2011 Renewable Energy Portfolio Standard Review

Report of the
New Hampshire Public Utilities Commission
To the New Hampshire General Court

November 1, 2011

Submitted to:

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I. INTRODUCTION AND BACKGROUND

A. Overview of the RPS

On July 10, 2007, the New Hampshire Legislature created the state's first Renewable Portfolio Standard (RPS). A common policy tool used by dozens of states throughout the United States, New Hampshire's RPS is similar to other states in its mechanisms, yet unique in many of its details. Codified as RSA 362-F, the RPS requires that all electric service providers serving NH customers satisfy a percentage of their electric retail sales load with renewable energy certificates (RECs), where each REC is created from one megawatt hour (MWh) of electric generation that has been fueled by qualified renewable sources.[1] A REC may be purchased through the established regional trading platform at the New England Power Pool Generation Information System (NEPOOL-GIS) or created through self-generation. Compliance began in 2008 with an obligation for each electric provider to obtain 4% of its load (or have the commensurate number of RECs). The obligation increases to 23.8% by 2025.

Other key features of NH's RPS include its four class structure and its alternative compliance payment option. Electric service providers must meet the RPS obligations in four separate classes: Class I includes new renewable energy systems and new capacity added to existing biomass, methane gas, or hydroelectric renewable energy generation; Class II includes new solar energy generation; Class III includes existing biomass and methane gas energy generation; and Class IV includes existing small hydroelectric generation.[2] If an electric service provider cannot meet its RPS obligation in a given class with RECs, usually because of market scarcity or high market prices, it delivers alternative compliance payments (ACPs) into the state's Renewable Energy Fund (REF). The 2008 ACP rate was set by the statute, and is adjusted each year according to the Consumer Price Index (RSA 362-F:10, III & IV).

The purpose of the NH RPS is stated clearly in RSA 362-F:1: to provide fuel diversity not only to NH, but to the New England region as a whole, to lower regional dependence on fossil fuels, to stabilize and lower energy costs, to invest in local renewable energy in order to

[1] Municipal electric utilities are exempt from complying with NH's RPS. Electric service providers that must comply include competitive energy suppliers and non-municipal distribution companies providing default [electric] service.
[2] For a detailed explanation of each class and its eligible technologies, see RSA 362-F:4, I-IV.

benefit the state's economy, and to stimulate investment in low emission renewable energy generation to mitigate the risks of climate change and to improve the overall air quality and public health of NH and New England. In order to evaluate NH's RPS and ensure that the fundamental purposes are being met, and that the specific policy and regulatory mechanisms are fashioned in the most efficient way to meet such purposes, the RPS law requires the NH Public Utilities Commission (PUC), the agency responsible for implementing and administering the RPS, to conduct periodic reviews. RSA 362-F:5. This report contains the findings of the first review, covering the RPS compliance period of 2008 through 2010. Additional reviews of the law are required in 2018 and 2025. *Id*.

Tables 1 through 5 summarize key measures of the program's performance since enactment.

Table 1. Number & Capacity of Approved RPS Generators by Location as of 10/27/11

	NUMBER OF GENERATORS				NAMEPLATE CAPACITY (MW)			
	NH	NE*	NY	Total	NH	NE*	NY	Total
Class I	13	6	10	29	108.8	10.4	157.3	276.5
Class II	97	59	0	156	0.83	7.05	0	7.88
Class III	7	6	6	19	68.7	36.6	28	133.3
Class IV	1	12	0	13	0.75	26.1	0	26.85
Total	**118**	**83**	**16**	**217**	**179.1**	**80.2**	**185.3**	**444.5**

*Rest of New England (other than NH)

Table 2. Overall RPS Compliance Costs and Rate Impacts, 2008-2010

Total Compliance Costs (RECs & ACPs) (may include some small REC banking costs)	Default Service Providers (Utilities)	Competitive Energy Suppliers (CEPs)	Total
2008 costs	$11,217,163	$647,911	$11,865,074
2009 costs	$13,212,989	$3,227,370	$16,440,359
2010 costs	$12,620,489	$5,981,067	$18,601,556
Total costs 2008-2010	$37,050,641	$9,856,348	$46,906,988
2008 retail sales (MWh)	9,988,926	561,615	10,550,541
2009 retail sales (MWh)	8,377,043	1,755,143	10,132,186
2010 retail sales (MWh)	7,556,408	3,075,349	10,631,757
Total retail sales 2008-2010 (MWh)	25,922,377	5,392,107	31,314,484
Average cost/kWh 2008	$0.0011	$0.0012	$0.0011
Average cost/kWh 2009	$0.0016	$0.0018	$0.0016
Average cost/kWh 2010	$0.0017	$0.0019	$0.0017
Average cost/kWh '08-'10	**$0.0014**	**$0.0018**	**$0.0015**

Table 3. RPS Compliance Method & Average Costs for Default Service and Competitive Electricity Suppliers

RPS COMPLIANCE METHODS	2008	2009	2010
DEFAULT SERVICE LOAD BY REGULATED UTILITIES			
Utility RPS Obligation (MWh)	399,557	506,825	569,753
Utility REC Purchases (MWh)	250,304	473,274	518,455
Utility REC Costs	$ 6,196,784	$ 12,362,463	$ 11,889,852
Average REC Cost	$ 25	$ 26	$ 23
Utility ACPs (MWh)	149,254	36,777	10,083
Utility ACP Costs	$ 4,286,560	$ 951,598	$ 301,179
Average ACP Cost	$ 29	$ 26	$ 30
% compliance met with RECs*	**61%**	**92%**	**98%**
% compliance met with ACPs	**37%**	**7%**	**2%**
COMPETITIVE ELECTRICITY SUPPLIER (CEPS)			
CEPs RPS Obligation (MWh)	22,465	105,309	231,881
CEPs REC Purchases (MWh)	17,813	113,542	140,192
CEPs REC Costs	$ 455,093	$ 2,830,679	$ 3,646,668
Average REC Cost	$ 26	$ 25	$ 26
CEPs ACPs (MWh)	6,712	13,269	75,825
CEPs ACP Costs	$ 192,818	$ 396,691	$ 2,334,399
Average ACP Cost	$ 29	$ 30	$ 31
% compliance met with RECs*	**90%**	**87%**	**67%**
% compliance met with ACPs	**30%**	**13%**	**33%**

**Numbers may not add because some RECs are banked for future compliance years.*

Table 4. Average Cost of Purchased RECs by Class, Year, and Type of Provider

	2008	2009	2010
Average Default Service Provider (Utility) REC Costs			
Class I	$ -	$ 29.59	$ 20.48
Class II	$ -	$ -	$ 47.58
Class III	$ 26.58	$ 26.73	$ 23.00
Class IV	$ 16.45	$ 18.87	$ 23.94
Average Competitive Electricity Provider REC Costs			
Class I	$ -	$ 31.82	$ 16.90
Class II	$ -	$ -	$ 107.00
Class III	$ 25.70	$ 23.94	$ 28.29
Class IV	$ 23.00	$ 26.10	$ 25.97

Table 5. Alternative Compliance Payment (ACP) revenue 2008-2010

	Total	Class I	Class II	Class III	Class IV
2008	$4,483,917	$0	$0	$4,286,270	$ 197,647
2009	$1,344,188	$0	$0	$ 78,468	$1,265,720
2010	$2,625,499	$26,321	$58,884	$1,538,783	$1,001,511
Total	$8,453,604	$26,321	$58,884	$5,903,521	$2,464,878

B. Short History of NH RPS Legislation

As with any legislation affecting a broad sector of the economy, the NH RPS was fashioned with many diverse interests in mind. While adhering to the fundamental purposes of RSA 362-F and 374-G (dealing with distributed generation), representatives of competing interests and technologies worked with public legislators and agencies to craft an RPS that would best serve NH, its consumers, its natural environment, and its economy. As a result, the NH RPS has four classes, two of which include existing resources of biomass, landfill gas, and small hydroelectric generation, and two of which include most new renewable energy generation technologies, absent new stand-alone hydroelectric energy and all forms of combined heat and power (CHP). Other terms unique to the NH RPS include the requirement that all small customer-sited renewable energy systems be monitored and verified by a certified independent third-party in order to be eligible to produce RECs, the requirement that all existing hydroelectric generation be under 5 megawatts (MW) in size and include both upstream and downstream fish passages, even where the Federal Energy Regulatory Commission (FERC) has exempted that facility from such a requirement, and the ACPs are the sole source of public funding to directly incent renewable energy projects in the state. These NH-specific conditions were among the issues investigated in this review.

C. Economic Development and the Interstate Commerce Clause

The RPS is designed to incent new renewable generation, providing environmental benefits by reducing our use of fossil fuels. The RPS can also have an economic development effect, if generators, generation component manufacturers, or fuel suppliers are located in NH. Table 1 and Figures 6, 8, 9 and 10 demonstrate that some of the generation eligible for NH RECs is located in NH, though much of the NH certified RECs come from facilities outside the state, and nearly all of the solar capacity certified for NH Class II RECs are from outside the state.

Although it may be tempting to simply mandate that the only way to comply with the NH RPS is with RECs from generators located in NH, such a requirement would almost certainly violate the Interstate Commerce Clause of the U.S. Constitution.[3] The "dormant" interstate commerce clause has the effect of prohibiting states from passing laws that directly regulate or discriminate against interstate commerce or that favor in-state economic interests over out-of-state interests.[4] The NH RPS, in its current structure, includes no requirements, *prima facie*, or indirect, that favor NH providers of RECs over RECs that may come into NH from other states in New England and, with certain conditions related to delivery of the associated power into New England, adjacent synchronous control areas (New York and New Brunswick, Canada). As a

[3] U.S. Const. art. I, § 8, cl. 3.
[4] Endrud, Nathan E. 2008. *State Renewable Portfolio Standards: Their Continued Validity and Relevance in Light of the Dormant Commerce Clause, the Supremacy Clause, and Possible Federal Legislation*, 45 Harv. J. on Legis. 265, available at: www.nhcollaborative.org/Workgroups/WGC/Harvard%20Journal%20RPS%20Commerce%20Clause.pdf.

result, NH's RPS statute does not discriminate against interstate commerce on its face or favor in-state economic interests over out-of-state interests and should not trigger a legal challenge based on the Commerce Clause. Some states, however, have attempted to mandate in-state requirements within their RPS laws. Massachusetts, for example, was sued by TransCanada for allegedly violating the Commerce Clause. That case was settled by grandfathering power contracts signed prior to January 1, 2010 and eliminating certain in-state long term power purchasing contract requirements, but maintained language requiring certain in-state solar energy REC requirements.[5] The tension between crafting a state RPS policy that benefits the local economy while not violating the Commerce Clause has been well studied by the Clean Energy Group, the Harvard Journal on Legislation, and the National Regulatory Research Institute and others.[6] The research and analyses generally conclude that while laws that discriminate against out-of-state resources on their face may be struck down, if a state is to indirectly favor in-state resources, such a policy must "serve a legitimate public interest that outweighs the burden imposed on commerce."[7]

D. Review Process and Statutory Requirements

RSA 362-F:5 directs the PUC to "conduct a review of the class requirements in [the RPS law] and other aspects of the electric renewable portfolio standard program . . ." A report of the review findings is due to the NH General Court by November 1, 2011, and shall include "any recommendations for changes to the class requirements or other aspects of the RPS program." Specifically, the statute directs the PUC to review the following topics:

I. The adequacy or potential adequacy of sources to meet the class requirements of RSA 362-F:3;

II. The class requirements of all sources in light of existing and expected market conditions;

III. The potential for addition of a thermal energy component to the electric renewable portfolio standard;

IV. Increasing the class requirements relative to Classes I and II beyond 2025;

V. The possible introduction of any new classes such as an energy efficiency class or the consolidation of existing ones;

VI. The timeframe and manner in which new renewable Class I and II sources might transition to and be treated as existing renewable sources and if appropriate, how corresponding portfolio standards of new and existing sources might be adjusted;

VII. The experience with and an evaluation of the benefits and risks of using multi-year purchase agreements for certificates, along with purchased power, relative to meeting the

[5] Source: www.srectrade.com
[6] Elefant, C. and Holt, E. March 2011. CESA Report: The Commerce Clause and Implications for State Renewable Portfolio Standard Programs. Available at http://www.cleanenergystates.org/resource-library/tag/commerce-clause
[7] Bleskan, K., "Can in-state RPS requirements survive Commerce Clause lawsuits?" SNL, October 27, 2010. Available at: www.nhcollaborative.org/Workgroups/WGC/SNL%20RPS-Commerce%20Clause.pdf.

purposes and goals of the [RPS statute] at the least cost to consumers and in consideration of the restructuring policy principles of RSA 374-F:3;

VIII. Alternative methods for RPS compliance, such as competitive procurement through a centralized entity on behalf of all consumers in all areas of the state; and

IX. The distribution of the REF established in 362-F:10.

This review commenced in January 2011 and included several methods of investigation. PUC staff conducted research and facilitated a series of public comment meetings in order to learn from the diverse group of stakeholders that participate in NH's RPS. Five public workshops were held between February 2011 and June 2011 covering the baseline information about NH's RPS and the nine statutory review topics outlined above. Dozens of stakeholders provided written and oral comments, with critical information about the performance of the RPS and projections for the future. Thirty one public comments were submitted to the PUC, all of which are posted on the Commission's website.[8] The review was conducted almost entirely by Commission staff, with a brief solar market analysis provided by the National Renewable Energy Laboratory at no charge to the state. Additional key reports that informed this review included the Independent Study of Energy Policy Issues conducted pursuant to Chapter 335 of NH Laws of 2010 (SB 323) by the Vermont Energy Investment Corporation, the Connecticut 2011 RPS review report, and dozens of RPS reports by other states, the US Department of Energy, and various energy non-profit or research institutions.[9]

II. REVIEW TOPICS (referenced by subparagraph number in RSA 362-F:5)

A. Adequacy of Sources to Meet Class Requirements, Topic I
Class Requirements in Light of Market Conditions, Topic II

Although NH's RPS is a state-specific policy, the practice of compliance occurs in a regional context. This region includes the New England states and adjacent synchronous control areas: New York and New Brunswick (which includes Price Edward Island and Nova Scotia in Canada). Electric service providers may purchase RECs that originate from associated electricity production in any New England state or from adjacent control areas when the associated power is delivered and sold into the New England control area. Likewise, many of these states may satisfy their RPS obligations using RECs originating in NH, another New England state, or an adjacent control area when the associated power is delivered into New England. This dynamic has the effect of broadening the supply and demand markets for RECs for any particular state, beyond what the market might support within a single state. While this provides greater flexibility for the electric service providers in meeting their compliance obligations, it also makes incenting the REC supply on a specific state-by-state level difficult. While the NH RPS is designed to provide fuel diversity and stimulate investment to all of New

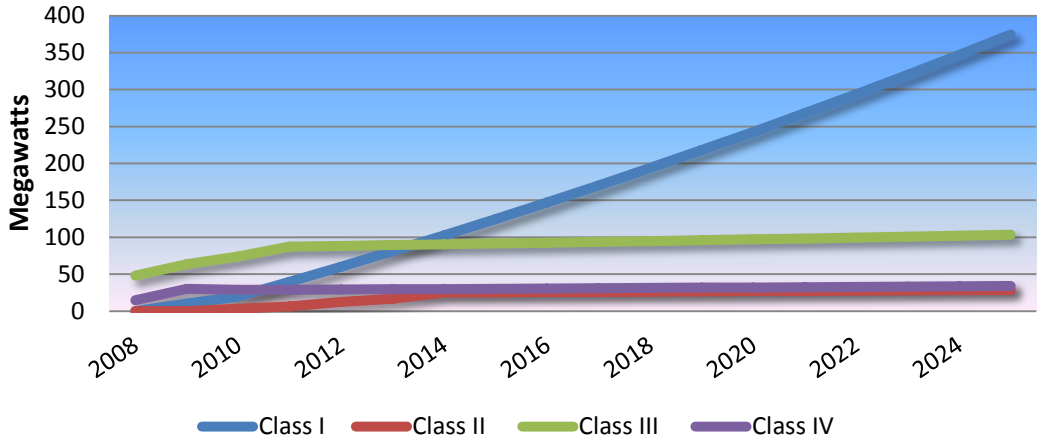
[8] At: www.puc.nh.gov/Sustainable%20Energy/Review%20RPS%20Law.html.
[9] A complete list of references is provided in Appendix A.

