the fence with regard to accepting EPBB payments and PBI payments.	
New Solar Homes Partnership		Commercial not included.	Base incentive in 2007 is $2.50/W. As of 8/1/08, the reserved volume had not yet reached the 15MW step point.
Feed-In Tariff	System in PG&E territory, Zip code 94102, PV Watts calculator used to estimate kWh/year, used defaults from the estimator, 15 year contract.	System in PG&E territory Zip code 94102 PV Watts calculator used to estimate kWh/year used defaults from the estimator 15 year contract.	Energy output from the PV system was matched to hourly tariff by day type. Discount rate is 8.93%.
NJ Board of Public Utilities Solar Renewable Energy Certificates (SRECs)	System in Newark, NJ. PV Watts used for estimation of energy production per year. 15 year time frame used.	System in Newark, NJ. PV Watts used for estimation of energy production per year. 15 year time frame used.	SRECs estimated at 60% of SACP value. Discount rate is 8.93%.
NJ Customer On-Site Renewable Energy (CORE) Program	Residential application assumed to be in the private sector, where CORE incentives are $3.50/W for 0-10kW.	CORE incentives not included for the commercial system.	

PV Program Name	Residential Assumptions	Commercial Assumptions	Notes
WE Energies Solar Buy Back Rate	System in Milwaukee, WI. PV Watts used for estimation of eneryg production per year. 10 year time frame used because contracts for this program are 10 years.	System in Milwaukee, WI. PV Watts used for estimation of energy production per year. Note that contracts for this program are 10 years.	Incentive is $0.225/kWh. Discount rate is 8.93%.
Madison Gas and Electric Clean Power Partner Solar Buyback Program	System in Madison, WI. PV Watts used for estimation of energy production per year. 10 year time frame used because customers must sign a 10-year contract.	Maximum system size is 10 kW.	Participants must also participate in MGE Green Power Tomorrow- must buy electricity back at regular electric rate plus $0.01; therefore, subtracted this cost from the incentive payment. Discount rate is 8.93%.
Focus on Energy- Renewable Energy Cash-Back Rewards	Maximum incentive is 25% of project cost. 5kW system at $9/W costs $45,000. Twenty-five percent is 11,250. Incentives given at $1.50/kWh up to maximum incentive.	Maximum system size is 20 kW.	
Xcel Energy- Renewable Energy Buy-Back Rate	Minimum system size is 20 kW.	Negotiated on a case-by-case basis.	
Commonwealth Solar	Based on the Commonwealth Solar Residential Rebate Calculator. Avaible at http://www.masstech.org/solar/.	Based on the Commonwealth Solar Non-Residential Rebate Calculator. Avaible at http://www.masstech.org/solar/.	
Chicopee Electric Light Solar Rebate Program	Maximum incentive per system is $5,000.	Commercial sector not applicable.	Incentive is $2.50/W.
Energy Consumers Alliance of New England- Renewable Energy Certificate Incentive	System in Worcester, MA. PV Watts used for estimation of energy production per year. 7 year time frame is used because contracts are for 3 or 7 years.		REC price is $0.03/kWh.

