

EXHIBIT C

**RENEWABLE ENERGY CREDIT PRICES – THE MARKET SIGNAL FROM THE
STATE RENEWABLE PORTFOLIO STANDARD PROGRAM**

Prepared for

**THE NEW YORK STATE
ENERGY RESEARCH AND DEVELOPMENT AUTHORITY**
Albany, NY

Carole Nemore
Associate Project Manager

Prepared by

SUMMIT BLUE CONSULTING, LLC
Boulder, CO

Frank Stern
Nicole Wobus

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ABSTRACT

NYSERDA is required to present the New York Public Service Commission (PSC) with an evaluation report of the New York RPS 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 (the Summit Blue Team) were selected to perform a market conditions assessment to help understand the current state of the market and how the program has changed market conditions since its inception. This report presents findings pertaining to renewable energy credit prices and the New York RPS program. This work will be part of a comprehensive market conditions assessment report submitted to NYSERDA in November of 2008.

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SUMMARY

Renewable energy credits (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. This report presents findings pertaining to REC prices and the New York RPS program. This work will be part of a comprehensive market conditions assessment report submitted to NYSERDA in November of 2008.

The evaluation team conducted both primary and secondary data collection activities. Primary data collection activities consisted of in-depth telephone interviews with a broad set of renewable energy market participants.

This report addresses the topics critical to understanding this market signal:

- **NYSERDA RPS Program REC Pricing Summary.** What have the REC prices been in the first three solicitations?
- **REC Price Comparisons.** How do the NYSERDA prices compare to those seen in other states?
- **External Factors Affecting REC Prices.** What factors, other than program components, tend to make prices go up or down?
- **Program Components that May be Affecting REC Prices.** How do program components tend to affect REC prices?

Key findings are presented below.

NYSERDA RPS PROGRAM REC PRICING SUMMARY

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; non-wind (hydro and biomass) prices increased from RFP 1037 to RFP 1168, from \$13.13 to \$18.30.

REC PRICE COMPARISONS

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, the geographic region upon which each state can draw on resources without out-of-state 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.

Factors favoring lower prices are the relatively abundant wind resource in New York, 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 (meaning NYSERDA will not pay *any* price to meet the target).

Factors favoring higher prices include New York's vintage requirements (which are stringent relative to Maine and Maryland), and the limited geographic region upon which New York can draw without facilities needing to meet energy delivery requirements for imports (which is small relative to states that can draw on resources within their multi-state electricity control area). Some of these factors make New York REC prices higher than some states and lower than other, such as levels of RPS goals – New York's goals relative to existing eligible renewable resources are more aggressive than Maine, but less aggressive than Massachusetts.

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.

EXTERNAL FACTORS AFFECTING REC PRICES

The main drivers of REC prices are the main drivers in renewable energy project economics. These key drivers are listed below:

- Equipment Costs

- Fuel Costs for Biomass Facilities
- Project Revenues
 - Energy sales
 - Federal PTC benefits
- Supply-Demand Balance
- Term of REC Contract

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, the evaluation team asked developers a series of questions on this topic during our in-depth interviews with these key market participants. 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 State 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. 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 out of state facilities seem to primarily be limiting program participation to in-state projects. This should not substantially affect REC pricing, since there is not a shortage of competition among in-state program participants.

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 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 the 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.

Section 1

INTRODUCTION

NYSERDA is required to present the New York Public Service Commission (PSC) with an evaluation report of the New York RPS 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 (the Summit Blue Team) were selected to perform a market conditions assessment to help understand the current state of the market and how the program has changed market conditions since its inception. The Summit Blue Team's market conditions assessment, together with a program impact evaluation being conducted simultaneously by KEMA, will inform NYSERDA's March 2009 RPS evaluation report. This report presents findings pertaining to renewable energy credit (REC) prices and the NYSERDA RPS program. This work will be part of a comprehensive market conditions assessment report submitted to NYSERDA in November.

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 reflect the premium payments needed to support new renewable generation after accounting for energy revenues and tax credits.

DATA SOURCES AND METHODS

The evaluation team conducted both primary and secondary data collection activities. Data collection activities were closely coordinated across the Summit Blue market conditions research team and the KEMA impact evaluation team. 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. The focus of primary data collection efforts 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 as well as program participants), the financial/investment community, equipment manufacturers and distributors, voluntary green power marketers, Load Serving Entities (LSEs), trade associations, 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 also conducted with market participants closely related to the Customer Sited Tier programs of the RPS. Because the Customer Sited Tier 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 Customer Sited Tier programs, as well as program staff for each of the Customer Sited Tier programs.