England, and NH in particular, it also seeks to "keep energy and investment dollars in the state to benefit our own economy." At times these goals may compete.

1. Existing REC Market Conditions

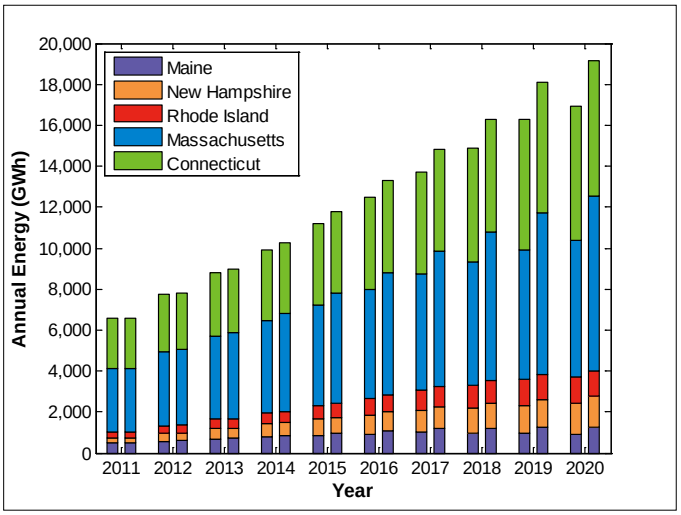
New Hampshire's retail electricity market comprises approximately 9% of the total load for the New England region, as defined by the Independent System Operator of New England (ISO-NE).[10] Figure 1 below, using forecasted sales data for NH electric service providers, shows the approximate installed capacity needed in order to meet the class obligations of the state's RPS.[11] The total NH RPS obligation is estimated to be nearly 3 million megawatt-hours by 2025, assuming an annual electric sales growth figure of 1.2%.[12] Given the relatively small share that NH has of the regional load, and the correspondingly small share of the regional demand for RECs, significantly altering NH's RPS requirements would not necessarily impact regional REC market prices, although it may affect the rates paid by NH consumers due to changes in the quantity of RECs to be acquired.

Figure 1. NH RPS Requirements 2008 to 2025[13]



[10] ISO New England, *New Hampshire 2011 State Profile*, www.iso-ne.com/nwsiss/grid_mkts/key_facts/nh_01-2011_profile.pdf.
[11] This forecast includes several assumptions made about capacity factors for the eligible renewable energy technologies under each resource class.
[12] ISO New England, *New Hampshire 2011 State Profile.*
[13] For a detailed list of the NH Class requirements by year and percentage, see table in Appendix B.

Figure 2. ISO-New England Projection of RPS Targets for "New" Resources [14]



The structure of the RPS in NH, as in many other state RPS programs, creates an effect that may produce a binary market. For example, when the demand is greater than supply, the price of a REC rises to approach the ACP. When the supply substantially exceeds the demand, the REC market may drop to a price approaching zero, because if every entity that must comply with an RPS requirement has met that requirement, then the remaining unsold RECs have no market value, other than banking RECs for future compliance periods. This is a common feature of most RPS programs, and can be mitigated by closely watching the markets and adjusting the requirements accordingly, but such adjustments may be difficult administratively. Generally, an RPS program's REC supply is generated in a "lumpy" fashion, while the requirements tend to increase at a steady rate. When projects come online may be mismatched to increases in REC requirements, and may involve a lag period. In other words, a binary REC market may produce boom and bust cycles in REC creation with unmet demand resulting in REC prices approaching the ACP, then after a development lag incented by those high REC prices, a boom in REC supply that can cause the REC price to collapse.

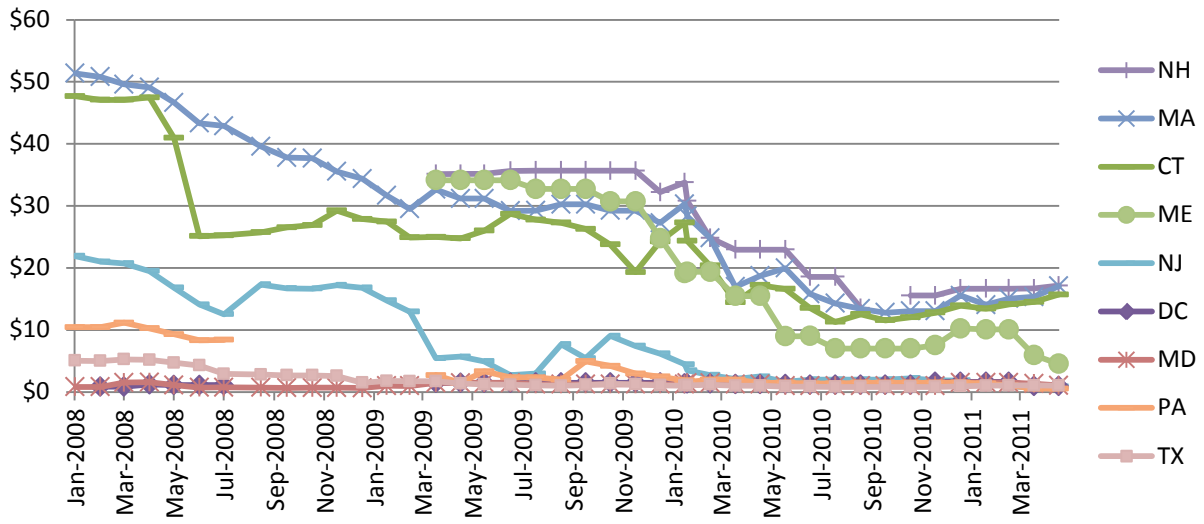
Although the REC pricing dynamics may have shifted in recent market activity, significant periods during the 2008-2010 compliance years showed REC prices for Class I resources that were less expensive (per MWh) than REC prices for Class III resources. This is a noteworthy dynamic because the market is sending a signal that suggests that existing resources are of greater value than new resources.[15] This pricing dynamic may also reflect the fact that the NH RPS did not have a Class I obligation the first year of compliance, when the Class III and

[14] ISO-NE, 2011 Regional System Plan, 10/31/11, p. 131. Two methods were used for the projection.
[15] In 2010, because Class III RECs were trading at a higher value than Class I RECs, one biomass generator, Indeck-Alexandria, LLC, which had qualified as a Class I source due to substantial new capital investment, sought to be reclassified as a Class III source. DE 10-120. However due to the statutory definitions involved the Commission denied the request.

Class IV requirements were significant. Also, many other states, including Massachusetts, Connecticut, and New York, already had RPS policies in place for many years, therefore preparing a robust Class I REC market that could be readily accessed by NH electric service providers. While many states have a class similar to NH's Class I, NH is unique in having a single class to support existing biomass and landfill gas (Class III). Figure 3 below shows the downward trend in Class I REC prices, dropping from $35.64 in mid- 2009 to $16.70 in May 2011. By comparison, as of the first quarter of 2011, Class III RECs were trading at approximately $26.00/MWh, up from an average of $24.80 in 2010., although there are reports that Class III RECs have fallen to a price close to that of Class I RECs in the summer of 2011.

The downward trend in Class I REC prices indicates that there is a large regional supply of RECs relative to the demand for RECs, which suggests that NH electric service providers would not have difficulty purchasing RECs in the market and meeting their RPS obligations at reasonable costs to ratepayers. In fact, the most recent compliance reporting period, for 2010, showed that no providers made alternative compliance payments in lieu of purchasing Class I RECs. The NH Class I REC market tends to track the Massachusetts and Connecticut Class I markets.

Figure 3. Class I/Tier I REC Pricing, January 2008 – May 2011[16]



[16] Data compiled from Evolution Markets (2007), Spectron (2011), from Sumner and Bird, July 2011. Technical Assistance Request: NH Tier II Standard. National Renewable Energy Laboratory.

Table 6. Recent Average REC Prices for 2010 and Q1, 2011 from AESC 2011[17]

		2010	2011
Conn.	Class I	$13.50	$13.50
	Class II	$0.50	$0.90
	Class III	$11.25	$10.00
Mass.	Class I	$15.00	$14.95
	Class II renewable	$23.75	$23.00
	Class II waste-energy	$4.00	$5.25
	Class APS	*$19.00*	*$19.00*
R.I.	New	$16.00	$15.25
	Existing	$0.75	$0.75
Maine	Class I	$7.75	$9.00
	Class II	$0.18	$0.18
N.H.	Class I	$13.50	$15.50
	Class II solar	*$25.00*	*$25.00*
	Class III	$21.50	$18.75
	Class IV	*Not Available*	$24.50
Data from confidential REC brokers quotations compiled by Sustainable Energy Advantage, LLC			

Given that the NH electricity market represents a relatively small share of the load for the ISO-NE region, increasing the requirement for Class I RECs in the NH RPS would not likely materially impact the prices for those RECs. It would however contribute to a modest increase in demand for Class I RECs, which in turn could spur the development of new renewable energy facilities in the region. This incremental diversification supports the purpose statement of RSA 362-F, which states that:

> "Renewable energy generation technologies can provide fuel diversity to the state and New England generation supply through use of local renewable fuels and resources that serve to displace and thereby lower regional dependence on fossil fuels …."

An increase in the supply of Class I resources contributes to suppress prices in the wholesale market, as observed in New York as a result of its RPS program, and thereby could save all ratepayers money on their monthly electric bills.[18] Increasing RPS requirements would cause RC prices to rise, unless new renewable projects were developed in a timely fashion. While NH must consider the costs of the RPS to

[17] Synapse Energy Economics, Inc. *Avoided Energy Supply Costs in New England: 2011 Report*, July 21, 2011, p. 2-47.
[18] New York Renewable Portfolio Standard Market Conditions Assessment. February 2009. Summit Blue Consulting, LLC.

ratepayers, the 2010 costs of the RPS are estimated at approximately $0.0017/kWh.[19] For the typical NH residential ratepayer using about 500 kWh per month this amounts to about $0.85 per month.

Recommendation: Maintain the existing class obligations in favor of policy consistency and predictability for the renewable energy industry, particularly given the inability of NH to significantly affect the regional REC market and the potential for increased rate impacts if the class obligations were to increase.

2. Expected REC Market Conditions

Predicting the future supply and price dynamics of NH's REC market, as well as the regional REC market, is very difficult. The two REC markets are inextricably linked not only with each other, but also with the REC market for New York, as a primary adjacent control area.[20] REC price predictions include a wide range of values. For example, a recent review of Connecticut's RPS projected a low to high range for Class I RECs between $11 and $50 through 2020.[21] While some experts have predicted that REC prices may eventually fall to levels as low as $2.00/REC, others have predicted that prices will rise to reach the ACP, as the market goes through boom and bust cycles, a dynamic discussed previously. Changes in the Connecticut and Massachusetts RPS policies are certain to affect the NH REC market, as those states comprise the largest loads for the New England control region (ISO-NE). Other key factors to understand in the REC market include the greater economic picture, affected by both federal policy and financial markets, which in turn affect the ability of project developers to access affordable financing.

The New England energy efficiency program administrators undertake a study of avoided energy supply costs in New England every two years to use in evaluating the benefits of energy efficiency and demand response investments compared with supply side investments to meet load growth. One factor is the avoided costs of RPS compliance. Synapse Energy Economics, which prepared the 2011AESC Report, has undertaken the most detailed publicly available projection of RPS compliance costs. They project the cost of new or incremental new renewables along with projected wholesale power costs and estimate the premium needed to support the necessary investment for RPS compliance and thus develop a REC price forecast for each state and RPS class. Their summary and detailed forecasts are found in Appendix B. The forecast levelized price impact of $2.30/MWh of load for New Hampshire translates to $0.0023/kWh or about $1.15 per month for 500 kWh of monthly consumption.

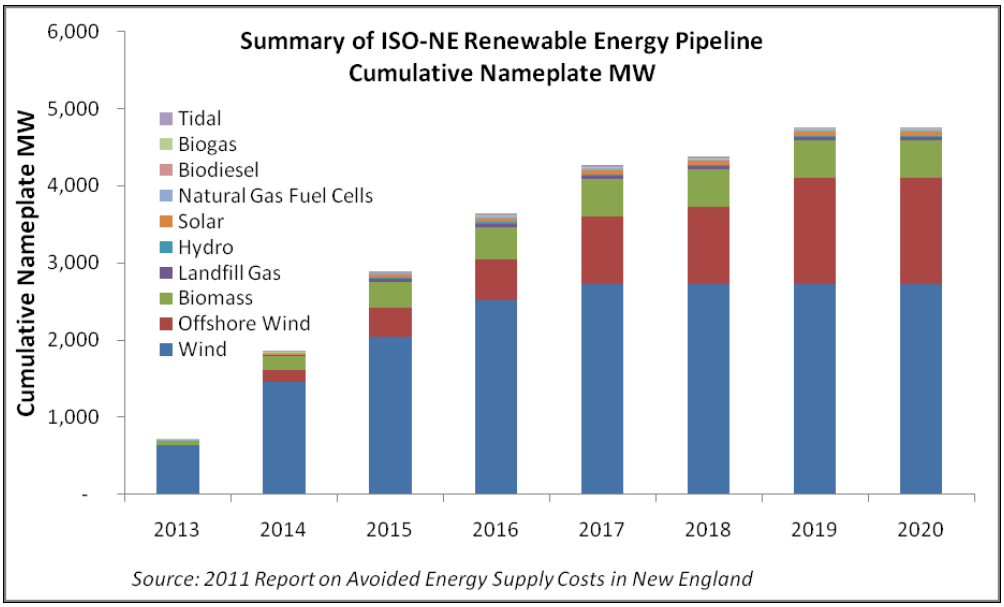
[19] See Table 2 herein.
[20] Imports from adjacent control areas are also limited by transmission capacity.
[21] Rutger's University, *A Review of Connecticut's Renewable Portfolio Standard*, July 19, 2011.

Table 7. AESC 2011 Levelized RPS Price Impact Forecast (2012-2026)[22]

Avoided RPS Cost by Class ($/MWh of Load) Levelized Price Impact 2012 – 2026 (2011$)						
	CT	ME	MA	NH	RI	VT
Class I	$1.77	$0.87	$1.74	$1.31	$1.41	$0.50
All Other Classes	$0.40	$0.05	$3.24	$0.99	$0.01	$0.00
Total	**$2.17**	**$0.92**	**$4.98**	**$2.30**	**$1.43**	**$0.50**

Although REC prices have experienced a downward trend, with many developers claiming that the prices are too low to spur project development, RPS requirements will continue to ramp up over the coming years, and this dynamic may shift. REC compliance (supply) has generally been dominated by hydroelectric and biomass, but with the growth of wind and solar development due to cost declines, policy modifications, resource potential, and consumer demand, the regional renewable resource portfolio may shift.[23] As Figure 4 below shows, onshore and offshore wind comprise a large majority of the capacity that is in the ISO-NE project queue.[24]

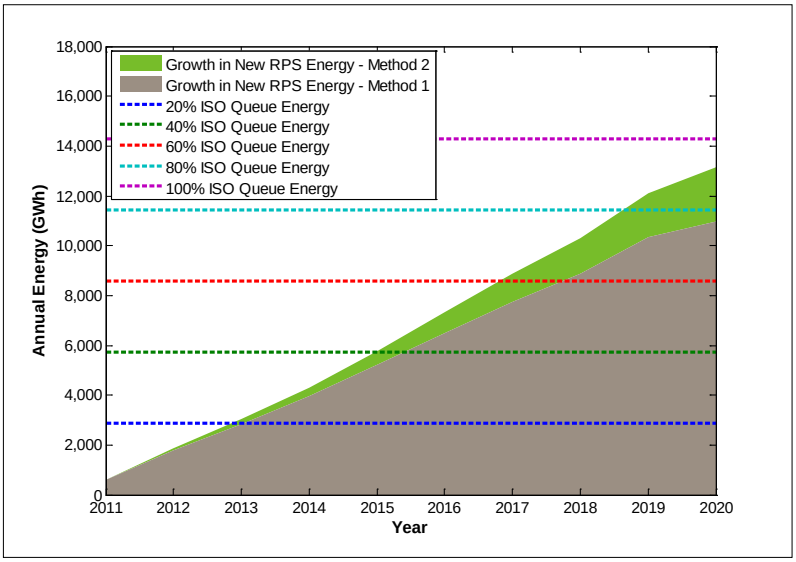
Figure 4. Project Queue for Renewable Energy Projects in the ISO-NE Region[25]



[22] Hornby et al. July 21, 2011. Avoided Energy Supply Costs in New England: 2011 Report. Prepared for Avoided Energy Supply Component (AESC) Study Group.
[23] For more detailed information on the Regional renewable energy trends in New England, see also: Vermont Public Service Board. October 3, 2011. Study on Renewable Electricity Requirements.
[24] Many projects in the ISO-NE queue do not get constructed; the successful project completion rate may range from approximately 20-60%, depending on which phase of development the project is in. Vermont Public Service Board. October 3, 2011. Study on Renewable Electricity Requirements.
[25] Id, p. 37.