Table G-2. Supporting notes for the representative small wind system analysis

Small Wind Program Name	Incentive Assumptions
NYSERDA Small Wind Incentive Program	Base incentive level and standard tower height for a Bergey Excel turbine. assumed. Incentive not for a farm, municipal or county government, not-for-profit facility, and school- these sector receive an adder to the incentive.
Self-Generation Incentive Program	SGIP projects must be at least 30 kW.
Emerging Renewables Program	Incentive is $2.50/W for first 7.5 kW and $1.50/W for increments >7.5 kW and < 30 kW.
California Feed-In Tariff	Wind estimated in PG&E territory- zip code 94102 (SF) at 5.75 m/s at 60 m with AWS True Wind. 37 m tower. Elevation at 16 meters. Annual energy generation about 15,001 kWh. Used the Massachusetts Technology Collaborative SWEET wind output calculator (http://www.mtpc.org/renewableenergy/small_renewables.htm). Average feed-in tariff price for a 15 year term is $0.09383/kWh.
Customer On-Site Renewable Energy (CORE) Program	Energy estimates from WindCad Turbine Performance Model originally developed by NREL and used by the CORE program staff. Wind speed is estimated at 4.7 m/s at 60m- from AWS True Wind (www.awstruewind.com) for Newark, NJ.
Focus on Energy- Renewable Energy Cash-Back Rewards	Maximum Cash-Back Reward = (annual electricity produced in kilowatt-hours) x Reward Factor; Reward Factor = (estimated wind energy system cost x 0.25)/(rated turbine capacity in kilowatts x 1,752). Focus on Energy Wind Turbine Output Estimator (http://www.focusonenergy.com/Information-Center/Renewables/Wind-Site-Evaluation-Tools/Wind-Turbine-Output-Estimator.aspx) for Madison, WI. Site: a fairly even mix of open and wooded areas. Tower height= 120 feet, tallest obstacle=30 feet. Estimated 7,709 kWh/year. Reward factor is 0.57; wind energy system cost = $40,245 (www.bergey.com).
Xcel Energy- Renewable Energy Buy-Back Rate	Minimum system size is 20 kW.
Energy Consumers Alliance of New England- Renewable Energy Certificate Incentive	REC price is $0.03/kWh. Wind estimated in Lowell, MA at 4.7 m/s at 60m. 37 m tower, elevation of 30m. Used the Massachusetts Technology Colaborative SWEET wind output calculator (http://www.mtpc.org/renewableenergy/small_renewables.htm).

Table G-3. Supporting notes for the representative fuel cell system analysis

Fuel Cell Program Name	Incentive Assumptions
NYSERDA Fuel Cell Rebate and Performance Incentive Program	Equipment assumed to be new. Incentive is $2/W for small systems plus a performance based incentive of $0.15/kWh for 3 years if CF>50%. Capacity factor assumed to be 75% from multiple sources: 1) DOD Residential Proton Exchange Membrane (PEM) Fuel Cell Demonstration Program: Volume 2- Summary of Fiscal Years 2001-2003 Projects. White, M.K., Lux, S.M., Knight, J.L., Binder, Dr.M.J., Holcomb, F.H., and Josefik, N.M. 2) DOE Climate Change Fuel Cell Program, DOE Award Number: DE-FG26-01NT41266, 2004. 3) Brdar, R.D., "Fuel Cells Merit Wider Deployment," EnergyBiz Magazine. www.energycentral.com.
Self-Generation Incentive Program	Minimum system size requirement is 30 kW.
Emerging Renewables Program	Incentive is $3/W.
California Feed-In Tariff	Fifteen year operation. Average feed-in tariff price for a 15 year term is $0.09383/kWh. Capacity factor assumed to be 75% from multiple sources: 1) DOD Residential Proton Exchange Membrane (PEM) Fuel Cell Demonstration Program: Volum 2- Summary of Fiscal Years 2001-2003 Projects. White, M.K., Lux, S.M., Knight, J.L., Binder, Dr.M.J., Holcomb, F.H., and Josefik, N.M. 2) DOE Climate Change Fuel Cell Program, DOE Award Number: DE-FG26-01NT41266, 2004. 3) Brdar, R.D., "Fuel Cells Merit Wider Deployment," EnergyBiz Magazine. www.energycentral.com.
Customer On-Site Renewable Energy (CORE) Program	Incentive is $5/W.
Xcel Energy- Renewable Energy Buy-Back Rate	Minimum system size requirement is 20 kW.

Table G-4. Supporting notes for the representative ADG system analysis

ADG Program Name	Incentive Assumptions
NYSERDA Anaerobic Digester Gas-to-Electricity Rebate and Performance Incentive	New equipment assumed. Capacity incentive capped at the lesser of $350,000 or 50% of project cost. Discount rate is 8.93%.
California Feed-In Tariff	Fifteen year operation. Average feed-in tariff price for a 15 year term is $0.09383/kWh. Capacity factor assumed to be 80% from NYSERDA's Incentive Estimation Tool. Discount rate is 8.93%.
WE Energies- Biogas Buy-Back Rate	Fifteen year operation/contract. Capacity factor assumed to be 80% from NYSERDA's Incentive Estimation Tool. Assumed 36% on-peak operation; 64% off-peak operation. Discount rate is 8.93%.
Xcel Energy- Renewable Energy Buy-Back Rate	Ten year operation/contract. Capacity factor assumed to be 80% from NYSERDA's Incentive Estimation Tool. Discount rate is 8.93%.
Central Vermont Public Service- Biomass Electricity Production	Five year operation/contract. Capacity factor assumed to be 80% from NYSERDA's Incentive Estimation Tool. Average day-ahead LMP for VT for 2007 is $0.06941/kWh from NE-ISO. Discount rate is 8.93%.
Customer On-Site Renewable Energy (CORE) Program	