OVERVIEW OF THIS REPORT

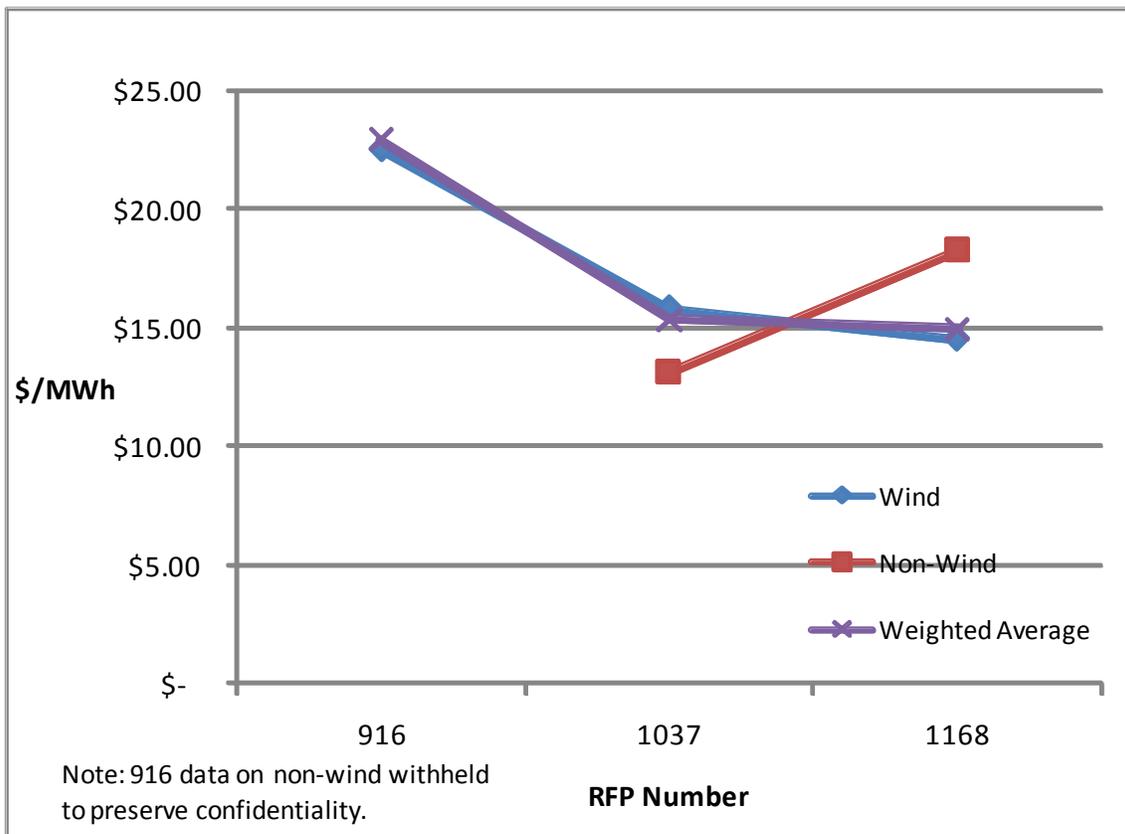
This report addresses the following topics critical to understanding this market signal. The next section presents a New York RPS program REC pricing summary. This is followed by a comparison of REC prices in other states. The next section discusses external factors affecting REC prices. Following is a section describing program components that may be affecting REC prices. References are presented in the final section.

Section 2

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 2-1. 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 \$18.30.¹ 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.