As part of its 2011 Regional System Plan, ISO-NE has also compared the quantity of energy that would be produced by various levels of projects that are in their interconnection study queue (projects that are sufficiently serious that the developer is expending funds to study the engineering issues and impacts associated with interconnecting the proposed generation to the regional transmission system). This analysis is reflected in Figure 5 below.

Figure 5. ISO-NE, RSP 2011, p. 136, Various Levels of Estimated Cumulative Electric Energy from New Renewable Projects in the ISO queue as of April 1, 2011, compared with new RPS yearly demand (GWh).



"Notes: Non-FERC-jurisdictional queue projects throughout New England are included. Various percentages of electric energy availability from queue projects have been assumed and are not projections of the projects' expected energy production. RPSs also can be met with behind-the-meter projects, imports, new projects not in the queue, and alternative compliance payments. NESCOE has estimated that the renewable projects that responded to the RFI could produce as much as 15,000 GWh."

The current list of projects in the ISO-NE Transmission Interconnection Study Queue, located in New Hampshire that may qualify to produce NH RECs is shown in Table 8 below.

Table 8. NH Projects in the ISO-NE Transmission Interconnection Study Queue as of 10/1/11 That May Qualify to Produce NH RECs[26]

					Capacity			
Updated	Request Date	Project Name	Unit Type	FUEL	SumMW	WinMW	County	OpDate
Commercially Operational								
5/22/2009	11/15/2004	Lempster	Wind Turbine	Wind	24	24	Sullivan	11/10/2008
5/22/2009	7/10/2007	Indeck Energy Alexandria	Steam Turbine	Wood	16.5	16.5	Grafton	1/31/2009
Active Project Interconnection Queue under FERC Jurisdiction								
3/21/2011	3/6/2006	Comerford Unit #2	Hydro	Water	48.3	48.5	Grafton	1/27/2012
7/29/2011	3/6/2006	Comerford Unit #4	Hydro	Water	48.2	48.5	Grafton	1/25/2013
9/26/2011	8/9/2006	Granite Reliable Power	Wind Turbine	Wind	100	100	Coos	12/30/2011
7/29/2011	10/15/2007	CPD Berlin	Steam Turbine	Wood	29.5	29.5	Coos	8/31/2013
6/20/2011	2/15/2008	Laidlaw Berlin Biomass Energy Plant	Steam Turbine	Wood	58.7	58.7	Coos	10/15/2013
11/24/2010	9/18/2009	Biomass	Steam Turbine	Wood	20	20	Cheshire	10/30/2013
6/30/2011	9/8/2010	Wind	Wind Turbine	Wind	48	48	Grafton	12/31/2012
7/19/2011	10/1/2010	Laidlaw Berlin Biomass Energy Plant Inc	Steam Turbine	Wood	67.5	67.5	Coos	10/15/2013
8/25/2011	5/27/2011	Wind	Wind Turbine	Wind	18.15	18.15	Hillsborou	9/30/2012
9/21/2011	8/1/2011	Wind	Wind Turbine	Wind	33	33	Hillsborou	6/30/2013
9/7/2011	9/7/2011	Wind	Wind Turbine	Wind	80	80	Merrimack	12/31/2013
Active Project Interconnection Queue Not under FERC Jurisdiction								
11/4/2010	2/21/2007	Wind Project	Wind Turbine	Wind	34	34	Coos	11/1/2012
1/31/2011	3/31/2008	Distribution Wind Alternative	Wind Turbine	Wind	50	50	Grafton	12/31/2012
1/10/2011	4/4/2008	Steam Turbine	Steam Turbine	Wood	16.5	15	Merrimack	3/31/2013
9/26/2011	5/14/2010	Wind	Wind Turbine	Wind	18	18	Hillsborou	12/3/2012

Some may be duplicates or not actually under active development at this time.

[26] ISO New England, *Interconnection Request Queue 10-1-11*, www.iso-ne.com/genrtion_resrcs/nwgen_inter/status/interconnection_request_queue_10012011.xls

Historically, RPS programs have included low levels of transparency for REC price data and REC transactions. Improving the level of transparency, while respecting proprietary project information, would greatly improve the ability to track and predict REC market prices and trends for regulators and developers alike, and would better inform their decision-making process.

3. Class I (New or Expanded Renewable Generation)

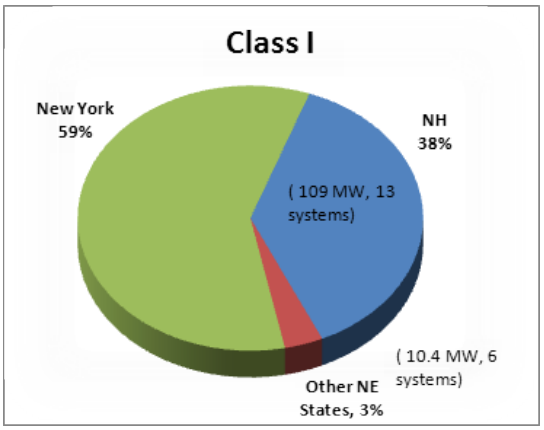
The Class I REC requirements are designed to stimulate investment in new sources of renewable energy in New Hampshire and other northeast states. The requirements are critical to New Hampshire's ability to meet its renewable energy goal of meeting 24% of retail load with renewable electricity by 2025. Class I requirements ramp up incrementally from .5% of retail load in 2009 to 16% by 2025. The bulk of new renewable energy facilities will fall within this category, with Class II (for new sources of solar energy) comprising only .3% of load by 2025.

The Class I requirement is essentially technology neutral; nearly every form of renewable electricity is eligible for this category. Allowable technologies include: wind, solar, geothermal, hydrogen (derived from biomass fuels or methane gas), ocean thermal, wave, current, tidal energy, methane gas, eligible biomass technologies, incremental generation from an eligible biomass or methane source or hydroelectric generating facility, and the displacement of electricity from solar water heating systems.

Numerous renewable energy facilities have been developed in New Hampshire that are eligible to produce Class I RECs. Among these are PSNH's 50 megawatt (MW) Schiller Station wood boiler, the 24 MW Lempster wind farm, an 8 MW combined heat and power facility and a 5 MW generating unit at the University of New Hampshire, both of which are fueled with landfill methane gas, and the Indeck 16 MW biomass power plant in Alexandria. In addition, several renewable energy facilities that are planned or under development will also be eligible for Class I RECs, namely the 100 MW Granite Reliable wind facility in Coos County, the 48 MW Groton Wind Project, and the 75 MW Berlin biomass plant.

As shown in Figure 6, 38% of all facilities currently eligible for Class I RECs are located within New Hampshire.

Figure 6. Class I Resources by Location and Capacity



The current Class I resources' definition permits facilities that were in operation prior to 2006 to earn RECs for incremental increases in output. New small hydro facilities, however, are not eligible to earn RECs.

This exclusion of new, stand-alone hydroelectric energy, in a state with significant freshwater resources that may be sustainably harnessed to produce local, clean, energy does not seem to be in the best interest of an RPS that is supposed to incent the development of new sources of renewable electricity. Balancing the interests of many NH citizens and entities who would like to see freshwater streams and rivers remain available for recreation, a healthy fish habitat, and other purposes is important in the decision of how and where to support new hydroelectric power. There are over 3,070 active dams in NH, only 132 of which have been developed into a hydropower facility.[27] According to a report by the US DOE, there are over fifty undeveloped potential hydropower sites that are less than 100 kW in capacity, and about thirty-eight sites for hydropower facilities between 100 kW and 1 MW.[28] Allowing smaller, run-of-river, micro-hydroelectric facilities to earn RECs through Class I eligibility may strike the appropriate balance and improve the public benefits of the state's RPS. It would allow such facilities to compete for grants under the Commission's annual Request for Proposals for renewable energy projects as well as to earn Class I-based REC revenue. This issue was discussed in the public workshops, and several stakeholders expressed support for the possibility of including micro-hydroelectric systems, which may be defined as facilities smaller than one MW, as a Class I resource. Input from stakeholders suggested that a standard such as that offered by the Low Impact Hydropower Institute (LIHI) may be appropriate for inclusion in the NH RPS, but other stakeholders expressed concerns that micro-hydropower systems may offer little capacity to the overall NH energy mix and may potentially impact the environment

[27] New Hampshire Department of Environmental Services. http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer_chapter11.pdf. From VEIC Study, section 10.13 of which further details the NH hydroelectric market.
[28] Francfort, J. 1995. US Hydropower Resource Assessment for NH. Prepared for US DOE.

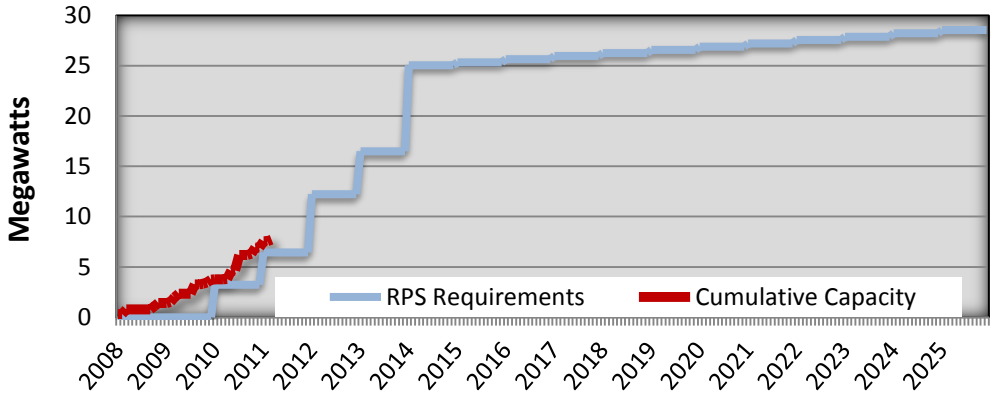
negatively. Other studies have cited significant, environmentally safe, potential for micro-hydroelectric development, particularly from existing dams or run-of-river locations.[29]

Recommendation: Study environmental and market ramifications of including micro-hydroelectric resources that meet certain state environmental criteria, FERC guidelines, and/or LIHI certifications as an eligible Class I resource.

4. Class II (New Solar Generation)

NH Class II requires that a portion of new renewable energy generation come specifically from solar technologies that produce electricity. As Figure 7 below shows, the growth in capacity to meet this requirement has matched the increase in the requirement itself, even surpassing the requirement to date. The NH Solar REC market is a regional one, and many of the solar resources come from non-NH based sources.

Figure 7. Class II Requirements and Supply: 2008 to 2025



Demand for solar RECs varies through the region. In New York and Massachusetts, solar electric facilities must be located within the state, or interconnected to the state's electric distribution system. Therefore solar electric facilities in New Hampshire are not eligible to earn solar RECs for compliance in each of those states, but solar facilities located in those states are eligible to earn NH RECs.[30] In 2010, Massachusetts changed its RPS to include a solar carve-out within its Class I resources for "qualified in-state interconnected solar facilities," among other specific requirements that narrow the potential MA solar REC resource base.[31]

[29] Small Hydro has Strong Bipartisan Support. So Why Can't We get Our Act Together? Stephen Lacey. August 11, 2011. www.thinkprogress.org

[30] New York's requirement is for customer-sited generation, not specifically requiring customer-sited solar. www.dsireusa.org

[31] "Starting in 2010, retail suppliers must provide a portion of the required renewable energy under the Class I Standard from qualified in-state, interconnected solar facilities. The DOER carried out a stakeholder process that began during second quarter of 2009 to determine the details of this requirement, called the Class I Solar Carve-Out. Final regulations were issued December 2010. Qualifying solar facilities (officially known as "Solar Carve-Out Renewable Generation Units" in the regulations) must be 6 MW (direct current DC) or less, and must have become operational after December 31, 2007. Facilities that received funding prior to January 1, 2010 from the Massachusetts Renewable Energy Trust or more than 67% funding from the American Recovery and Reinvestment Act (except the federal grant in lieu of tax credit) are ineligible. The Solar Carve-Out Minimum Standard for compliance year 2012 is 0.163%.*** The

Connecticut, Maine, and Rhode Island do not have a specific solar class: solar energy is included in each of the states' Class I for new renewable energy.

Although the trend in Class II REC supply and demand appears to be keeping in balance, an additional 20 MW (approximately based on assumed capacity factors) of solar capacity will be needed in order to meet the NH RPS requirements by 2025, and most of that by 2014. Some stakeholders have expressed concern that this will be difficult to accomplish. Looking at the regional policy context and the federal policy emphasis on bringing down the costs of solar electricity, meeting the NH Class II requirements over the next fourteen years is an achievable and likely outcome, at a cost that is not burdensome to NH ratepayers due to overall small RPS requirement involved (0.3% of load in 2014 and thereafter).[32]

Because Maine, Connecticut and Rhode Island do not have a solar REC class, a solar REC in each of those markets can only earn the market price of any Class I resource, which is lower, as shown in Table 4, unless they sell those solar-based RECs into the NH or MA solar REC markets. Vermont, which does not have an RPS, has 10.8 MW of solar electric capacity either under construction or in the permitting phase due to a solar feed-in tariff, could generate a substantial number of solar RECs that could be sold into the NH REC market.[33] Generators of solar electricity will want to earn the most for each REC that the market will offer; selling into the NH Class II market may offer a higher REC price than selling into the regional Class I market. This dynamic is shown in the market data; NH Class II RECs were trading at $25[34] to $115.00[35] in 2010 and at $25[36] to $75.00 in 2011[37] according to various sources. Additionally, the ACP for NH Class II is $163.11 for 2011, whereas it is only $62.13 for NH Class I (and similarly for other states' Class I ACP).[38] The higher solar ACP allows the price to rise to a potentially higher ceiling before electric service providers would opt not to purchase RECs and instead pay the ACP.

Each regional policy therefore contributes to the overall supply of solar RECs that are available for NH Class II compliance. As shown in Figure 8, the vast majority of the solar capacity eligible for NH RECs is located outside of New Hampshire. This capacity should not be confused with REC purchases by NH electric providers; NH supplier purchases may be from

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Solar Minimum Standard is calculated by dividing the annual solar compliance obligation in megawatt hours (MWh) by the total RPS load obligation from the previous two years. The solar compliance obligation in turn is based on the difference in the SRECs generated during the past two years (see the DOER regulations for calculations and additional guidance). When 400 MW (DC) of qualifying solar facilities have been installed, no additional solar facilities will be qualified for the Solar Carve-Out, although they would be eligible to qualify as a RPS Class I Renewable facility and continue to satisfy the overall Class I Standard." www.dsireusa.org

[32] See the DOE's Sunshot Initiative. The AESC 2011 forecast cost to load for Class II ranges from $0.00009/kWh in 2016 to $0.00001/kWh in 2021.

[33] Sumner, J. and Bird, L. and Bird, L. July 2011. Technical Assistance Request: NH Tier II Standard. National Renewable Energy Laboratory.