Appendix H:

SUPPORTING NOTES FOR THE LEADING STATES COMPARISONS

Table H-1. Photovoltaics (PV) State Rebate, Utility Rebate and Production Incentive Programs[311]

Photovoltaics State Rebate, Utility Rebate and Production Incentive Programs			
State	Incentive	Program Name	Notes
NY	Residential: $4/W, $3/W (≤5 kW, additional capacity up to 10kW) New York Energy Star Homes/Res Building Integrated PV: $4.50/W, $3.50/W (≤5 kW, additional capacity up to 10kW) Non-residential: $4/W, $3/W (≤25 kW, additional capacity up to 50kW) Non-res Building Integrated PV: $4.50/W, $3.50/W (≤25 kW, additional capacity up to 50kW) Schools, Non-Profit, Municipalities: $5/W, $4/W (≤25 kW, additional capacity up to 50kW)	NYSERDA PV Incentive Program	Varies by sector, installed capacity, and system type.
	Residential & Commercial: $\$3.50/\mathrm{W}_{DC}$ Schools, Non-Profit, Gov't: $\$4.50/\mathrm{W}_{DC}$	Long Island Power Authority (LIPA) Solar Pioneer Program	
CA	Residential: $1.90-$2.20/W or $0.26-$0.34/kWh Commercial: $1.55-$1.90/W or $0.22-$0.26/kWh Gov't/Non-Profit: $2.30-$2.65/W or $0.32-$0.37/kWh	California Solar Initiative	As of 7/24/2008. Incentive varies by administrator (PG&E, SCE, CCSE) step.
	Base: $2.50/W Solar as a Standard Feature: $2.60/W Residential Areas of Affordable Housing: $3.50/W Common Areas of Affordable Housing: $3.30/W	New Solar Homes Partnership	The actual incentive varies based on the system's expected performance compared to a reference system.
	$0.09271/kWh - $0.09572/kWh	California's Feed-In Tariff	Incentives are tied to the Market Price Referent (MPR) in CA and are adjusted by time-of-use factors. MPRs shown here are for 2008 and vary by length of contract.

[311] Database of State Incentives for Renewables and Efficiency (DSIRE). http://dsireusa.org. ; California Public Utilities Commission. "California Solar Initiative Staff Progress Report." July 2008.; California Energy Commission. "New Solar Homes Partnership Guidebook." 2nd Edition. CEC-300-2007-008-CMF. July 2007.; New York State Energy and Research Development Authority (NYSERDA). http://powernaturally.org.; Kelly Muellman, Green Energy Associate. Email communication. July 22, 2008. Energy Consumers Alliance of New England. http://www.massenergy.org. Note that CA utilities have multiple rebate programs available to customers.

NJ	Market based value	NJ Board of Public Utilities Solar Renewable Energy Certificates (SRECs)	
	$1.75-$4.10/W	Customer On-Site Renewable Energy (CORE) Program	Varies by capacity and applicant type.
WI	$0.225/kWh	WE Energies Solar Buy Back Rate	
	$0.25/kWh	Madison Gas and Electric Clean Power Partner Solar Buyback Program	
	$1.50/kWh - $2.00/kWh not to exceed 25% (35% for non-profit and public) of project cost or $35,000 (0.5kW – 20 kW)	Focus on Energy- Renewable Energy Cash-Back Rewards	
	Negotiated rate	Xcel Energy- Renewable Energy Buy-Back Rate	Rate negotiated on a case-by-case basis.
MA	Residential: $2.00-$5.50/W_{DC} Non-Residential: $3.25-$45.0/W_{DC}	Commonwealth Solar	Varies by capacity, applicant type and rebate "adders."
	$2.50/W	Chicopee Electric Light Solar Rebate Program	
	$0.03/kWh	Energy Consumers Alliance of New England- - Renewable Energy Certificate Incentive	Incentive on top of net-metering, rebates or tax incentives. Contracts for 3 or 7 years.