Figure 2-1. Wind REC Prices Decline, Others Increase

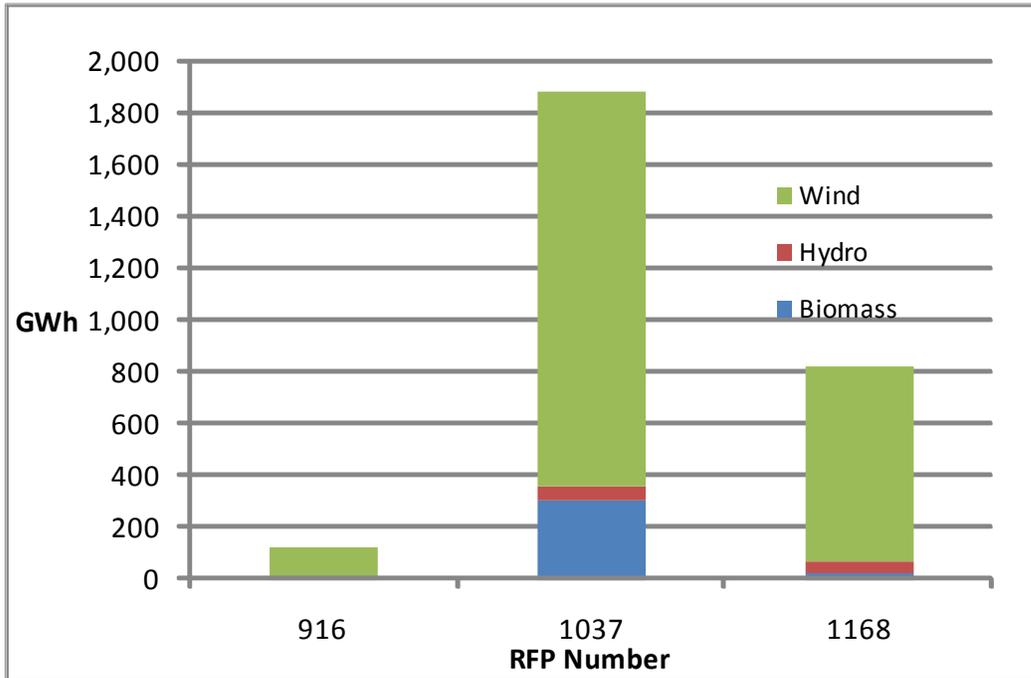


Source: NYSDERDA and Summit Blue Consulting.

¹ NYSDERDA'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.

Wind has dominated in all three RFPs, as can be seen in Figure 2-2. 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 2-2. Wind Has Consistently Dominated



Source: NYSERDA and Summit Blue Consulting.

Section 3

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, the evaluation team gathered REC pricing data for neighboring states. The team presents these data 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. This 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 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.

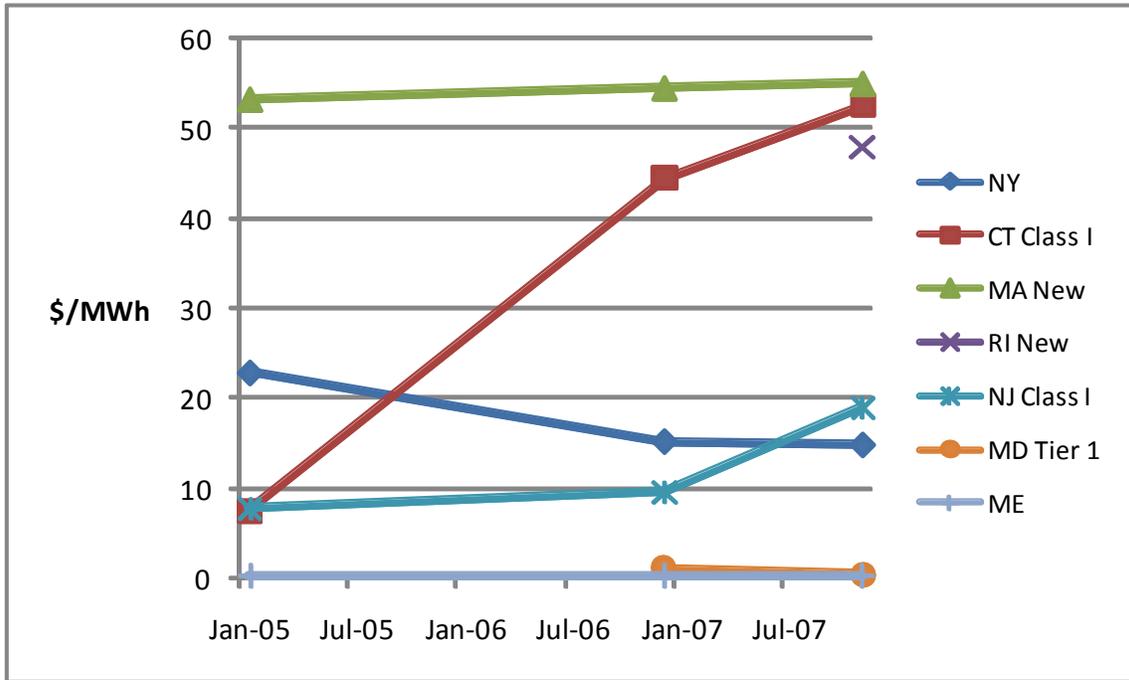
In contrast, northeast states with RPSs rely upon unbundled REC transactions for compliance, and most of the states are a few years into their RPS compliance schedules. Further, REC pricing data is made available by a major REC market broker, Evolution Markets. As a result, a comparison of REC prices 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.

In this section, the evaluation team presents REC pricing data provided by REC broker, Evolution Markets, as well as REC data from NYSERDA's RPS program records.

Figure 2-3 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 2-1. 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.

NEIGHBORING STATES

Neighboring states include those that trade within the ISO²-New England- and PJM³ Interconnection regions.

² Independent system operator.

⁴ 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.

ISO-New England

Looking first at the New England states, 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.⁴ 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 basis⁵ and (2) exclusion of construction and demolition waste from eligibility for Tier 1.⁶

With a shortage of eligible resources, Massachusetts' load serving entities have fallen short on meeting their requirements through procurement of RECs;⁷ 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.⁸ 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

⁴ 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.

⁵ New England Wind Forum. http://www.eere.energy.gov/windandhydro/windpoweringamerica/ne_astate_template.asp?stateab=ct. Downloaded July 30, 2008.

⁶ 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>.