[34] See Table 6 herein.

[35] Source: Spectron, from Sumner and Bird. July, 2011.

[36] See Table 6 herein.

[37] Source: Spectron, from Sumner and Bird. July, 2011.

[38] www.dsireusa.org

NH-based solar generation systems, however the ability to track each specific purchase and retirement is limited.

Figure 8. Total Capacity of Class II (Solar) Resources by Location

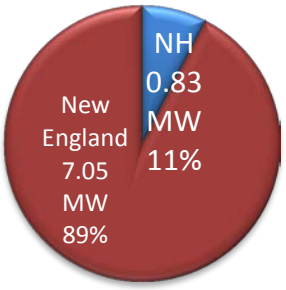


Table 9 below shows the facilities that are interconnected with the New Hampshire grid and net-metered, most of which are solar PV systems. These comprise a much higher capacity number (2.35 MW) than the 0.883 MW that are certified to produce RECs.

Table 9. Net-Metered Facilities in NH as of 12/31/10.

Electric Utility	Solar		Other*		**Total**		Allowed Net Metered Capacity (MW)
	# of Installs	Total Capacity (MW-DC)	# of Installs	Total Capacity (MW-DC)	# Net Metered Installs	Net Metered Capacity	
New Hampshire Electric Cooperative	141	0.456	38	0.277	179	0.733	4.12
National Grid	44	0.145	0	0.000	44	0.145	3.16
Public Service Company of NH	329	1.463	36	0.394	365	1.857	36.55
Unitil Energy Systems, Inc.	32	0.284	4	0.023	36	0.307	6.17
NH Total	**546**	**2.348**	**78**	**0.694**	**624**	**3.042**	**50.00**
% of Total or Allowed	88%	77%	13%	23%		6%	

*Other includes 70 wind systems (0.412 MW) and 8 micro-hydro and biofuel generation facilities (0.282 MW).

Solar electric energy, when interconnected with a local distribution grid, can help avoid transmission charges, and distribution and transmission capacity investments because it tends to produce substantial amounts of power, close to where it is consumed, at times of high electric demand when such charges are incurred when capacity is most needed. New Hampshire and New England are now summer peaking systems, driven in large part by air conditioning loads that are, in turn, driven in large part by solar insolation (heat gain on building surfaces and ambient air temperatures from solar radiation). Solar noon (the typical daily peak of solar insolation) occurs at about 12:50 pm (hour ending 1 pm) DST during the hottest days of the year. In nine of the past ten years, the New England system peak has occurred during the hour beginning at 2 pm DST, less than 2 hours past solar noon on average.[39] Although the peak coincidence is not perfect, it is still strong. The peak hour of generation is also used by ISO New England for allocation of generation capacity charges in the FCM. Solar generation also has a

[39] ISO New England Annual System Peak Day, Hour & Load MW, February 18, 2011, www.iso-ne.com/markets/othrmkts_data/fcm/reports/syspeak/isonewengland_system_peak_dates.xls.

high coincidence with high cost hours for electric generation. In keeping with the purposes of the NH RPS and in compliance with the Interstate Commerce Clause, encouraging solar resources within NH is a policy consideration that may be addressed through the state's RPS.

In November 2010, the Legislative Committee to Study Methods of Encouraging the Installation and Use of Small Scale Renewable Energy Resources by Homeowners and Businesses produced a final report that made several recommendations, including requiring that Class II REC sources be interconnected with the distribution system maintained by NH-regulated distribution companies on the basis that the premium ACP for Class II RECs over Class I REC should be associated with the avoided cost benefits arising from interconnection with the New Hampshire distribution system.[40] Some of these benefits, such as avoided transmission charges, may inure to all ratepayers on the same local distribution system. Another recommendation made by this legislative committee included transferring the Class II requirement to distribution companies, in recognition of the general transmission and distribution system avoided cost benefits, and to allow long term contracting for new solar PV installations, including the possibility of a reverse auction to create a market driven approach to least cost compliance. Each of these recommendations would likely encourage additional solar capacity to be built in NH, would disqualify many of the existing Class II sources, and would narrow the NH Class II REC market.[41]

Because most of the currently qualified Class II sources would be unable to interconnect to the New Hampshire distribution grid, if such a requirement were to be imposed it would be prudent to recalibrate the Class II requirements to reset them initially to a level close to or slightly greater than the capacity of systems likely to qualify, both existing and in development. The slope of the increase in the Class II requirement might likewise be reduced to allow a more gradual ramp up to the originally set goal of 0.3% of load.

Recommendations: Consider the recommendations put forth by the 2010 legislative study committee and proposed in HB 311, particularly the recommendation to require interconnection of Class II resources to the NH distribution grid. Recalibrate the Class II requirement accordingly and set a more gradual ramp up to the goal of 0.3% of load.

5. Class III (Existing Generation from Biomass/Methane)

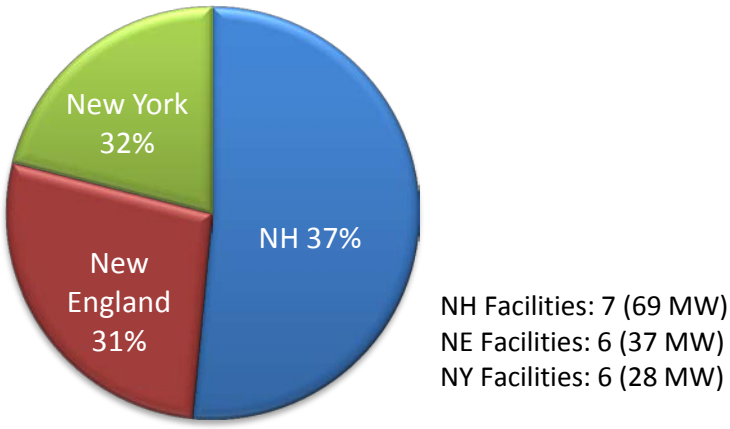
Another indigenous energy resource important for New Hampshire is biomass. Not only do biomass energy resources provide heat and electricity to the state, the industry also provides significant tax revenues and jobs. Although thermal energy from biomass resources is widely

[40] *Final Report of the Committee to Study Methods of Encouraging the Installation and Use of Small Scale Renewable Energy Resources by Homeowners and Businesses*, HB 1377, Chapter 229:3, Laws of 2010, November 1, 2010, www.gencourt.state.nh.us/statstudcomm/reports/2032.pdf.
[41] HB 311 adopts the key recommendations from the Janeway et al study committee and the bill is currently pending in the NH House.

recognized as an efficient way to utilize the resource, the NH RPS is an electric RPS, and therefore does not include thermal energy from biomass as an eligible resource. The Class III requirement which includes existing biomass facilities that produce 25 MW or less, began at 3.5% of electric retail supplies in compliance year 2008, and will grow to 6.5% in 2011 where it will remain through 2025.

Class III also includes existing methane gas facilities. This methane gas inclusion has produced a REC market that may receive a significant supply of RECs from landfill gas facilities in New York State, as Figure 9 below shows. Slightly more than half of Class III capacity, however, is from NH sources.

Figure 9: Total Capacity of Class III Sources by Location (MW)



Another consideration regarding the future of Class III is the effect of recent changes in Massachusetts regulations. A 2010 report, *Biomass Sustainability and Carbon Policy*[42] concluded that in a regional REC market, one state's policy will be felt throughout the regional market. Many biomass plants, including the Schiller Station in Portsmouth, may be blocked from selling RECs in the Massachusetts REC market due to proposed changes narrowing eligibility for Massachusetts RECS.[43] As a result of these changes, the supply of RECs in the other states' markets, including NH, will increase. This increase in supply coincides with the NH Class III requirement reaching its plateau of 6.5% in compliance year 2011, a dynamic which, in the absence of other market factors, may lower the price of NH Class III RECs from what they would otherwise be.

[42] Manomet Center for Conservation Sciences, prepared for MA DOER. June 2010. *Biomass Sustainability and Carbon Policy*. www.manomet.org
[43] Massachusetts DOER, RPS Biomass Draft Regulation, at www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Energy%2c+Utilities+%26+Clean+Technologies&L2=Renewable+Energy&L3=Biomass&sid=Eoeea&b=terminalcontent&f=doer_renewables_biomass_policy-reg-process&csid=Eoeea

Other predictions, made primarily in the context of the public workshops held at the PUC in the period from February 2011 to June 2011, suggest that there may be a decrease in available Class III REC supply, due to the temporary or permanent closure of regional biomass plants and/or the sale of NH Class III RECs into the Connecticut or Massachusetts Class I markets. Recent developments in the NH biomass resource base include negotiated power-only contracts between PSNH and five biomass Independent Power Producers (IPPs), which are under consideration by the PUC.[44]

Feedback provided by biomass power producers and their representatives indicate that REC prices and wholesale power prices are not sufficient to cover the costs of operating these plants. They have suggested creating a price floor for Class III RECs as a means to increase plant revenue. Several biomass power producers also believe that a large supply of landfill gas from New York is further causing a depression in the Class III REC price, although this claim has not been fully substantiated by evidence of sales of these RECs into NH's Class III market.[45] The approximate REC price for Class III during compliance year 2010 was $24.80; as compared to the ACP price of $29.87 for that same year. In addition to this observed average REC price, the majority of ACPs were paid into Class III, which would indicate a shortage of Class III RECs either entirely or at least at a price that is less than the ACP.[46] Instituting a price floor would create an added cost to ratepayers, increased administration at the Commission or other administrating entity. Further, such a change raises the question of where the floor should be set. With Class III REC requirements increasing from 5.5 percent to 6.5 percent of retail electric load in 2011 and many biomass facilities uncertain about their future ability to generate due to rising operational and fuel costs, this trend of rising Class III REC prices may continue.

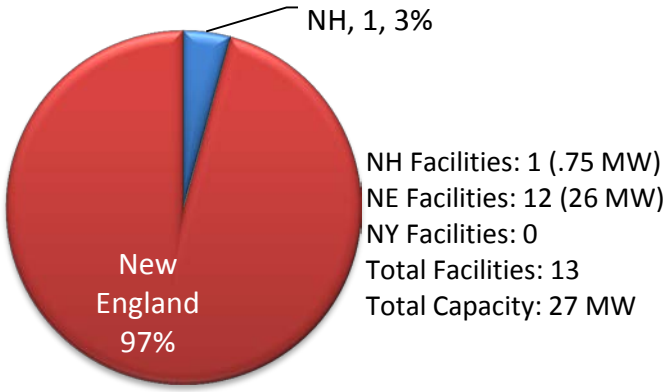
Recommendation: Monitor the eligibility and sources of Class III RECs.

6. Class IV (Existing Small Hydroelectric)

Although NH has a significant existing hydroelectric resource base totaling about 498 MW in capacity,[47] only one facility, Cocheco Falls, is certified to produce NH Class IV RECs. As Figure 10 below shows, ninety-seven percent of the Class IV capacity comes from non-NH sources.

[44] The power purchase agreements must be approved by the Commission.
[45] Minutes from Public Workshop #1
[46] $1.539 million was paid in Class III ACPs for compliance year 2010. This is out of $2.625 million total ACPs paid for compliance year 2010.
[47] U.S. Energy Information Administration, New Hampshire Renewable Electricity Profile, www.eia.gov/cneaf/solar.renewables/page/state_profiles/new_hampshire.html.

Figure 10. Class IV Resources by Location and Capacity:



Class IV was created to acknowledge the value of our state's indigenous resource base, and to better support the continued operation of these relatively small hydroelectric facilities, many of which have faced the expiration of long-term above market power contracts.[48] While these resources do comprise an important piece of the state's indigenous energy mix, the existence of Class IV as a means to provide additional financial support for small hydroelectric facilities has not yet proven successful. In order to produce Class IV RECs, the hydroelectric facility must have a gross nameplate capacity of 5 MW or less, have installed FERC-approved diadromous fish passages,[49] and when required, have documented applicable state water quality certification pursuant to section 401 of the Clean Water Act.

The legislative history indicates that these requirements were created to narrow a broad regional market. NH's Class IV requirement of a fish passage mechanism proves costly for some NH facilities. Partly in response, the NH legislature, in 2010, required the PUC to issue an annual Request for Proposals (RFP) that is funded through the Renewable Energy Fund (REF). The PUC issued a technology neutral RFP in February 2011: any NH-based hydroelectric facility that needed funds to install fish passages or make other capital improvements that would lead to Class IV REC eligibility could apply. No hydro facilities applied for fish passage funding, however, and there continues to be a dearth of NH-based Class IV sources.

There have been situations in which fish ladders are not necessary to preserve the integrity of the fish ecosystem that co-exists with a dam and its associated hydropower facilities. For example, in Docket 10-151 regarding the application for REC certification of fourteen Holyoke Gas and Electric canal facilities to produce Class IV RECs, the applicant argued that it needed only one set of upstream and downstream fish passages at the opening to its canal network that led into a system of fourteen separate hydropower generating facilities, and that FERC had approved this configuration. The Commission, in its final decision, did not reach this issue because it found that the fourteen facilities constituted a single installation with a

[48] Granite State Hydropower Association. Letter to Debra Howland from Richard Norman, February 4, 2008.
[49] Diadromous fish travel both upstream and downstream.

generation capacity in excess of 5 megawatts, rendering the facilities ineligible for Class IV RECs.

Nonetheless, the case demonstrates the potential of the RPS statute to require fish ladders where none are needed. The RPS law also ignores the role that FERC plays in determining whether hydroelectric dams require fish ladders. All hydroelectric facilities need FERC permits in order to operate. FERC determines whether or not a facility is exempt from a fish ladder requirement. In many cases, including the previous example, FERC has found that it would be financially onerous and unnecessary to require fish ladders when doing so has no impact on the natural migration habits of the fish.

Recommendation: Given the widely recognized value in New Hampshire's hydropower resources, keep Class IV in place, but study the implications of no longer requiring fish passages if FERC has exempted a facility from installing fish passages.

B. Potential for Thermal Energy Component, Topic III Possible Introduction of Any New Classes such as Energy Efficiency, Topic V

1. Thermal Energy Component

RSA 362-F:5, III requires the Commission to evaluate the potential for the addition of a thermal energy component to the RPS. Two options were considered: the addition of a thermal energy component or class, in a pure (thermal-only) form, or the addition of a class for combined heat and power (CHP) facilities. Currently, the only form of thermal energy that may be used as an eligible resource in the NH Class I category is solar water heating that displaces electrical energy, with the equivalent electricity displacement as the means to quantify the amount of RECs produced. Otherwise, the NH RPS is an electric standard, and thermal energy used for space heating or other purposes is not included.

In the NH Office of Energy and Planning's (OEP) 2008 *Thermal Renewable Energy Report*, a range of options for providing financial support for renewable thermal energy were extensively studied and analyzed by a broad group of stakeholders and OEP staff.[50] Reaffirming the importance that renewable thermal energy has in our state's heating, cooling, and industrial process needs, this study also ultimately concluded that while there were many sound policy tools to incent and promote renewable thermal energy, using an electric portfolio standard such as the RPS was not the optimal one to do so. Three years later however, these alternative policy tools, such as a thermal systems benefits charge for heating fuels, have yet to be established, and the RPS once again is seen by many as a means to incent thermal renewable energy in a formal legislative and regulatory capacity.

[50] For more details on thermal renewable energy in NH, including definitions and key findings, see the full report at http://www.nh.gov/oep/programs/energy/documents/thermal_renewable_energy_report_december_2008.pdf

Biomass and solar are the two primary renewable resources available to NH to generate thermal energy. Solar energy may be harnessed to heat or cool a conditioned space, or used in industrial processes. Producing thermal energy from the combustion of biomass, given its resource base in the state, and the economic development dependent on its harvesting, processing and use, is the primary consideration when it comes to a thermal class or component with the RPS. The key benefits to including thermal energy in the RPS would be the displacement of additional fossil fuels from the NH economy, the greater efficiency that biomass energy achieves when used in a thermal application (versus to produce electricity only), and the economic benefits gained from a potential expansion in this sector. The difficulties with incorporating thermal energy into the existing RPS include electric ratepayer and compliance equity, monitoring and verification of the energy produced, and REC administration complexities within the existing NEPOOL-GIS tracking and trading platform. If NH decided to include thermal energy from biomass or solar going forward, the creation and tracking of the RECs produced would likely need to be performed manually within the PUC or another regulatory agency, as the NEPOOL-GIS system only creates and tracks RECs that are created through electrical production and verification in the existing system operator. There is little guidance currently offered from other states, as no other RPS has a purely thermal component nor has the NEPOOL-GIS dealt in purely thermal RECs that are not from solar thermal systems.[51] Nevertheless, many NH stakeholders have expressed strong support for a thermal component to be added to the RPS, as shown in the more than 15 public comments submitted to the PUC during the public review workshop process.[52]

Recommendation: Study the ways in which the RPS could be expanded to include thermal only renewable sources which do not also generate electricity or displace electric use.