Table H-2. Photovoltaics (PV) State Grant, Local Grant, Utility Grant, and Personal Tax Credit Programs[312]

Photovoltaics State Grant, Local Grant, Utility Grant, and Personal Tax Credit Programs		
State	Incentive	Program Name
NY	25% with a maximum of $5,000	Solar and Fuel Cell Tax Credit
MA	Varies	Matching Grants for Communities
	15% with a maximum of $1,000	State Tax Credit
WI	Business and Marketing: Up to 50% of	Focus on Energy- Renewable Energy

[312] Ibid.

	project costs with a maximum of $10,000 Feasibility Study: Up to 50% of project costs with a maximum of $10,000 Implementation: 25% (35% for state, non-profits, or local governments) or $50,000	Grant Program
	$10,000 - $100,000	WE Energies- Direct Financial Incentives for Not-for-Profits
PA	Varies with a maximum of $500,000	Pennsylvania Energy Harvest Grant Program
	Varies with a maximum of $1 million	Pennsylvania Energy Development Authority (PEDA) Grants. Note that the PEDA solicitation was closed during the time of the analysis.
	Varies with a maximum of $25,000	Metropolitan Edison Company SEF Grants (First Energy Territory)
	Varies with a maximum of $25,000	Penelec SEF of the Community Foundation for the Alleghenies Grant Program (First Energy Territory)

Table H-3. Small Wind State Rebate, Utility Rebate and Production Incentive Programs[313]

Small Wind State Rebate, Utility Rebate and Production Incentive Programs			
State	Incentive	Program Name	Notes
NY	$2,400 - $120,000	NYSERDA On-Site Small Wind Incentive Program	Varies by make and model of the turbine and the tower height.
CA	$1.50/W	Self-Generation Incentive Program	
	$2.50/W, $1.50/W (≤7.5kW, >7.5kW and <30kW)	Emerging Renewables Program	Affordable housing projects can receive rebates 25% above the

313 Database of State Incentives for Renewables and Efficiency (DSIRE). http://dsireusa.org.; New York State Energy and Research Development Authority (NYSERDA). http://powernaturally.org. PON 1098.; Kelly Muellman, Green Energy Associate. Email communication. July 22, 2008. Energy Consumers Alliance of New England. http://www.massenergy.org.

			standard level up to 75% of installed system cost.
	$0.09271/kWh - $0.09572/kWh	Fed-In Tariff	Incentives are tied to the Market Price Referent (MPR) in CA and are adjusted by time-of-use factors. MPRs shown here are for 2008 and vary by length of contract.
NJ	$3.20/kWh (for the first 16,000 kWh of estimated energy production); $0.50/kWh (for the estimated energy production between 16,000 kWh and 750,000 kWh)	Customer On-Site Renewable Energy (CORE) Program	The incentive is capped at 120% of the estimated system specific performance.
WI	Maximum Cash-Back Reward = (annual electricity produced in kilowatt-hours) x Reward Factor; Reward Factor = (estimated wind energy system cost x 0.25)/(rated turbine capacity in kilowatts x 1,752) not to exceed 25% of project cost or $35,000 (≤20 kW) $0.066/kWh	Focus on Energy- Renewable Energy Cash-Back Rewards Xcel Energy- Renewable Energy Buy-Back Rate	
MA	$0.03/kWh	Energy Consumers Alliance of New England- - Renewable Energy Certificate Incentive	Incentive on top of net-metering, rebates or tax incentives. Contracts for 3 or 7. years.

Table H-4. Small Wind State Grant, Local Grant, Utility Grant, and Personal Tax Credit Programs[314]

Small Wind State Grant, Local Grant, Utility Grant, and Personal Tax Credit Programs		
State	Incentive	Program Name

[314] Ibid.