⁷ Massachusetts Division of Energy Resources. 2008. *Massachusetts Renewable Energy Portfolio Standard Annual RPS Compliance Report for 2006*.

⁸ Massachusetts Division of Energy Resources. 2008. *Massachusetts Renewable Energy Portfolio Standard Annual RPS Compliance Report for 2006*.

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 eligible if they came on line after July 1, 2003.⁹ Massachusetts uses a December 31, 1997 vintage date.¹⁰ As noted above, Maine's RPS originally had no vintage requirements, though the State's RPS now includes a requirement for 10% "new" renewables by 2017,¹¹ and eligible new renewable-energy systems include those placed into service after September 1, 2005.¹² 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.¹³

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. 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.

⁹ State of Connecticut, Department of Utility Control. "RPS Overview." <http://www.dpuc.state.ct.us/Electric.nsf/bb23886a033a7ef28525713c000031d4/39b7cf92f5053bac8525730d005070b8?OpenDocument>. Downloaded November 13, 2008.

¹⁰ 225 CMR: DIVISION OF ENERGY RESOURCES. 10/19/07 225 CMR – 111 225 CMR 14.00 RENEWABLE ENERGY PORTFOLIO STANDARD.

¹¹ 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.

¹² 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)

¹³ 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.

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.

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 by the evaluation team.

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.¹⁴ 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 20.¹⁵ 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-

¹⁴ 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.

¹⁵ American Wind Energy Association. http://www.awea.org/pubs/factsheets/Top_20_States.pdf. Downloaded July 30, 2008.

of-state 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.¹⁶ Massachusetts has relatively stringent emission requirements for biomass plants.

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.¹⁷ 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.¹⁸ 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

¹⁶ Cory, K, and Swezey, B. 2007. "Renewable Portfolio Standards in the States: Balancing Goals and Implementation Strategies." National Renewable Energy Laboratory.

¹⁷ Paying an ACP does not get a state closer to its RPS targets.

¹⁸ American Wind Energy Association. http://www.awea.org/pubs/factsheets/Top_20_States.pdf. Downloaded July 30, 2008.

growing demand for generating capacity, and develop a plan to construct transmission capacity to deliver to customers the electric output from those zones.¹⁹

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. 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.²⁰ 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

¹⁹ Texas Senate Bill 20. Enrolled version.

²⁰ 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.”

renewables” RPS baseline. There is nothing keeping New York’s existing renewables from selling RECs into the voluntary markets.

Section 4

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 for new projects. 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.

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:

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

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 2-1 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 2-1. Simplified List of Revenues and Costs for Renewable Energy Projects

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

Source: Summit Blue Consulting

Key Driver: Major Expenses: Equipment Costs

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.²¹ Costs for renewable generation plants, as with all types of 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.²²

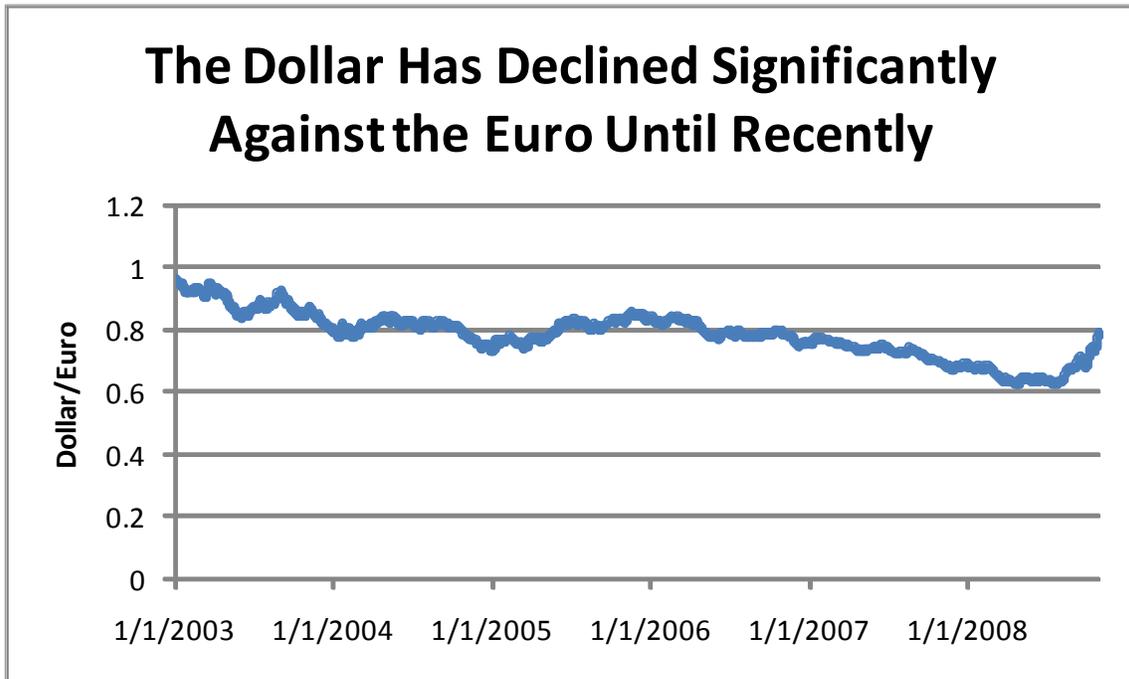
The declining value of the dollar relative to the euro, until the recent credit crisis, shown in Figure 2-4, has also been a factor in the increase in equipment costs. This is a particularly important factor for wind turbines due to the large portion of the manufacturing market being dominated by European 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.²³

²¹ 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 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.