2. Combined Heat and Power (CHP)

Cogeneration, also known as CHP, offers another viable option as a means to incorporate thermal energy into the RPS. CHP technologies produce both electricity and useful heat energy. CHP technologies are inclusive of many fuel inputs, including biomass, fossil fuels, and hydrogen. For the purposes of consideration for inclusion the NH RPS, CHP should be limited to those technologies that use renewable fuels, such as biomass. During the stakeholder process, there was little to no support for CHP with natural gas or other non-biomass fuels. Including CHP fueled by natural gas may have the result of not only flooding the REC market with a large resource potential, it also may squander scarce ratepayer incentives on systems that are often already economic, absent REC revenues. Additionally, allowing technologies that are fueled with natural gas directly opposes the purposes of the NH RPS, which include diversifying away from fossil-fuels and their associated price vagaries.

[51] James Webb, NEPOOL-GIS system administrator, August 2011.
[52] See http://www.puc.nh.gov/Sustainable%20Energy/Review%20RPS%20Law.html for complete public comments and meeting minutes.

There are two recent bills that have appeared in the NH legislature that directly relate to CHP: HB 543, *An Act relative to biomass combined heat and electricity facilities*, which is currently held in the House Science, Technology and Energy Committee, and HB 381, *An Act authorizing net metering for micro-combined heat and power systems.*[53] HB 381 passed in 2011 and went into effect on July 1. The act authorizes CHP systems between 1 kW and 30 kW in size to net-meter, regardless of whether the fuel input is renewable or not. HB 543, currently under consideration in the House, would authorize the recognition of CHP systems fueled with biomass under the RPS as Class I or Class III sources, including multipliers applied based on efficiency ratings of the system.

Other states, including Massachusetts and Connecticut have incorporated limited CHP systems into their RPS programs. The inclusion of CHP, as defined in HB 543, would increase the potential resource base of sources generating Class I or Class III RECs for NH RPS compliance. While CHP systems are sound technologies that should be supported in a comprehensive energy policy in NH, the addition of this resource to Class I and III will likely increase the supply and further drive down the price of RECs, absent any other changes to the requirements or the regional dynamics of the REC market.

Another point of consideration is that HB 543 and HB 381 do not define CHP in like manners. While HB 381 applies to micro-CHP systems that may be fueled with any fossil fuel, HB 543 only applies to CHP systems that are fueled with biomass and are up to 25 MW in size. While the two parameters are easily distinguishable for many, these differences, should HB 543 also become law, may create some level of confusion in the market or consternation over unlike treatment of CHP technologies across different policy mechanisms.

It is also worth noting that useful thermal energy from CHP generation can only be used locally, as it cannot be transported long distances like electricity. There may be merit to weighing the public policy considerations of targeting thermal RPS credit for only thermal energy that is delivered for use in New Hampshire.

Recommendation: Consider inclusion of CHP as an eligible Class I or III resource, giving credit to the CHP thermal output on an energy equivalent MWh basis and evaluate the public policy rationale for limiting such credit to thermal energy delivered for use within New Hampshire.

3. Energy Efficiency

The question of whether to include an energy efficiency class in the RPS law or incorporate it as an eligible resource into Class I was answered by nearly all stakeholders with a

[53] For the full text of each bill, see www.gencourt.state.nh.us/legislation/2011

resounding "no."[54] From utility representatives, to state agency analysts, to non-profit memberships and leading experts on best practices in state energy policy, there was consensus that such a modification to the RPS would not improve the program, but might actually harm it. Several entities, including the Northeast Energy Efficiency Partnership (NEEP), the Clean Energy States Alliance (CESA), and the Vermont Energy Investment Corporation (VEIC) have all recommended establishing a separate Energy Efficiency Resource Standard. Additionally, OEP was recently awarded a federal grant to facilitate a stakeholder process to develop a state energy efficiency policy.

Recommendation: After completion of the OEP stakeholder process, the Legislature should assess whether to establish an Energy Efficiency Resource Standard or other separate policy addressing energy efficiency outside the scope of the RPS.

4. Distributed Generation

Another option for a new RPS class, whether it may replace an existing one or result from combining others, is for a technology-neutral distributed generation (DG) class. A DG class may include technologies ranging from biomass CHP, solar photovoltaic, wind, or hydroelectric, provided that each system was interconnected to the distribution grid. Requiring DG resources to be interconnected with the distribution grid may provide benefits to the state, its utilities, and its ratepayers. DG resources may help decrease investments needed to increase the capacity of the distribution grid, much like energy efficiency and demand response. It may help avoid regional transmission charges and delay or defray new transmission capacity investments. When the DG resource is solar electric, the load profile of the solar system often closely matches the peak demand of the grid and the resource is considered "peak coincident." The addition of peak coincident resources serves to lower peak demand and thereby lower power costs. A single DG class within the RPS could also be technology-neutral, with the broad eligible technology parameters of an RPS. A DG class may also be structured to synergize with RSA 374-G in order to promote utility investment in eligible technologies. One drawback to a DG resource class may be the difficultly in stimulating the appropriate level of investment and development to match the requirement, given that the market would be geographically smaller than the existing resource class markets.

5. Renewable Fuels Used in Non-Eligible Power Plants

One technology that is not currently eligible to produce RECs under the NH RPS is the energy generation resulting from the firing of renewable fuels at a traditionally (or formally) fossil-fueled powered electricity plant, also known as co-firing." For example, an oil-burning power plant might be retrofitted to allow biomass as a fuel source. The question is whether under an RPS program that electrical generation produced from the biomass combustion at the oil or

[54] For feedback and written comments on this topic, see http://www.puc.nh.gov/Sustainable%20Energy/Review%20RPS%20Law.html, workshop #2 minutes.

coal power plant should qualify for REC creation. Co-firing, under certain emissions and permitting parameters, is considered to be appropriate within an RPS by the NH Department of Environmental Services. Including renewable energy co-firing as an eligible resource to produce RECs from traditional fossil-fuel fired power plants may provide a positive incentive to those plants to make significant investments in diversifying their fuel sources with cleaner, locally available fuels such as biomass, while also maintaining much of the infrastructure of the plant itself, as well as its associated jobs. Determining the technical and economic potential for this technology application would be an important step toward including it in the NH RPS, in order to better maintain a healthy supply and demand balance in the REC market.

C. Increasing Class I and II Requirements Beyond 2025, Topic IV

The current RPS law specifies that each resource class requirement be met through 2025. In a recent docket before the PUC (DE 10-195), parties differed in their interpretation of RSA 362-F:3 and the extent of an RPS obligation beyond 2025. The PUC's majority opinion found the obligation to continue in 2026 and thereafter at the levels set for 2025, though a dissenting opinion concluded that the current statute was silent on whether an RPS compliance obligation continued beyond 2025 and therefore there was none. [55] A motion for rehearing was filed and denied and the issue was appealed to the New Hampshire Supreme Court, although the appeal was subsequently withdrawn as part of a settlement that is now pending before the Commission. Legislative clarity on this point may provide greater willingness on the part of investors to support renewable generation facilities and provide greater certainty for long-term contracts for RECs that may extend beyond 2025. Legislative clarification may also help avoid future litigation of this issue. A number of commenters urged such clarification during this review.[56] Presently, it seems premature to consider increasing the Class I and II requirements beyond 2025 until there is more experience with the existing requirements.

Recommendation: Clarify the extent of the RPS obligations beyond 2025, specifically, whether or not the 2025 obligations continue indefinitely absent further legislative change.

D. Consolidation, Topic V (continued)

Each of the four resource classes within the RPS were created with a particular policy, economic, or environmental interest in mind. Combining any one or all of the resource classes may make sense for the sake of simplicity and flexibility, but will likely prove difficult to re-fashion in light of these diverse interests that remain as important today as they were in 2008. One option would be to combine all resources into a single class: each resource could be treated

[55] Public Service Company of New Hampshire, *Petition for Approval of Purchased Power Agreement with Laidlaw Berlin BioPower, LLC,* Order Granting Conditional Approval, Order No. 25,213 (April 18, 2011), and Order Denying Rehearing, Order No. 25,239 (June 23, 2011).
[56] RPS review workshop minutes, 3/15/2011.

equally, where 1 MWh equals one REC. Alternatively, multipliers could be applied to each resource, thus placing greater value on some resources and less on others.

The primary concern with a single class system is that NH resources under the current classes, namely solar, existing biomass and small hydroelectric, will lose much-needed financial support currently earned from REC revenue.

Another option may be to have a two-class system: one for renewable energy that is interconnected at the transmission level, similar to the current Class I, and a second one for distributed generation, inclusive of all eligible technologies that are customer-sited and interconnected with the distribution grid.[57] A DG class may also foster greater flexibility for the utilities to pursue location-based generation investments, under a purview of both a DG resource class and RSA 374-G, *Electric Utility Investment in Distributed Energy Resources.*

Recommendation: Explore options for modified classes, with and without multipliers.

E. Timeframe and Manner to Transition Class I and II to Existing, Topic VI

Transitioning Class I and II resources to existing resources involves a detailed study of the amortization of the original financing and depreciation of each technology, as well as ongoing operating costs, and may add unnecessarily to the complexity of the RPS at this early stage of the program. It may make sense to sunset new generation into existing generation after the amortization of original financing, but that should occur only after many years, on the order of 10 to 15 years from when new sources originally go into service. Consideration of this issue is not ripe at this time and may be more appropriate starting with the next review in 2018.

F. Experience with Multi-year Purchase Agreements, Topic VII

NH's method of compliance for its RPS is flexible and relatively speaking, market-based. Electric Service providers comply through the creation, trade and retirement of Renewable Energy Certificates (RECs) between producers and themselves. The clearinghouse for these transactions occurs within the NEPOOL-GIS system, which is part of the Independent System Operator of New England (ISO-NE). RECs can be purchased on the spot market during a quarterly trading period, or through bilateral contracts, or RECs can be produced by utility-owned (or merchant-owned) generation. While this market-based REC system is common in many states with RPS programs, there are other methods of compliance.

All providers of electricity in NH, excluding municipal suppliers, must comply with the REC requirements each year. These providers of electricity include distribution companies providing default service and competitive energy suppliers. The obligation to obtain RECs in

[57] All generation would be new as of January 1, 2006, with the exception of grandfathered existing systems deemed appropriate or already under the current RPS structure.

order to meet the requirements each year could also be placed solely on the distribution companies for their entire delivered load. Instead of the distribution utility obligation applying only to default service sales, it would apply to all energy delivered. The NH electricity market is partially deregulated, and it is this unbundling of generation, transmission, and distribution that fosters a choice in who will bear the RPS obligation, only the distributors of the energy through the distribution rate, the suppliers of electricity through the generation rate, including competitive, default, and self-supplied service, or some combination of the two.

Utilities (or other such complying entities) may purchase all RECs through bi-lateral contracts. These contracts might range from one or two years to fifteen or twenty years, depending on the purchaser's goals or length of the RPS. One benefit associated with this form of compliance is greater transparency and stability for renewable energy project developers. According to a recent report on design considerations for an RPS in Vermont, "overall, RPS targets far exceed the state long-term contracting programs on which RPS projects are largely dependent. This dearth of long-term contracts, and the associated challenges of project financing, is one of the defining factors in New England's renewable energy market today."[58] Many developers of renewable energy projects that participated in the NH RPS Review stakeholder workshops corroborated this finding and emphasized the importance of long-term contracting for both power and RECs to achieve the financing to actually construct projects.

One risk associated with long-term contracting is the political risk incurred by the utilities that future legislation or regulation may change the RPS, and the utility is locked into a contract that no longer serves the policy that mandated it. New Hampshire distribution utilities have some experience with short-term, medium-term, and long-term contracting for renewable energy and/or RECs. For example, PSNH has long term contracts with Lempster Wind and Berlin BioPower (Laidlaw) for energy, capacity, and RECs.

Utility feedback, in writing and through their representatives' participation in the RPS Review public workshops, indicated that they prefer the current method of compliance, which grants them significant flexibility in terms of how they chose to procure RECs.[59] PSNH expressed in its written comments that it would be amenable to transferring the RPS obligation to only distribution companies, whereas the NH Electric Cooperative is not amenable to this option. There was little input from the competitive suppliers on this same option, or on the topic of mandatory long-term contracting. No stakeholder expressed support for the option where the state would designate a central entity (such as an agency or other third-party entity) to procure all RECs on behalf of electric service providers: deterring factors are likely the high state administrative cost associated with this option and loss of control on the part of the utilities.

[58] Analysis of Renewable Energy Policy Options for Vermont. August 2011. Prepared by SEA and CESA for the VT Public Service Board.
[59] See utility comments and minutes from the public workshop held on May 25, 2011.

The PUC's experience with evaluating utilities' use of multi-year contracts has been positive, albeit limited. It is apparent from testimony in PUC cases that investors seek longer term contracts before committing to a project's construction. When assessing the public interest, however, it is also clear that the longer the term of a contract, the more assumptions are needed regarding energy, capacity, and REC market conditions. For contracts extending beyond 2025 there has been some debate over the extent of the REC requirement, an issue addressed earlier in this report. It is also important to note that PSNH, Unitil, National Grid, and NHEC may evaluate its REC procurement differently than Competitive Electric Power Suppliers (CEPS), as CEPS are energy supply providers who do not always anticipate their load in the future in the same way that a distribution company may, and therefore may be more inclined to procure RECs on a shorter term basis. Based however on the limited experience with multi-year contracts to date, the PUC recommends no change regarding their use.

G. Alternative Methods for Compliance, Topic VIII

Another way to comply with REC obligations is REC procurement and retirement through a centralized entity, such as a state agency or another designated procurement entity. New York uses this method for nearly all RPS compliance. NY State Energy Research and Development Authority (NYSERDA) procures RECs through a competitive bid process, purchases, and then retires those RECs through multi-year contracts. A recent review of the New York RPS found that the program had a price-suppression effect on the wholesale electricity market in that state, which benefits ratepayers on their monthly electric bills.[60]

Another compliance method that would be available to NH is the use of a Feed-in-Tariff (FIT). A Feed-in-Tariff sets a standard price that reflects the actual cost of a particular technology, and then sets a long-term contract for that standard price for any system that meets the pre-determined project and contract criteria. Although this type of policy tool has proven successful in spurring significant amounts of new renewable energy production in other states and countries, it is considered by some to be a more costly and administratively intensive means of doing so. Others argue that while in the short-term, these higher costs are present, in the long-term the costs are less than other policy options when factors such as lower financing costs for projects receiving the standard contract of the FIT program, fewer project delays, wholesale electricity price suppression, etc. are taken into account. [61] Using an FIT as a means of RPS compliance was discussed briefly at the public workshops and many of the stakeholder participants were not in favor of pursuing this option in the near future.[62]

[60] For a complete review of the NY RPS program, see the 2009 report prepared by Summit Blue for NYSERDA, *New York Renewable Portfolio Standard Market Conditions Assessment.*
[61] For more information about feed-in-tariffs and comparable renewable energy policies, see the 2009 Deutsche Bank Group paper, *Paying for Renewable Energy: TLC at the Right Price.*
[62] See public comments and minutes from the May 25, 2011 work session.