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MA	Varies	Matching Grants for Communities
	15% with a maximum of $1,000	State Tax Credit
	Varies with a maximum of $50,000	Clean Energy Pre-Development Financing Initiative
	Varies	Large On-Site Renewables Initiative Grants
WI	Business and Marketing: Up to 50% of project costs with a maximum of $10,000 Feasibility Study: Up to 50% of project costs with a maximum of $10,000 Implementation: 35% or $50,000	Focus on Energy- Renewable Energy Grant Program
	$10,000 - $100,000	WE Energies- Direct Financial Incentives for Not-for-Profits
PA	Varies with a maximum of $500,000	Pennsylvania Energy Harvest Grant Program
	Varies with a maximum of $1 million	Pennsylvania Energy Development Authority (PEDA) Grants
	Varies with a maximum of $25,000	Metropolitan Edison Company SEF Grants (First Energy Territory)
	Varies with a maximum of $25,000	Penelec SEF of the Community Foundation for the Alleghenies Grant Program (First Energy Territory)

Table H-5. Fuel Cell State Rebate, Utility Rebate and Production Incentive Programs[315]

Fuel Cell State Rebate, Utility Rebate and Production Incentive Programs			
State	Incentive	Program Name	Notes
NY	Basic: $2/W up to $20,000 (<25 kW), $1/W up to $200,000 (≥25kW) Bonus: $0.5/W up to $2,500 per unit and $5,000 per site (<25kW), $0.5/W up to $100,000 per site (≥25kW) Performance: $0.15/kWh up to $10,000 per year (<25kW) or up to $300,000 per year (≥25kW) if capacity factor is ≥50%, $0.05/kWh up to $10,000 per year (<25kW) or up to $300,000 per year (≥25kW) if capacity factor is <50%	NYSERDA Fuel Cell Rebate and Performance Incentive	Bonus capacity incentives for standalone systems at Essential Public Service sites (e.g., police station, hospital, public utility). Performance incentives can be received for up to 3 years.
CA	$2.50/W (non-renewable fuel) $4.50/W (renewable fuel)	Self-Generation Incentive Program	
	$3/W	Emerging Renewables Program	Affordable housing projects can receive rebates 25% above the standard level up to 75% of installed system cost.
	$0.09271/kWh - $0.09572/kWh	Feed-In Tariff	Incentives are tied to the Market Price Referent (MPR) in CA and are adjusted by time-of-use factors. MPRs shown here are for 2008 and vary by length of contract.
NJ	$5/W (for systems ≤10kW) $3/W (for first 10kW for systems > 10kW) $2/W (for 11-100 kW) $1.50/W (for 101-500 kW)	Customer On-Site Renewable Energy (CORE) Program	Thirty percent maximum on rebates.

315 Database of State Incentives for Renewables and Efficiency (DSIRE). http://dsireusa.org.

	$0.15/W (for systems 501kW-1MW)		
WI	Negotiated rate	Xcel Energy-Renewable Energy Buy-Back Rate	Rate negotiated on a case-by-case basis.

Table H-6. Fuel Cell State Grant, Local Grant, Utility Grant, and Personal Tax Credit Programs[316]

Fuel Cell State Grant, Local Grant, Utility Grant, and Personal Tax Credit Programs		
State	Incentive	Program Name
NY	20% with a maximum of $1,500	Solar and Fuel Cell Tax Credit
MA	Varies	Large On-Site Renewables Initiative Grants
WI	$10,000 - $100,000	WE Energies- Direct Financial Incentives for Not-for-Profits
PA	Varies with a maximum of $500,000	Pennsylvania Energy Harvest Grant Program
	Varies with a maximum of $1 million	Pennsylvania Energy Development Authority (PEDA) Grants
	Varies with a maximum of $25,000	Metropolitan Edison Company SEF Grants (First Energy Territory)
	Varies with a maximum of $25,000	Penelec SEF of the Community Foundation for the Alleghenies Grant Program (First Energy Territory)

[316] Ibid.