²² 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>.

²³ American Wind Energy Association, *AWEA 2007 Market Report*, January 2008.

Figure 2-1. Value of the Dollar has Declined in Euros, 2003-2008

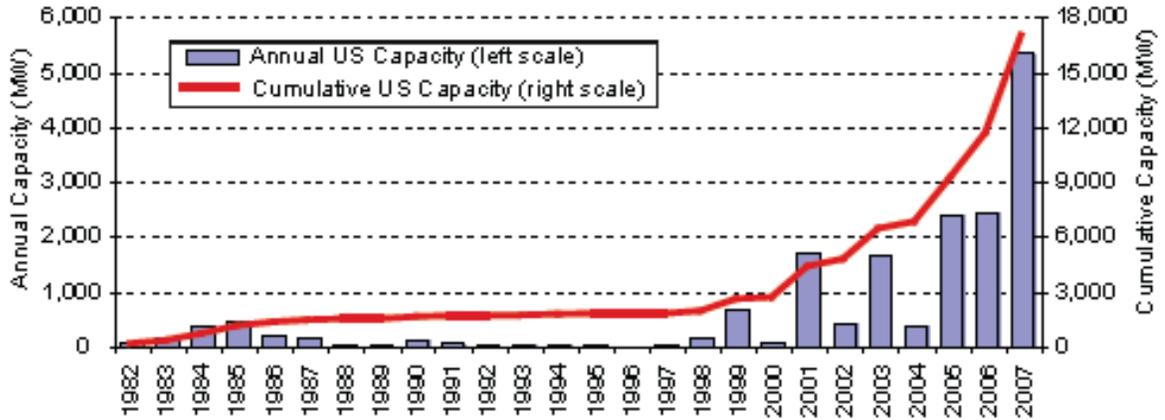


Source: FXHistory, "Historical currency exchange rates", <http://www.oanda.com/convert/fxhistory>.

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 Production Tax Credit (PTC) in August 2005 through the end of 2007 and again in December 2006 through the end of 2008,²⁴ 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 2-5. This strong demand led to supply shortages and price increases. Price increases over this period, plus estimated prices in 2008, are shown in Figure 2-6.

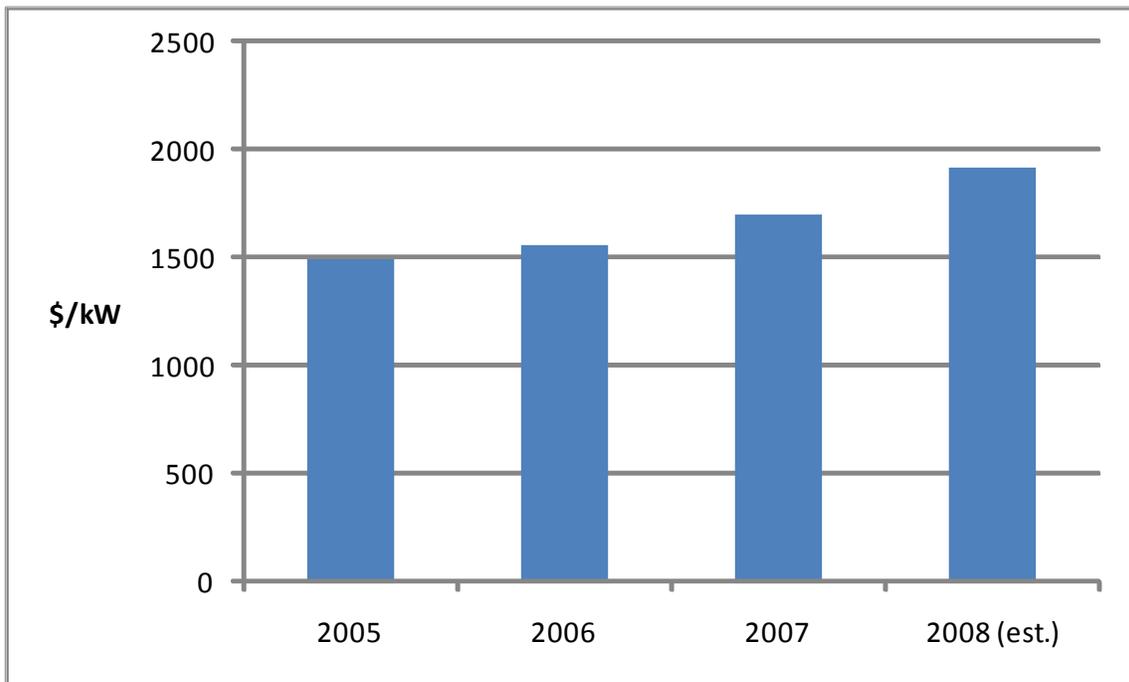
²⁴ Database of State Incentives for Renewables and Energy Efficiency, "Renewable Energy Production Tax Credit," Last reviewed February 2008, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=US13F&State=federal¤tpageid=1&ee=0&re=1.