RSA 362-F:6, II, (along with the associated implementation rules, Puc 2505.08), requires that all electricity production that is not tracked by ISO-NE from customer cited sources be monitored and verified by an independent entity. Additionally, small production or fractional increments of RECs (e.g. 5 MWh of production per year would be considered small within the NEPOOL-GIS system) often need to be aggregated to be practically available for sale in the regional REC market. Monitoring and verification entities must be certified by the PUC, as do any aggregators of RECs from customer-sited sources. This requirement has proven to be onerous and expensive to the owners of customer-sited sources, particularly owners of small residential renewable energy systems. In the three years of RPS compliance, only three entities have registered with the commission as independent monitors, one of which is the NH Electric Cooperative (also the only certified aggregator),[63] and the other two are individuals who work in the energy services sector. The fact that the other three distribution utilities in the state have not registered as independent monitors or aggregators, nor has another entity with large-scale meter reading capacities, indicates that a significant portion of in-state generation capacity is not eligible to produce RECs for NH RPS compliance. This is confirmed by the discrepancy between the capacity of NH net metered solar systems (2.35 MW) and qualified Class II (solar) sources that are located in NH (0.88 MW) as shown in Figure 8.

An important consideration for the self-reporting or estimation of production from customer-sited systems is the potential for falsification, misrepresentation, or misunderstanding of actual production data. This concern informed the existing statutory and regulatory requirements for an independent monitor to verify output. For example, engineering estimates of annual production from a small customer-sited solar electric system may over-estimate or under-estimate actual production. A customer attempting to self-report may misread the meter and report an incorrect amount. Furthermore, if a system is installed incorrectly or later encounters a problem and loses rated capacity, RECs may be created that are not supported by an equal amount of real electricity generation. These concerns must be balanced, however, with the economic cost of the independent monitor services, the forgone benefit of earned in-state RECs, and how the incentive of REC revenues may better address the purposes of the RPS itself.

In Massachusetts, for example, all systems under 10 kW report production data, either manually or automatically, to the state's Production Tracking System by logging into an assigned account and entering in the monthly production data. The state then submits this production data to the NEPOOL-GIS system for solar REC creation. If a producer fails to enter in his or her system's data, then any RECs that would have been created from that period are forfeited.

Recommendation: Amend RSA 362-F:6 to allow the PUC to devise alternative method(s) of tracking or accounting for Class II RECs, such as engineering production estimates, for systems under 5 kW in gross nameplate capacity. For net metered systems that should clearly qualify as a NH RPS source, but that do not bother to qualify, allow the PUC to devise a method to credit

[63] NH Electric Cooperative offers an agreement with its member that provides monitoring and aggregation of the customer's system's production in exchange for ownership of the RECs created from that production.

estimated production against default service load RPS obligations. Language to this effect can be found in section 5 of HB 311, 2011.

H. Renewable Energy Fund Distribution, Topic IX

The Renewable Energy Fund (REF), 362-F:10, is a non-lapsing special fund used to support thermal and electrical renewable energy initiatives. The PUC manages the REF, guided by the statute, and distributes nearly all of the fund to renewable energy projects in New Hampshire. A small portion of the fund is used for administration costs. Past REF reports, due to the legislature each October 1, detail how the REF has been spent each year.[64] Funding for the REF comes from Alternative Compliance Payments (ACPs) made by the electric service providers in lieu of purchasing RECs. ACPs are made once per year, on or before July 1.

In addition to the requirement that the REF be used to support renewable energy initiatives in NH, RSA 362-F:10 also mandates that all Class II Alternative Compliance Payments (ACPs) are spent only on solar energy technologies, that the PUC develop and administer a small residential renewable generation incentive program, that the REF be apportioned to projects in the residential and non-residential sectors in accordance with their respective shares of total retail electric sales statewide in every two-year period after 2010, and that the PUC issue a competitive RFP for the non-residential sector no later than March 1 each year.

The REF currently funds two residential rebate programs, one for small electric generation systems such as wind or solar electric (photovoltaic) and one for solar water heating systems, and also funds one non-residential rebate program for solar electric and solar thermal technologies. It is important to note that the NH Legislature specifically mandated the PUC to create and administer the small residential renewable electric generation system rebate program in 2009, shortly after the RPS program began. Additionally, with respect to HB 1270 mandating an annual commercial and industrial sector RFP, the REF allocated one million dollars to an RFP that was released in February 2011, from which five grants were awarded. Two of the grants were for upgrades to small hydroelectric facilities, one was for a wood pellet heating system in an elementary school, one was for a landfill gas to energy (combined heat and power) facility, and one was for a solar photovoltaic project.[65]

Suggested changes to fund distribution include allocating more money to projects that would generate RECs in the class for which there is a shortfall (classes in which ACPs are made in lieu of RECs) and establishing a single residential technology-neutral rebate program. Stakeholders also discussed the wisdom of requiring that an annual RFP be funded by a source that receives fluctuating revenues. According to some commenters, the REF, which is the only publicly funded program for renewable energy projects in NH, has created an environment in

[64] See Annual Renewable Energy Fund Reports here or go to the PUC website.
[65] For full grant award details, visit http://www.puc.nh.gov/Sustainable%20Energy/RFPs.htm

which both rebate program and competitive bid solicitation funding is relatively small, unpredictable, and inconsistent from one year to the next. ACPs, the source of the REF, are made once per year, and cannot be easily predicted given the market-based nature of RPS compliance within a regional energy system. In their view, the unpredictable nature of funding has led to significant market disruption, contrary to the purposes of the RPS and making it difficult for prudent business planning and consumer decision-making.

Since 2008, the REF has received approximately $8.4 million dollars, but the amount per year has varied, to wit: $4.5 million (2008 compliance); $1.3 million (2009 compliance), and $2.6 million (2010 compliance). The future level of contribution to the fund is unknown. A number of commenters suggested, as a means to provide a predictable source of funding for the REF, a system benefits charge (SBC) for renewable projects that would be assessed on all ratepayers in a manner similar to the SBC used to fund utility energy efficiency programs.[66]

Other ways to enhance the efficiency of fund distribution without affecting ratepayers is to provide greater flexibility in how the funds are distributed. The PUC is now constrained in how it distributes funds, with statutory requirements for a residential rebate program and nonresidential RFPs, as well as a proportionality requirement for residential and nonresidential sector expenditures. With the swing in fund availability, variable take-rates of rebate programs, and uncertain timing of RFP grant award distributions it may be difficult to comply with all the statutory requirements even while carefully attempting to do so. For example, assume ACPs result in revenue of $1.5 M for the compliance year. The PUC must provide funding for small scale system rebates (RSA 362-F:10, V) and initiate a competitive grant round for nonresidential projects (RSA 362-F:10, XI), all the while ensuring that over each two year period the amounts actually expended for nonresidential versus residential ratepayers reasonably approximates their share of load. With $1.5 M in ACPs the amount available for a competitive RFP grant round would be only about $750,000, even assuming any nonresidential rebate programs were not funded for that year, an amount too small to justify a complex grant review process.

Recommendations: Amend RSA 362-F to allow the PUC greater flexibility in distribution of the REF. Specifically, the requirement for an annual nonresidential RFP might be waived for fiscal years in which ACP/REF revenue is below a given amount, say $2 million. Also, the RSA 362-F:10, VI requirement to "reasonably balance overall amounts expended from the fund, net of administrative expenditures, between residential and nonresidential sectors" might be amended to read "reasonably balance overall amounts expended, *allocated, or obligated* from the fund . .."

I. Other Statutory and Administrative Issues

The following section includes observations by commenters during this review as well as areas of RSA 362-F and the PUC's RPS administrative rules, (Puc 2500), that bear clarification.

[66] See also the Independent Study of Energy Policy Issues by Vermont Energy Investment Corporation (VEIC), 2011, for renewable energy funding recommendations.

1. Compliance Dates and REC Acquisition

RSA 362-F:8 requires that all electricity providers subject to the requirements of the RPS submit a report to the PUC documenting its compliance with the requirements by July 1 of each year. Puc 2503.03 subsequently added that the electricity providers should also submit any owed ACPs at this same time, and that all GIS certificate settlement reports of RECs should be submitted by July 30. Related to this rule, Puc 2503.03(e) could be modified, assuming all else remains equal, to read as follows: "A provider of electricity shall separately file its GIS report containing the final number of certificates settled for the prior calendar year *and the first quarter of the current calendar* year no later than July 30 of each year" (italics represent added portion). RSA 362-F:7 allows these providers to use RECs from the first quarter of the subsequent year to meet the requirements of the previous year, not in excess of 30% of the provider's requirements in a given class. These two combined features (the report and settlement date and REC trading period) are in conflict with one another. The NEPOOL-GIS trading period for first quarter RECs begins on July 15 and continues through September 15.[67] The statute requiring the compliance report to the commission does not allow for settlement of first quarter RECs even though the same statute allows those RECs to be used for compliance; nor does the PUC rule governing the submission of the REC settlement reports allow for the duration of the trading period through September 15.

Allowing a later date for submission of ACP reports would further delay the ability to allocate funds for the rebate programs, which is the sole source of funds for these programs. Further, a later report date would delay the release of the grant awards from the annual commercial RFP solicitation, which could be problematic given the timing of the New Hampshire construction season. Additionally, this conflict between the report and ACP due date and the trading period for first quarter RECs has fostered a situation where an electric service provider could, and indeed has, submitted an incomplete report with ACPs in the expectation that it would later ask for a refund equivalent to the first quarter RECS that are later acquired during the July-September trading period. Other states that use the NEPOOL-GIS system either do not allow first quarter RECs to be used for a previous year's compliance or if they do allow their use, the compliance report date is in October. These same states do not rely predominantly on ACPs to fund renewable energy initiatives and therefore are not dependent on the receipt of ACP's to determine annual allocation of resources.

Recommendation: Eliminate the eligibility of first quarter RECs for the previous year's compliance by amending the last sentence in RSA 362-F:7, I to delete the phrase "or the first quarter of the subsequent year" so that, for example, compliance for 2012 would be met only with RECs created during 2012 or earlier.

[67] NEPOOL-GIS Operating Rules 3.2. Rules effective July 1, 2011.

Rule Change: Clarify in Puc 2500 the filing requirements for compliance reports and when and how refunds to RPS compliers are permissible under 362-F:7 and 8.

2. Definition of "capital improvement"

RSA 362-F: 4, I(i) states that an eligible Class I resource shall include, "The incremental new production of electricity in any year from an eligible biomass or methane source or any hydroelectric generating facility licensed or exempted by Federal Energy Regulatory Commission (FERC), regardless of gross nameplate capacity, over its historical generation baseline, provided the commission certifies demonstrable completion of *capital investments* attributable to the efficiency improvements, additions of capacity, or increased renewable energy output that are sufficient to, were intended to, and can be demonstrated to increase annual renewable electricity output. The determination of incremental production shall not be based on any operational changes at such facility but rather on *capital investments* in efficiency improvements or additions of capacity." It is unclear whether the term "capital investments" referred to in this section of the statute section is the same as that defined in Puc. 2502.03, which states that, " 'Capital investment' means investment in new plant and equipment directly related to restoring generation or increasing generating capacity including department permitting requirements for new plants, provided that such investment represents at least 80 percent of the federal income tax basis of the source's total plant and equipment, not including the source's real property and intangible assets."

The specific question is whether or not a facility must demonstrate that the capital investment in efficiency improvements or additions "represents at least 80 percent of the federal income tax basis of the source's total plant and equipment, not including the source's real property and intangible assets." This definition of "capital investment" does not seem to apply to sources which apply for Class I REC status pursuant to RSA 362-F:4, I(i). First of all, there is no definition of "capital investment" in RSA 362-F:4,I (i) and further no requirement that the capital investment be at least 80 percent of federal income tax basis. Instead, the definition of "capital improvement" in Puc 2502.03 is derived from the statutory language in RSA 362-F:4, I (j) which describes an entirely different category of sources eligible to produce Class I REC.[68]

Subsections (i) and (j) describe two distinct categories of Class I facilities. The rules regarding RSA 362-F:4, I(i) reference the category as "Certification of New Output." Puc 2505.05. Pursuant to the rules, the applicant must demonstrate that it made capital investments after January 1, 2006 with the successful purpose of improving the efficiency or increasing the output of renewable energy from the facility. For these facilities, the Class I certification is limited to *the incremental new production* attributable to the capital investments. Puc

[68] The statute has one additional reference to "capital investments" in 362-F:13, Rulemaking. That section provides, in part, that the Commission shall adopt rules to "V. Establish procedures for the classification of existing or proposed generation facilities, including a provision for a preliminary designation option, and to verify the completion of capital investments required of certain class I resources."

2505.05(c). The rule for applicants seeking RSA 362-F:4, I(i) Class I status contains no independent definition of "capital investment."

RSA 362-F:4, I(j), on the other hand, represents repowered Class III or Class IV sources and *all of the output* is eligible to produce Class I RECs provided that the owner can demonstrate that "80 percent of its resulting tax basis of the source's plant and equipment, but not its property and intangible assets, is derived from capital investment directly related to restoring generation or increasing capacity." The rules characterize facilities eligible pursuant to RSA 362-F:4, I(j) as "Repowered Class III or IV Sources as Class I Sources." Puc 2505.06. Interestingly, Puc 2505.06 essentially repeats the definition of "capital investment" in the rule. See Puc 2505.06 (b).

Therefore, based on the plain language of the statute, the definition of "capital investment" in Puc 2502.03 should apply only to facilities seeking Class I REC (repowered) status pursuant to RSA 362-F:4, I(j). Facilities that are not repowering but only making improvements that add incremental capacity should not need to demonstrate that "80 percent of its resulting tax basis of the source's plant and equipment, but not its property and intangible assets, is derived from capital investment directly related to restoring generation or increasing capacity" to qualify for Class I REC status pursuant to RSA 362-F:4, I (i). Instead, such facilities must demonstrate that they have made some capital investment in order to boost electrical generating capacity.

Rule Change: Clarify Puc 2503.03 to clearly reflect the plain intent of the statute and apply only to repowered Class III or IV when seeking to qualify as Class I. Further, remove the definition of capital investment in Puc 2500.

3. Self-suppliers (direct market participants) compliance

362-F:2, XIV defines a "provider of electricity" as a distribution company providing default service or an electricity supplier as defined in RSA 374-F:2, II, but does not include municipal suppliers. 374-F:2, II defines electricity suppliers as "suppliers of electricity generation services and includes actual electricity generators and brokers, aggregators, and pools that arrange for the supply of electricity generation to meet retail customer demand, which may be municipal or county entities." Under the principles of restructuring, consumers have the option of using any of the above listed suppliers, as well as becoming a direct market participant and self-supplying electricity. The language of the RPS statute and Puc 2500 has led to some confusion as to whether or not self-supplying entities must comply with the resource class requirements of the RPS. For the compliance years 2008-2010, some self-supplying customers have not complied with RPS requirements. While self-suppliers do not currently represent a significant portion of NH's electric load, the continued experience with restructuring and regional electricity markets could change that dynamic. Not requiring compliance for self-suppliers creates a gap for compliance and may dilute the impact of the RPS in the future.

Recommendation: Require self-suppliers to comply with all RPS supplier requirements for RECs corresponding to their load. Clarify the definition of provider of electricity under RSA 362-F:2, XIV to include customers who meet their retail load through direct purchases from the wholesale market.

Rule Change Amend Puc 2502, definition of "provider of electricity" to include self-supplying entities.

4. Third Party Ownership and Rebate programs

Pursuant to Puc 2507.04(c), it is not clear whether third party owners of renewable energy facilities are eligible for a rebate from the programs funded by the REF. This rule states that, to be eligible to receive a rebate for a customer-sited source of up to 100 kW, an applicant shall be a New Hampshire entity, an end use customer of a provider of electricity located in New Hampshire, and the owner of the proposed project. The Commission determined, in Order No. 25,151, that for the commercial and industrial (C&I) rebate program, all three criteria must be met by a single entity that would then be eligible to receive the rebate. This reading of the rules prohibits third-party ownership of solar systems.