Table H-7. Anaerobic Digester Gas State Rebate, Utility Rebate and Production Incentive Programs[317]

Anaerobic Digester Gas State Rebate, Utility Rebate and Production Incentive Programs			
State	Incentive	Program Name	Notes
NY	New Equipment: $500/kW and $0.10/kWh Installed or substantially upgraded equipment since Jan.1, 2003: $0.02/kWh maintenance payment	NYSERDA Anaerobic Digester Gas-to-Electricity Rebate and Performance Incentive	New equipment is equipment that was installed on or after February 12, 2007.
CA	$0.09271/kWh - $0.09572/kWh	Feed-In Tariff	Incentives are tied to the Market Price Referent (MPR) in CA and are adjusted by time-of-use factors. MPRs shown here are for 2008 and vary by length of contract.
WI	$0.155/kWh (on-peak) $0.040/kWh (off-peak)	WE Energies-Biogas Buy-Back Rate	On-peak defined as Monday – Friday 9am to 9pm, excluding some holidays.
WI	$0.073/kWh	Xcel Energy-Renewable Energy Buy-Back Rate	
VT	95% of Locational Marginal Price (LMP) of generation published by ISO New England + $0.04/kWh	Central Vermont Public Service - Biomass Electricity Production Incentive “Cow Power”	
NJ	$5/W (systems up to 10 kW) $0.15/W - $3/W (systems over 10 kW)	Customer On-Site Renewable Energy (CORE) Program	Maximum incentive is 50% of system costs for systems up to 10 kW and 30% of system cost

[317] Database of State Incentives for Renewables and Efficiency (DSIRE). http://dsireusa.org.

			for larger systems.

Table H-8. Fuel Cell State Grant, Local Grant, Utility Grant, and Personal Tax Credit Programs[318]

Anaerobic Digester Gas State Grant, Local Grant, Utility Grant, and Personal Tax Credit Programs		
State	Incentive	Program Name
MA	Varies with a maximum of $50,000	Clean Energy Pre-Development Financing Initiative
	Varies	Large On-Site Renewables Initiative Grants
WI	Business and Marketing: Up to 50% of project costs with a maximum of $10,000 Feasibility Study: Up to 50% of project costs with a maximum of $10,000 Implementation: 25% or $250,000	Focus on Energy- Renewable Energy Grant Program
	$10,000 - $100,000	WE Energies- Direct Financial Incentives for Not-for-Profits
PA	Varies with a maximum of $500,000	Pennsylvania Energy Harvest Grant Program
	Varies with a maximum of $1 million	Pennsylvania Energy Development Authority (PEDA) Grants
	Varies with a maximum of $25,000	Metropolitan Edison Company SEF Grants (First Energy Territory)
	Varies with a maximum of $25,000	Penelec SEF of the Community Foundation for the Alleghenies Grant Program (First Energy Territory)

[318] Ibid.

Table H-9. State Rebate, Utility Rebate and Production Incentive Program Details

State Rebate, Utility Rebate and Production Incentive Program Details				
State	Program Name	Technologies Included	Budget	Details
NY	NYSERDA PV Incentive Program	Photovoltaics	$13.8 million (2008-2009)	No maximum size restriction; residential incentives capped at 10 kW; non-residential systems capped at 50kW. NYSERDA owns RECS for the first 3 years of operation, then the ownership transfers to the system owner.
NY	NYSERDA On-Site Small Wind Incentive Program	Wind	About $4.5 million (2007-2009)	System must be installed by a program-approved installer. Twenty-nine system models are eligible for the program.
NY	NYSERDA Fuel Cell Rebate and Performance Incentive	Fuel Cells	$11.2 million	
NY	NYSERDA Anaerobic Digester Gas-to-Electricity Rebate and Performance Incentive	Anaerobic Digester Gas	$11 million	Maximum incentive per system is $1 million.
NY	Long Island Power Authority (LIPA) Solar Pioneer Program	Photovoltaics	$345 million (2000-2009)	Maximum size is 10kW.