Figure 2-2. 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.

Figure 2-3. 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.

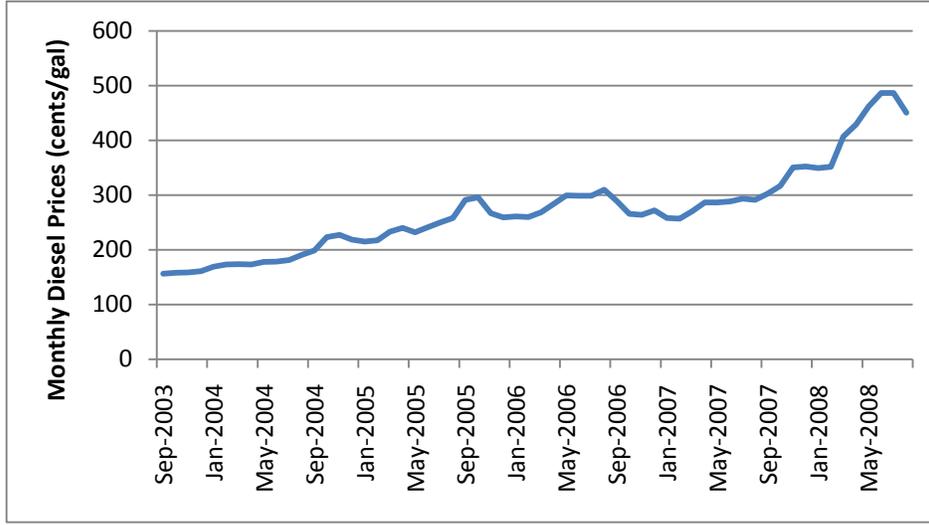
Key Driver: Major Expenses: Fuel Costs for Biomass Facilities

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 cyclicity. 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 2-7, 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 2-4. 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.

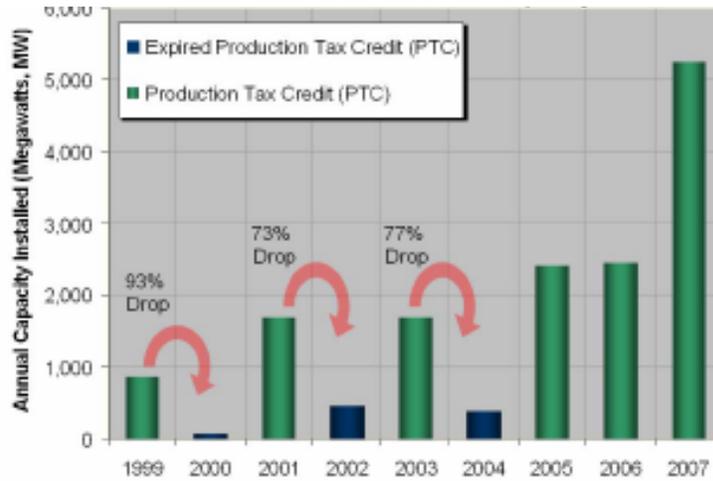
Key Driver: Project Revenues

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, 2008.²⁵ 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 2-8, the federal PTC has had a profound impact on the annual installation of wind capacity.

²⁵ Tom Raum, “Bush signs \$700 billion bailout bill,” *Associated Press*, October 3, 2008, http://ap.google.com/article/ALeqM5hT-MwpK6QSoOPF74bGFqnUl_HVuwD93J6ND00.

Figure 2-5. 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.