The existing RPS statute does not prohibit a third-party owner of a renewable energy system in New Hampshire from receiving a rebate. Importantly, based upon comments from vendors and consumers, due to the high upfront costs of some renewable energy systems, there is a need for both a rebate *and* a power purchase agreement (PPA) between the consumer and its third party developer/owner to make such systems affordable. The purpose of the Renewable Portfolio Standard (RPS) is to provide fuel diversity, retain energy monies in the state, reduce harmful emissions, and help to stabilize and lower future volatile energy costs. The PPA project model has been and continues to be widely used across U.S. markets in which there has been successful development of renewable energy generation systems; creating a regulatory environment in NH that allows the use of the PPA (a third-party ownership model) for rebated systems would better assist our state in meeting the purpose and goals of the RPS.

Finally, the purpose of the Renewable Energy Fund (REF) (RSA 362-F:10), the source of the rebate program funding, is to support thermal and electrical renewable energy initiatives. By clarifying Puc 2507.04, this purpose would be met. Allowing third-party owners to receive an incentive payment would neither disrupt the management of an REF rebate program nor inhibit the efficient resolution of other matters pertaining to the management of this program.

Rule Change: Clarify Puc 2507 to allow third-party owners to receive REF incentive payments where 2507(a), (b), and (c) may be met without having to be met by a single entity and explicitly allow third-party ownership where Puc 2507 (a), (b), and (c) are met by the project owner and/or host site jointly.

5. Definition Modifications

REC Aggregation is an important component to REC-market participation from small-scale distributed generation (DG) generators; defining this market player would better facilitate increased NH-based resource participation. The current Puc 2500 rules lack a definition for a "REC Aggregator." The rules should be modified to include such a definition, which could read as follows:

"A party that acquires RECs from owners of customer-sited sources for the purpose of selling them to providers of electricity, or, in the case in which the aggregator is a provider of electricity, for the purpose of meeting the RPS requirements established in Puc 2503."

The definition of "customer-sited source" found at Puc 2502.13 requires amendment to include displaced electricity from thermal sources, to allow for solar thermal energy that displaces electricity is an eligible resource under the NH Class I.

Puc 2503.04, "Certificate Banking" should be clarified to state that it is only electric service providers (and not the generators) that can bank RECs. The NEPOOL-GIS Operating Rules currently govern the banking of RECs by generators; this rule allows generators of RECs to bank them only for the trading year in which they were produced, after which they are retired or used to create Residual Mix Certificates.[69] The Puc 2503.04 rule on certificate banking creates some confusion by not clearly defining what entities can bank under the NH RPS. Allowing only the electric service providers to bank RECs would eliminate such confusion and allow the GIS system to govern RECs at the wholesale level and NH to govern RECs at the state retirement-obligation level.[70]

Rule Changes: Modify Puc 2500 to include a definition of "REC Aggregator", clarify what a "customer sited source" is, and define entities that are entitled to "certificate banking".

III. CONCLUSION

The 2011 review of NH's RPS revealed valuable information about the policy and its performance, as well as a good deal of information about the renewable energy and supporting sectors within the state. While answering many questions posed by the legislature and stakeholders, the review raised nearly as many questions as it answered. Although RSA 362-F does not require another review to be conducted until 2018, it may be wise to conduct another review in 2014, after the passage of three more compliance years, coupled with on-going analysis and documentation of trends.

[69] See NEPOOL-GIS Operating Rule 3.7
[70] When the Commission opens a rulemaking on Puc 2500, Staff may provide additional minor modifications and clarifications to improve the functionality of the RPS program.

In its three years of operation, the NH RPS has made real progress towards accomplishing the statutory purposes identified by the Legislature. NH has helped to create hundreds of new renewable energy systems, develop a broader project installation and support services market, and contribute important project revenues through REC demand toward diversifying and increasing the regional power portfolio. There are many modifications that can be made, through the legislative and regulatory processes, to improve the NH RPS pursuant to its goals, but, the long-term stability and transparency of this broad policy tool are endemic to its ultimate success. Diversifying New Hampshire's energy portfolio, stabilizing energy costs, and hedging against long-term energy market uncertainty are achievable long term benefits from this state wide renewable energy policy.

APPENDIX A
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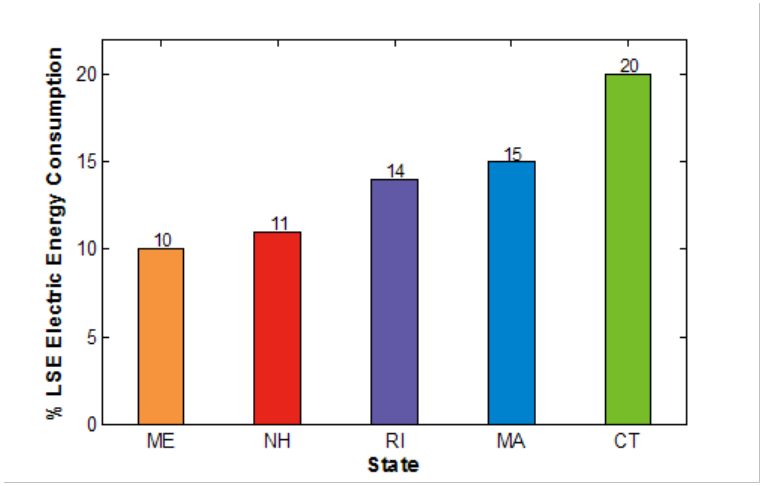
APPENDIX B
Supplemental Figures and Charts

RPS state targets for "new" renewable resources in 2020.



Regional System Plan. 2011, ISO-NE, p. 124

AESC 2011 RPS Targets and REC Price Forecasts for NH

AESC 2011: Renewable Portfolio Standard (RPS) Targets, Renewable Energy Credit (REC) Price Forecasts, and Avoided RPS Costs in $/MWh of Load

(all values in 2011 dollars)

			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
NEW HAMPSHIRE	RPS Targets (%)	Class 1	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	11.0%	12.0%	13.0%	14.0%	15.0%	16.0%	16.0%
		Class 2	0.08%	0.15%	0.20%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
		Class 3	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
		Class 4	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	REC Prices ($/MWh)	Class 1	$ 15.71	$ 17.41	$ 26.21	$ 27.60	$ 28.84	$ 29.76	$ 29.39	$ 17.03	$ 5.14	$ 6.63	$ 3.46	$ 6.84	$ 9.82	$ 10.23	$ 7.85	$ 4.12
		Class 2	$ 25.00	$ 18.75	$ 24.13	$ 24.81	$ 25.93	$ 26.76	$ 26.42	$ 15.70	$ 5.39	$ 6.96	$ 3.63	$ 7.18	$ 10.32	$ 10.75	$ 8.24	$ 4.32
		Class 3	$ 18.75	$ 17.82	$ 16.91	$ 16.04	$ 16.76	$ 17.29	$ 17.08	$ 10.99	$ 5.14	$ 6.63	$ 3.46	$ 6.84	$ 9.82	$ 10.23	$ 7.85	$ 4.12
		Class 4	$ 24.47	$ 21.56	$ 18.74	$ 16.04	$ 16.76	$ 17.29	$ 17.08	$ 10.99	$ 5.14	$ 6.63	$ 3.46	$ 6.84	$ 9.82	$ 10.23	$ 7.85	$ 4.12
		Loss Adjustment	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
	Avoided RPS Cost: $/MWh of Load	Class 1	$0.34	$0.56	$1.13	$1.49	$1.87	$2.25	$2.54	$1.65	$0.55	$0.79	$0.45	$0.96	$1.49	$1.66	$1.36	$0.71
		Class 2	$0.02	$0.03	$0.05	$0.08	$0.08	$0.09	$0.09	$0.05	$0.02	$0.02	$0.01	$0.02	$0.03	$0.03	$0.03	$0.01
		Class 3	$1.32	$1.25	$1.19	$1.13	$1.18	$1.21	$1.20	$0.77	$0.36	$0.47	$0.24	$0.48	$0.69	$0.72	$0.55	$0.29
		Class 4	$0.26	$0.23	$0.20	$0.17	$0.18	$0.19	$0.18	$0.12	$0.06	$0.07	$0.04	$0.07	$0.11	$0.11	$0.08	$0.04

Synapse Energy Economics, Inc. *Avoided Energy Supply Costs in New England: 2011 Report*, July 21, 2011, p. C-14.

Summary of Technologies Designated in Renewable Portfolio Standards in New England

Technology	CT Classes			MA Classes[a]			ME Classes		RI	NH Classes			
	I	II	III	I	IIa	IIb	I	II		I	II	III	IV
Solar thermal	✓			✓	✓		✓		✓	✓	✓		
Photovoltaic (PV)	✓			✓	✓		✓		✓	✓	✓		
Ocean thermal	✓			✓	✓				✓	✓			
Wave	✓			✓	✓				✓	✓			
Tidal	✓			✓	✓		✓		✓	✓			
Marine or hydrokinetic				✓	✓								
Hydro	<5 MW	<5 MW		<25 MW	<5 MW		✓[b]	✓	<30 MW	incremental			<5 MW
Wind	✓			✓	✓		✓		✓	✓			
Biomass, biofuels	Sustainable, advanced conversion low NO_X emissions[c]	✓		Low-emission, advanced technology[d]	✓		✓	✓[e]	✓ Includes cofiring with fossil fuels	Low NO_X, and PM emissions		<25 MW, low NO_X, and PM emissions	
Landfill gas	✓			✓	✓		✓		✓	✓[f]		✓[f]	
Anaerobic digester				✓	✓				✓	✓		✓	
Fuel cells[g]	✓			w/ renewable fuels	✓		✓		w/ renewable resources				
Geothermal				✓	✓		✓		✓	✓			
Municipal solid waste		✓				✓		✓ w/ recycling					
Cogeneration, combined heat and power (CHP)			Customer sites, minimum 50% fuel efficiency	✓				✓[e]					
Energy efficiency			✓										

(a) The Massachusetts *Green Communities Act* divides the state's RPS into Class I and Class II resources, each of which allows primarily the same renewable technologies. Resources that began operating after December 31, 1997, are Class 1 renewables, and those that were in operation on or before that date are Class II renewables. The act also provided for an Alternative Energy Portfolio Standard (APS) for which the currently active technologies are (1) natural gas and renewably fueled CHP located in state and (2) flywheel storage. Hydropower must be certified by the Low-Impact Hydropower Institute. Technologies eligible for APS are not included in the ISO's RPS projections.

(b) These resources can be pumped hydro units, and they must meet all federal and state fish-passage requirements.

(c) These terms are explained in the state's RPS legislation and regulations: Gen. Stat. of Conn. Ch. 277, §16-1. (a) 45 (Revised January 1, 2011).

(d) Renewable Energy Portfolio Standard-Class I, CMR, Ch. 225, Sec. 14.05.7. Massachusetts currently is drafting revised regulations for woody biomass eligibility criteria.

(e) These can be high-efficiency units built through December 31, 1997.

(f) This category also includes biologically derived methane gas from sources such as biodiesel, yard waste, food waste, animal waste, sewage sludge, and septage.

(g) Fuel cells are a relatively new “renewable” energy technology. These units emit negligible amounts of SO_2, NO_X, and particulates such that Connecticut does not require fuel cell installations to obtain air permits. For Massachusetts, an RPS fuel cell using an "eligible biomass fuel" includes landfill or anaerobic digester methane gas, hydrogen derived from such fuels, or hydrogen derived using the electrical output of a qualified renewable generation unit. As shown in the table, RPS fuel cells in Rhode Island must use eligible renewable resources.

Annual Percentages of Electric Energy Provided by Affected Load-Serving Entities for Meeting the States’ RPS Classes, 2011 to 2020

Year	CT Classes[a]			MA Classes[b]			ME Classes[c]		RI Classes[d]		NH RPS Classes[e]			
	I	I or II	III	I	IIa	IIb	I	II	Existing	New	I	Ii	III	IV
2010	7.0	3.0	4.0	5.0	3.6	3.5	3.0	30	2.0	2.5	1.0	0.04	5.5	1.0
2011	8.0			6.0			4.0			3.5	2.0	0.08	6.5	
2012	9.0			7.0			5.0			4.5	3.0	0.15		
2013	10.0			8.0			6.0			5.5	4.0	0.2		
2014	11.0			9.0			7.0			6.5	5.0	0.3		
2015	12.5			10.0			8.0			8.0	6.0			
2016	14.0			11.0			9.0			9.5	7.0			
2017	15.5			12.0			10.0			11.0	8.0			
2018	17.0			13.0						12.5	9.0			
2019	19.5			14.0						14.0	10.0			
2020	20.0			15.0							11.0			
Use GIS to track RECs?	Connecticut, Massachusetts, Maine, Rhode Island, and New Hampshire all use the Generator Information System to track Renewable Energy Certificates.													
Purchase of RECs from outside ISO New England allowed?	Yes, from adjacent areas, with confirmation of delivery of energy from the renewable energy source and reciprocal RPSs for NY, NJ, PA, MD, and DE			Yes, from adjacent areas, with confirmation of delivery of energy			Yes, from adjacent areas		Yes, from adjacent areas		Yes, from adjacent areas, with confirmation of delivery of energy from the renewable energy source			

(a) All Connecticut Class I technologies except LFG and fuel cells can be used to meet Class II requirements. For Class III, CHP facilities can be used to offset generation on the grid with the more efficient on-site use of fuel.

(b) Class I includes a “carve-out” that must be satisfied by Solar RECs (SRECs) from post-2007, behind-the-meter PV resources, limited to no more than 6 MW (using the nameplate capacity—the megawatt capability designated by the manufacture per parcel of land. Class IIa is a minimum percentage for existing pre-1998 vintage resources using the same technologies as Class I but with hydro limited to no more than 5 MW (nameplate capacity) per facility. Class IIb is a minimum percentage for pre-1998 vintage waste-to-energy plants that meet certain Massachusetts-specified recycling and other regulations.

(c) The 30% requirement refers to electric energy delivered to affected LSEs.

(d) Existing resources can make up no more than 2.0% of the RPS percentage.

(e) Class I increases an additional 1% per year from 2015 through 2025. Classes II to IV remain at the same percentages from 2015 through 2025

APPENDIX C
Regional RPS Programs

RSA 362-F Review Topics	New Hampshire	Connecticut	Massachusetts	New York
Resource Classes	Class I (new capacity); Class II (solar); Class II (existing biomass and landfill gas); Class IV (existing small hydro).	Class I (new capacity, after 2003); Class II (biomass, hydropower created before 2003), Class III (combined heat and power systems created after 2006).	Class I (new capacity, after 1997), Solar Carve out (increasing portion of Class I must be Solar); Class II (existing renewable and waste energy); APS (alternative, CHP, etc.)	Main Tier (medium to large scale electric generation facilities), Customer-Sited Tier (behind the meter resources that produce energy for use on the site).
II. Current Resource Class market conditions	Over-supply of Class I; undersupply of Class IV in state; low-value solar REC market (Class II).	Most REC resources coming from out-of state facilities.	High-value solar REC market.	Central procurement auction market drives lower-cost [renewable] resources and has created wholesale [all electricity] market price suppression.
III. Thermal Component or Class	None.	None.	Alternative Portfolio Standard includes CHP	None.
IV. RPS end point	23.8% by 2025; post-2025 resource obligations unclear.	27% by 2020, with ongoing obligations.	No stated end date.	30% by 2015, with ongoing contract obligations.
V. Energy Efficiency Class or other new classes	None.	Yes, energy efficiency is included in Class III	Not in RPS. Rate-payer funding is used to support efficiency projects. Utilities are required to submit EE plans every three years.	Not in RPS. Energy Efficiency Portfolio Standard, reduce energy 15% by 2015. Incentives for energy efficiency programs.
VI. New Resources vs. Existing Resources	RPS includes 2 classes for new resources and two classes for existing biomass and hydro	Yes; NH Class III facilities qualify as Class I.	Yes.	Yes; 20.7% of RPS will be met with existing resources.