CA	California Solar Initiative	Photovoltaics	$2.2 billion (2007-2016)	Part of the larger Go Solar California! Campaign to install 3,000 MW of new solar capacity by 2016. The incentives are reduced based on steps. Each step includes a specified number of MW installed. Both Expected Performance Based Buy-Down ($/W) and Performance Based Incentives ($/kWh) are available. As of 2008, systems greater than 50kW must take the PBI. In 2010, system greater than 30kW must take the PBI.
CA	New Solar Homes Partnership	Photovoltaics	$400 million (2007-2016)	Part of the larger Go Solar California! Campaign to install 3,000 MW of new solar capacity by 2016. Incentive levels are set based on the reserved volume (MW); therefore, the incentive declines with an increase in program participation.
CA	Publicly Owned Utilities PV Programs (not these programs are not shown in the incentives matrix due to the large number of programs)	Photovoltaics	$784 million (2007 -2016)	Part of the larger Go Solar California! Campaign to install 3,000 MW of new solar capacity by 2016.

CA	Self-Generation Incentive Program	Small Wind, Fuel Cells	$83 million (2008)	System capacity must be between 30 kW and 5 MW. Incentive payment is capped at 3MW.
CA	Emerging Renewables Program	Small Wind, Fuel Cells	Unknown	
CA	Feed-In Tariff	Photovoltaics, Wind, Anaerobic Digestions, Fuel Cells (Renewable Fuel) and many other renewable energy sources	Unknown	Ten, 15, or 20 year contracts required. Maximum system size is 1.5 MW. The feed-in tariff is meant to help utilities meet their RPS requirements; therefore, RECs transfer to the utility.
CA	Southern California Edison-Biomass Standard Contract	Anaerobic Digestion, Fuel Cells (Renewable Fuel), Landfill Gas, Biomass, MSW	Unknown	All RECs transfer to SCE.
NJ	NJ Board of Public Utilities Solar Renewable Energy Certificates (SRECs)	Photovoltaics	None.	
NJ	Customer On-Site Renewable Energy (CORE) Program	Small wind, Fuel Cells, Biomass	$273 million (2005-2008) Note that this value includes program years when Photovoltaics were included in the program.	

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WI	WE Energies Solar Buy-Back Rate	Photovoltaics	Unknown	System capacity must be between 1.5 kW and 100 kW DC. There is a program cap of 1,000 kW. System owners must also enroll in the “Energy for Tomorrow” program- a green power program.
WI	WE Energies-Biogas Buy-Back Rate	Anaerobic Digestion, Biomass	Unknown	System capacity maximum is 1 MW. Fifteen year contract required.
WI	Madison Gas and Electric Clean Power Partner Solar Buyback Program	Photovoltaics	Unknown	System capacity must be between 1kW and 10 kW. Program capped at 150 kW. Customers must be a Green Power Tomorrow participant and sell all the solar power they generate to MGE for the agreed rate ($0.25/kWh) and buy it back from MGE at their regular electric rate plus $0.01.
WI	Focus on Energy-Renewable Energy Cash-Back Rewards	Photovoltaics, Wind, Biomass, Solar Water Heat, Non-Residential Wood-Burning Systems	Unknown	RECs remain with the customer/generator.

WI	Xcel Energy-Renewable Energy Buy-Back Rate	Photovoltaics, Wind, Anaerobic Digestions, Fuel Cells (Renewable Fuel) and many other renewable energy sources	Unknown	Minimum system size is 20 kW. Maximum system size is 800 kW, for biomass/biogas technologies, and 1 MW for all other technologies. RECs transfer to Xcel Energy. Ten year contract period required.
MA	Chicopee Electric Light Solar Rebate Program	Photovoltaics	$37,500 annually	The maximum incentive is $5,000. RECs remain with the owner, but Chicopee Electric Light has the option to buy them from the customer at $0.03/kWh.
MA	Commonwealth Solar	Photovoltaics	$68 million (2008-2011)	System capacity must be between 1 kW and 5 kW DC (STC) for residential systems and between 1kW and 5kW DC (STC) for non-residential systems.
MA	Energy Consumers Alliance of New England-Renewable Energy Certificate Incentive	Photovoltaics, Wind, Possibly Digester Gas	Unknown	RECs go toward renewable energy-based electricity product called *New England GreenStart.*[SM]
VT	Central Vermont Public Service-Biomass Electricity Production Incentive "Cow Power"	Anaerobic Digestion	Unknown	Five year contract required. RECs transfer to CVPS. CVPS sells the RECs to customers through Cow Power.

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