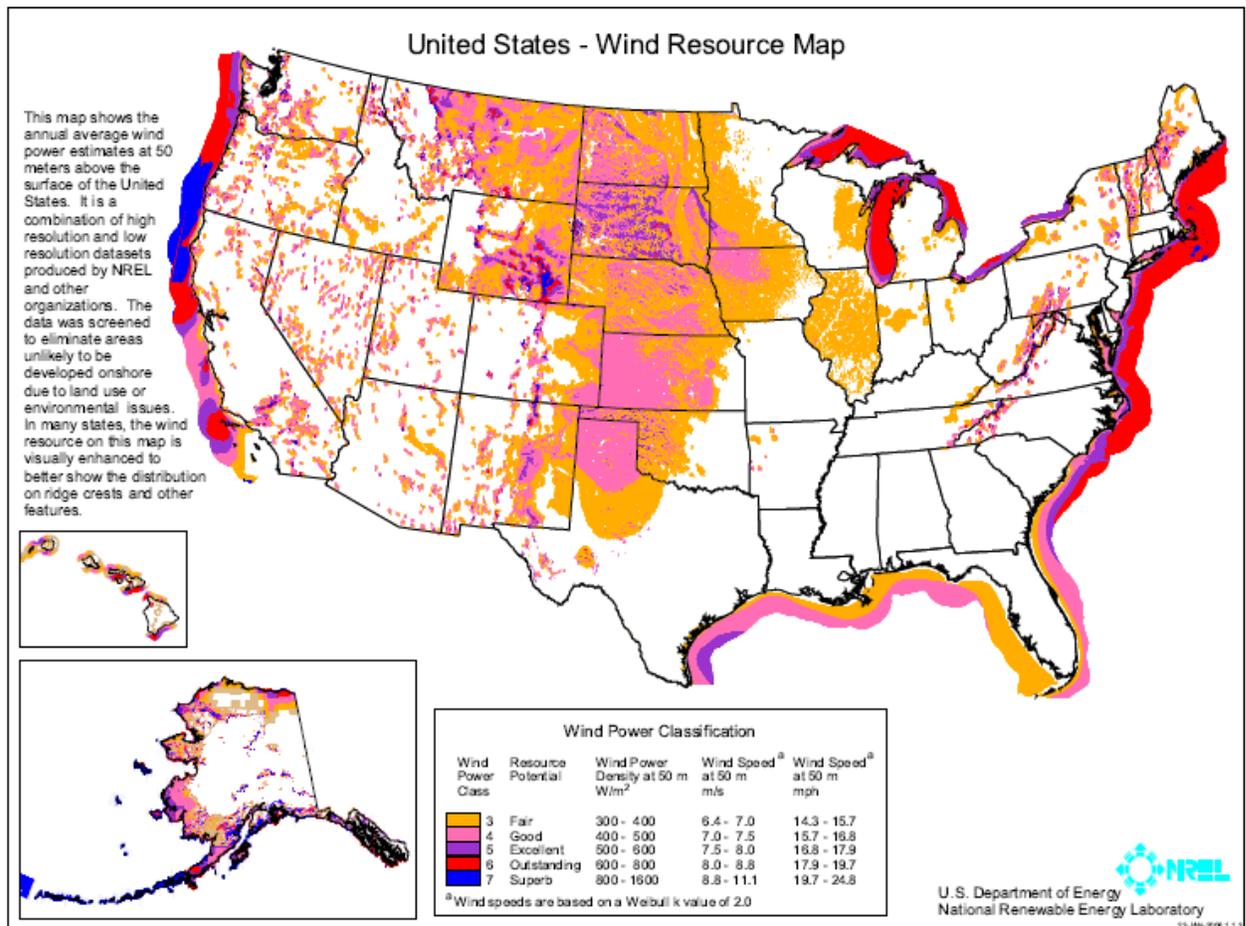
Energy revenues are determined by two main components: the amount of energy generated and the energy price. The amount of energy generated is dependent on the underlying resource: higher quality resources result in higher revenues; lower quality resources (i.e., those with less wind available) result in lower revenues. 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 2-9 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 2-6. Wind Resource in New York Are Significant, but Less than Many States

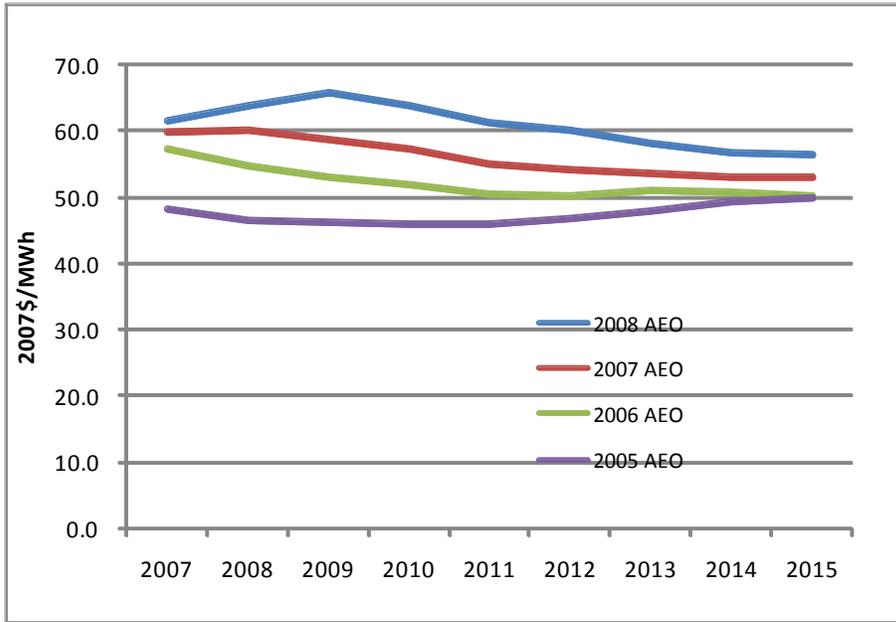


Source: National Renewable Energy Laboratory, "United States – 50-Meter Wind Resource Map," January 2006, http://www.windpoweringamerica.gov/pdfs/wind_maps/us_windmap.pdf.