RSA 362-F Review Topics	New Hampshire	Connecticut	Massachusetts	New York
VII. Multi-year purchase agreements/long-term contracting	Yes, are currently allowed but not widely used. Some utilities have short term contracts and fewer have a long-term contract with specific facilities (e.g. Schiller, Lempster)	Yes; includes some restrictions	Legislation requires utilities to solicit contracts twice every five years.	Yes; contracts must be for a minimum of three years and a maximum of ten years.
VIII. Method of RPS compliance	Market-based REC compliance through NEPOOL-GIS	Same as NH	Same as NH	Central procurement of RECs through NYSERDA
IX. Use of REF (e.g. compliance payments)	PUC administered ratepayer rebate programs and annual RFP	Connecticut Clean Energy Fund managed by the Renewable Energy Investment Fund Board.	The MassCEC funds renewable energy programs. Manages ACPs funds but majority of programs are funded through additional ratepayer surcharges.	Does not have compliance payments; instead has monthly surcharge (SBC) on energy bill.

APPENDIX D

NH Certified Renewable Energy Certificate (REC) Facilities

Facility Name	Total Gross Nameplate Capacity (MW)	Class	Type	State
Mark Richey Woodworking Wind Farm	0.6300	I	Wind Power	MA
Gardner Landfill	1.0000	I	Landfill Methane Gas	MA
Lowell Landfill	0.4600	I	Landfill Methane Gas	MA
Williams Stone	0.6300	I	Wind power	MA
Beaver Ridge Wind	4.5000	I	Wind	ME
Crossroads Landfill	3.2000	I	Landfill Methane Gas	ME
Smith Hydro, J. Brodie	17.6000	I	Hydro	NH
Schiller Station # 5	50.0000	I	Biomass	NH
Lempster Wind	24.0000	I	Wind	NH
Salonia, James	0.0019	I	Wind	NH
Indeck	16.4000	I	Biomass	NH
Sova, Charles E.	0.0100	I	Wind Power	NH
Colebrook Landfill Gas Facility	0.8000	I	Landfill Methane Gas	NH
Kreel, Kevin	0.0024	I	Wind Power	NH
Read, Chris	0.0026	I	Wind Power	NH
Indeck Station Service	0.0000	I	Biomass	NH
Christian Murphy	0.0024	I	Wind Power	NH
Barrie J. Sawyer	0.0024	I	Wind Power	NH
UNH Power Plant	4.6000	I	Landfill Methane Gas	NH
UNH CHP Plant	7.9000	I	Landfill Methane Gas	NH
Michael Furbush	0.0037	I	Wind	NH
High Acres Landfill 2	6.4000	I	Landfill Methane Gas	NY
Colonie Landfill	4.8000	I	Landfill Methane Gas	NY
Modern Landfill	6.4000	I	Landfill Methane Gas	NY
Seneca Landfill	6.4000	I	Landfill Methane Gas	NY
Madison County Landfill	1.6000	I	Landfill Methane Gas	NY
High Sheldon Wind Energy Center	112.5000	I	Wind Power	NY
Hyland Landfill	4.8000	I	Landfill Methane Gas	NY
Clinton Landfill	4.8000	I	Landfill Methane Gas	NY

Facility Name	Total Gross Nameplate Capacity (MW)	Class	Type	State
Fulton Landfill	3.2000	I	Landfill Methane Gas	NY
Chautauqua Landfill	6.4	I	Landfill Methane Gas	NY
Chaffee Landfill	6.4000	I	Landfill Methane Gas	NY
Mill Seat Landfill	6.4000	I	Landfill Methane Gas	NY
New Milford Landfill	2.4000	I	Landfill Methane Gas	CT
Pilgrim Furniture	0.3250	II	Solar PV	CT
Thule Corporation	0.3180	II	Solar PV	CT
Essex Meadows	0.0950	II	Solar PV	CT
Aldi PV Project	0.5000	II	Solar PV	CT
Daymon PV Project	0.3500	II	Solar PV	CT
BJ's Wholesale Club - Willimantic	0.0828	II	Solar PV	CT
BJ's Wholesale Club - Derby	0.0828	II	Solar PV	CT
Toffolon Elementary School	0.06339	II	Solar PV	CT
Plainville High School	0.15437	II	Solar PV	CT
Pilgrim Furniture	0.3250	II	Solar PV	CT
Washington Elms	0.0921	II	Solar PV	MA
Walden Square	0.0769	II	Solar PV	MA
North Village	0.1564	II	Solar PV	MA
Riverview	0.1987	II	Solar PV	MA
Mishawum	0.3913	II	Solar PV	MA
Champ Homes	0.0341	II	Solar PV	MA
Hopkinton Middle School	0.0952	II	Solar PV	MA
Hopkinton Fire Station	0.0109	II	Solar PV	MA
Hopkinton Police Station	0.0252	II	Solar PV	MA
Hopkinton High School	0.1934	II	Solar PV	MA
Nexamp PD Solar		II	Solar PV	MA
Bedard Brothers	0.064	II	Solar PV	MA
Berkshire South Regional Community Center	0.084	II	Solar PV	MA
Brandeis University	0.277	II	Solar PV	MA
Hancock Shaker Village	0.0896	II	Solar PV	MA
Quality Printing	0.14	II	Solar PV	MA
Town of West Stockbridge Town Hall	0.064	II	Solar PV	MA
Wheeler School	0.1	II	Solar PV	MA
Crimson Solar PV	0.5	II	Solar PV	MA
Princeton Properties - 1 Heritage Dr. Salem	0.018	II	Solar PV	MA
Princeton Properties - 2 Heritage Dr. Salem	0.011	II	Solar PV	MA
Princeton Properties - 3 Heritage Dr. Salem	0.011	II	Solar PV	MA
Princeton Properties - 4 Heritage Dr. Salem	0.018	II	Solar PV	MA

Facility Name	Total Gross Nameplate Capacity (MW)	Class	Type	State
Princeton Properties - 5 Heritage Dr. Salem	0.018	II	Solar PV	MA
Princeton Properties - 7 Heritage Dr. Salem	0.03	II	Solar PV	MA
Princeton Properties - 8 Heritage Dr. Salem	0.026	II	Solar PV	MA
Princeton Properties - 9 Heritage Dr. Salem	0.02	II	Solar PV	MA
Princeton Properties - 10 Heritage Dr. Salem	0.031	II	Solar PV	MA
Princeton Properties - 11 Heritage Dr. Salem	0.031	II	Solar PV	MA
Princeton Properties - 12 Heritage Dr. Salem	0.00384	II	Solar PV	MA
Princeton Properties - 14 Heritage Dr. Salem	0.031	II	Solar PV	MA
Princeton Properties - 15 Heritage Dr. Salem	0.024	II	Solar PV	MA
Princeton Properties - 16 Heritage Dr. Salem	0.031	II	Solar PV	MA
Princeton Properties - 17 Heritage Dr. Salem	0.14	II	Solar PV	MA
Princeton Properties - 17a Heritage Dr. Salem	0.00384	II	Solar PV	MA
Kirwan Enterprises facility	0.15105	II	Solar PV	MA
BJ's Wholesale Club – Leominster	0.26274	II	Solar PV	MA
BJ's Wholesale Club – Attleboro	0.2926	II	Solar PV	MA
Elysium PV	0.082	II	Solar PV	MA
Phoenix Park PV	0.506	II	Solar PV	MA
Adams Court A	0.0591	II	Solar PV	MA
Adams Court B	0.0148	II	Solar PV	MA
Princeton Crossings at Technology Drive (building 1)	0.224	II	Solar PV	MA
Princeton Crossing AGGREGATION	0.12096	II	Solar PV	MA
Princeton Crossings at Boston Road (building 2)		II	Solar PV	MA
Princeton Crossings at Boston Road (building 3)		II	Solar PV	MA
Princeton Crossings at Boston Road (building 4)		II	Solar PV	MA
Princeton Crossings at Boston Road (building 5)		II	Solar PV	MA
Princeton Properties -Salem	0.00384	II	Solar PV	MA
Haven, John	0.0018	II	Solar PV	NH
Yelle, Paul	0.0020	II	Solar PV	NH
Stuart, Richard	0.0024	II	Solar PV	NH
PSNH 789 Commercial St Manchester	0.0513	II	Solar PV	NH

Facility Name	Total Gross Nameplate Capacity (MW)	Class	Type	State
Joshua Ingalls	0.0014	II	Solar PV	NH
Kim Frase	0.0049	II	Solar PV	NH
Richard Bonin	0.0021	II	Solar PV	NH
Ralph E. Ralston	0.0031	II	Solar PV	NH
Carl A. McNall	0.0033	II	Solar PV	NH
Shawn L. Wilder	0.0034	II	Solar PV	NH
Kimball L. Bergstrom	0.0023	II	Solar PV	NH
Fred C. Lavigne	0.0033	II	Solar PV	NH
Barton N. Green	0.0036	II	Solar PV	NH
Gilbert W. Sutcliffe	0.0016	II	Solar PV	NH
Harriet B. Forkey	0.0039	II	Solar PV	NH
John E. Nyblom	0.002	II	Solar PV	NH
Arnold R. Miller	0.00205	II	Solar PV	NH
Bennett Mortell	0.0021	II	Solar PV	NH
Lee E. Larson	0.0024	II	Solar PV	NH
Roy A. Kjundal	0.00238	II	Solar PV	NH
Camp Merrowvista	0.003	II	Solar PV	NH
William R. Laren	0.0041	II	Solar PV	NH
Town of Plymouth	0.000016	II	Solar PV	NH
Eileen Webb	0.0015	II	Solar PV	NH
Dale P. Blackey	0.00205	II	Solar PV	NH
Frances D. Strayer	0.0043	II	Solar PV	NH
David R. Chase	0.00264	II	Solar PV	NH
Margaret Mason	0.0021	II	Solar PV	NH
Lisa M. Scott	0.00273	II	Solar PV	NH
David D. Sinkler	0.0046	II	Solar PV	NH
David L. & Jerilyn L. O'Hearn	0.0024	II	Solar PV	NH
John H. Scranton	0.0021	II	Solar PV	NH
James R. Ballou	0.00205	II	Solar PV	NH
Stanley Jackson	0.00216	II	Solar PV	NH
Frederick S. Kelsey	0.0021	II	Solar PV	NH
Ashley Bullard	0.0022	II	Solar PV	NH
George W. & Linda S. West	0.00294	II	Solar PV	NH
Frank D. Shaw	0.00328	II	Solar PV	NH
Patrick B. Miller	0.001225	II	Solar PV	NH
Stephen Farish & Jeanette Heidmann	0.00494	II	Solar PV	NH
Carol L. Jowdy	0.0022	II	Solar PV	NH
Kenneth Wells	0.002	II	Solar PV	NH
Victor R. St. Pierre	0.0021	II	Solar PV	NH
Michael E. Achilles	0.0043	II	Solar PV	NH
Brian A. Race	0.0021	II	Solar PV	NH
Justin Kline	0.00276	II	Solar PV	NH
Ed Ambrose	0.0026	II	Solar PV	NH
Justin Sawin	0.00414	II	Solar PV	NH
Brian M. Morgan	0.00473	II	Solar PV	NH
Gary S. Lemay (System 1)	0.00195	II	Solar PV	NH
Gary S. Lemay (System 2)	0.00456	II	Solar PV	NH

Facility Name	Total Gross Nameplate Capacity (MW)	Class	Type	State
Debra L. Clough	0.0024	II	Solar PV	NH
Robert Coulter	0.0046	II	Solar PV	NH
James S. Cross	0.004	II	Solar PV	NH
Ralph Churchill	0.00336	II	Solar PV	NH
Kevin S. Creel	0.0021	II	Solar PV	NH
Justin Chapman	0.0017	II	Solar PV	NH
John H Scranton	0.0042	II	Solar PV	NH
Susan S Ahearn	0.00315	II	Solar PV	NH
Norman W. Hillsgrove	0.0042	II	Solar PV	NH
William Nungesser	0.0046	II	Solar PV	NH
Peter Halfman	0.00483	II	Solar PV	NH
Ronald Haven	0.00774	II	Solar PV	NH
Phil Turner	0.00268	II	Solar PV	NH
Pat Russell	0.0048	II	Solar PV	NH
Steven Tybus	0.0025	II	Solar PV	NH
George Michelsen	0.00288	II	Solar PV	NH
David Lorman	0.00462	II	Solar PV	NH
Kristin Nordblom	0.0024	II	Solar PV	NH
Exeter High School	0.1	II	Solar PV	NH
John Duffield	0.0046	II	Solar PV	NH
Scott Horton	0.00483	II	Solar PV	NH
Steven Olafsen	0.00462	II	Solar PV	NH
Paul Robinson	0.00483	II	Solar PV	NH
Kirk Plender	0.004935	II	Solar PV	NH
Adam Peaslee	0.00473	II	Solar PV	NH
Ellen Rancourt	0.0046	II	Solar PV	NH
Chris Williams	0.0046	II	Solar PV	NH
Roland Hoag	0.00477	II	Solar PV	NH
Lea & Michael Koester	0.0077	II	Solar PV	NH
North Conway Water Precinct	0.1674	II	Solar PV	NH
Charles Joslin	0.0021	II	Solar PV	NH
Bernard E. Volz	0.00483	II	Solar PV	NH
James Koren	0.00344	II	Solar PV	NH
Town of Plymouth, Pease Library	0.00322	II	Solar PV	NH
Laurie Olson	0.0023	II	Solar PV	NH
Michael J. Palmeri	0.004	II	Solar PV	NH
Jonathan Sands	0.00258	II	Solar PV	NH
Town of Sandwich, Central Fire Station	0.11985	II	Solar PV	NH
David V. Scerra	0.00414	II	Solar PV	NH
Robert Dutton	0.0084	II	Solar PV	NH
Revolution Energy	0.06	II	Solar PV	NH
Town of Plymouth, Elem. School	0.00658	II	Solar PV	NH
Melanie Ratcliffe	0.00658	II	Solar PV	NH
Parker Morgan	0.0047	II	Solar PV	NH
America's Wood Company	0.02656	II	Solar PV	NH

Facility Name	Total Gross Nameplate Capacity (MW)	Class	Type	State
Peter Martin	0.0024	II	Solar PV	NH
Granby LFG	3.2000	III	Landfill Methane Gas	MA
Fall River Landfill	5.7000	III	Landfill Methane Gas	MA
Nanticoke LFG	2.6000	III	Landfill Methane Gas	MA
Pinetree Bethlehem	17.1000	III	Biomass	NH
Pinetree Tamworth	23.8000	III	Biomass	NH
Turnkey I Landfill	3.2000	III	Landfill Methane Gas	NH
Turnkey II Landfill	6.2000	III	Landfill Methane Gas	NH
Springfield Power	16.0000	III	Biomass	NH
Four Hills LFG	0.082	III	Landfill Methane Gas	NH
Four Hills Load Reducer	2.285	III	Landfill Methane Gas	NH
High Acres Landfill 1	3.2000	III	Landfill Methane Gas	NY
Seneca Landfill	5.6000	III	Landfill Methane Gas	NY
Seneca Landfill	5.6000	III	Landfill Methane Gas	NY
Model City Landfill	5.6000	III	Landfill Methane Gas	NY
Ontario Landfill	5.6000	III	Landfill Methane Gas	NY
Monroe-Livingston LFG	2.4	III	Landfill Methane Gas	NY
Johnston Landfill	16.2000	III	Landfill Methane Gas	RI
Johnston Landfill Expansion - Phase I	2.5000	III	Landfill Methane Gas	RI
Johnston Landfill Expansion - Phase II	6.4000	III	Landfill Methane Gas	RI
West Springfield	1.2000	IV	Hydro	MA
Centennial Island Hydro	0.6400	IV	Hydro	MA
City of Holyoke Hydroelectric facilities	0.0000001	IV	Hydro	MA
Benton Falls	4.4680	IV	Hydro	ME
North Gorham	2.2500	IV	Hydro	ME
Bar Mills	4.0000	IV	Hydro	ME
Salmon Falls Hydro	1.2000	IV	Hydro	ME
Stillwater Hydro	1.95	IV	Hydro	ME
Medway Hydro	3.44	IV	Hydro	ME
Scott D. Hall	1.875	IV	Hydro	ME
Canaan	1.1000	IV	Hydro	VT
Newport Hydro	4.0000	IV	Hydro	VT
Cocheco Falls	0.7500	IV	Hydro	NH