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.²⁶ Forecasts for the generation component of electricity prices, as shown in Figure 2-11, have steadily increased, which has likely reduced the need for renewable generators to seek as much revenues from the REC market.

Figure 2-7. 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 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.

²⁶ Energy Information Administration, “Coal and Electricity Prices and Expenditures,” *State Rankings, 2005*, <http://www.eia.doe.gov/emeu/states/seds.html>.

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. The Regional Greenhouse Gas Initiative (RGGI) was just 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.

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.²⁷ 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 to qualify as Class I renewable resources.²⁸ 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.²⁹

²⁷ 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>.

²⁸ Ibid.

²⁹ 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>.

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. Alternative compliance payments (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.

Key Driver: Term of REC Contract

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 is met with minimal risk, they are somewhat flexible in the exact term of a REC agreement.

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.

Section 5

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, the evaluation team asked developers a series of questions on this topic during our in-depth interviews with these key market participants.³⁰ 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.³¹ 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 State 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.

³⁰ 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.

³¹ 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.

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), 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.

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.³² 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.

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

³² 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.

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.³³ 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 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.

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

³³ One developer noted that 20 years also coincides with the lifetime of many turbines.

could opt to sell as little or as much of their project output to NYSERDA as they wished, in later RFPs 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.³⁴ 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.

³⁴ The number of unique companies here does not include those selling RECs from maintenance resources.

The incentive for projects to retain RECs for sale into the Massachusetts RPS market may be significantly diminished in the future. Massachusetts is contemplating new import rules for its RPS that, if passed, would require wind projects to participate in the capacity market and would impose other restrictions that would make it uneconomic for many New York projects to sell into that market.³⁵ If this happens, it is likely that future New York RPS solicitations will see more projects bidding in higher percentages of project output, as the New York projects will have somewhat more limited options for selling RECs out of state.

Delivery Requirements for Out of State Facilities

When New York's RPS first went into effect, intermittent facilities located out of state could sell 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-state intermittent renewable generator with an RPS Program contract will have a direct transmission and commodity effect on the New York electric system;"³⁶ and 2) to level the playing for in state and out of state facilities.³⁷ When out of state facilities were able to match REC sales with energy delivery on a monthly basis, they had greater flexibility than in-state 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 New York may be \$20/MWh, while it is \$25/MWh in the bid facility's location in a different state. During that hour, a facility located in New York would automatically be subject to the New York pricing scheme, while the out of state facility could take the more favorable pricing in their own power market.

³⁵ *Green Communities Act*, Section 105 of Chapter 169 of Acts of 2008, Commonwealth of Massachusetts, July 2008.

³⁶ For example, with a monthly matching requirement, there was no incentive for a facility to deliver energy into New York 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.

³⁷ *Ibid.*

Non-intermittent facilities located out of state 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.³⁸

For intermittent facilities, scheduling delivery into the New York control area to match REC production from an out of state facility 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 similarly stringent. 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.³⁹

Most of the participating developers interviewed have only bid in-state 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 out of state projects 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

³⁸ NYSERDA, "Renewable Portfolio Standard Program Purchase of Renewable Energy Attributes," Request for Proposals (RFP) Nos. 1037 and 1168, 2006, p. 16.

³⁹ 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 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.

for intermittent out of state 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, the evaluation team cannot comment specifically on input provided by interviewees from the companies that hold NYSERDA REC contracts for these two projects. However, the limited participation in the New York RPS program by out of state facilities is an important indicator in and of itself. The import rules appear to present enough of an economic barrier to most out of state 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 in-state program participants. However, greater flexibility for imports from out of state generators could increase competition by increasing the range of supply available.

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.⁴⁰ 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

⁴⁰ 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.

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.

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 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 hydro⁴¹

- *Limited selection criteria.*

Some interviewees recommended that NYSERDA 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 as 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

⁴¹ This is discussed in the NYSERDA 2008 Economic Benefits Report.

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.

- *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 to 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.⁴² 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.⁴³

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.

⁴² 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.

⁴³ 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.).

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.

- *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.

Interestingly, the fact that NYSERDA's 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 out of state facilities seem to primarily be limiting program participation to in-state projects. This should not substantially affect REC pricing, since there is not a shortage of in-state program participants. 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.

Section 6

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