Renewable Portfolio Standards in Energy Policy

A Policy Analysis for the State of New Hampshire

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Prepared by:
Chongwon Char and Scott Abramson

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Contact:
Nelson A. Rockefeller Center, 6082 Rockefeller Hall, Dartmouth College, Hanover, NH 03755
http://policyresearch.dartmouth.edu • Email: Policy.Research@Dartmouth.edu

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EXECUTIVE SUMMARY[1]

A Renewable Portfolio Standard (RPS) is a policy mandate that a given proportion of power supplied by retail electricity providers be derived from approved renewable sources. While there is no uniform approach to the construction or implementation of an RPS policy, several common and important features are shared by states that have successfully established portfolio standards.

Most states define the RPS in terms of the percentage of the electricity supply being generated from renewable sources. When defining eligible renewable sources, states often automatically include specific sources for which power-deriving technologies are universally accepted as renewable (e.g., wind and solar-photovoltaic production) and often exclude other energy sources (e.g., nuclear).

Three options by which electricity suppliers may comply with RPS requirements are available: 1) own an eligible renewable energy generator and its output electricity; 2) buy electricity generated by an eligible renewable energy generator; and 3) buy tradable Renewable Energy Certificates (RECs). Energy producers within the state of New Hampshire presently trade RECs through the NEPOOL–GIS system establish by ISO-New England, the not-for-profit corporation that regulates and manages the regional power grid.

The costs of RPS are difficult to estimate due to the natural volatility of energy markets. For eight states that have implemented RPS policies the EPA projected a great variance in cost impact to the consumer. The impact of these policies ranged from an average cost to the consumer of $3.50/year in Pennsylvania to a savings of $4.60/year in Minnesota.[2] Furthermore, the Department of Energy (DoE) found that the retail electricity price impact of a federal 10% RPS culminating in 2020 and continuing through 2030 to be an approximately 0.4% increase, whereas the impact on natural gas prices would be a net 0.6% decline in prices over the same time period. Overall, the DoE report found that combined total end-use expenditures would increase by 0.1%.[3]

The design of a state's RPS is determined by three factors: electricity market characteristics, particular state policy objectives, and renewable resource potential. Because these factors influence states differently, there is a high level of variability between the states' RPS. The consideration of any state's experience as being relevant to New Hampshire should ultimately take into account the particular goals of the state.

There are numerous lessons from other states' experiences that New Hampshire can use to evaluate RPS legislation. While it is premature to assess the overall impact of any particular state's effort, an evaluation of the early and immediate experiences that other states have had provides several important results. When forming an RPS it is important to implement a policy that allows producers to meet mandates in the most efficient way and at the lowest

[1] This report was written by undergraduate students at Dartmouth College under the direction of professors in the Rockefeller Center. In addition to the students listed on the title page, William O'Neal, a graduate chemistry student at Dartmouth College helped supervise the students writing the report.
[2] Environmental Protection Agency, *Renewable Portfolio Standards Fact Sheet*; 2005. Available at http://www.abanet.org/environ/committees/renewableenergy/teleconarchives/111605/epa.pdf
[3] Office of Integrated Analysis and Forecasting of the Energy Information Administration, *Analysis of a 10-percent Renewable Portfolio Standard,* Washington DC; Department of Energy: May 2003

cost to the consumer while still maintaining strong incentives to produce clean energy. In order to help ensure these goals, three things are essential:

1) Established time lines should be long enough in order to foster a stable market for renewable energy.
2) Alternative Compliance Payments (ACPs) should be set to serve as a price cap but should be established at a level high enough to still maintain the incentive to invest in renewable production.
3) Compliance periods should be flexible enough to account for natural variance in renewable energy production

Additionally, eligible sources should be defined with the following criteria:

1) Technical Eligibility - the exclusion or required use of certain technologies for deriving power from the resource (e.g., excluding nuclear or hydroelectric energy).

2) Existing vs. New Generation – RPS should serve as an incentive for *new* clean energy production and not provide windfalls for those already producing electricity from renewable sources.

Finally, three options by which electricity suppliers may comply with RPS requirements are available:

1) Ownership of an eligible renewable energy generator and its output electricity

2) Purchase of electricity generated by an eligible renewable energy generator

3) Purchase of tradable Renewable Energy Certificates (RECs)

Producers of electricity operating in New Hampshire currently trade RECs through ISO - New England's NEPOOL GIS which tracks RPS eligibility, generation attributes, and emissions factors from *all* electricity generation in the NE-ISO control area.

1. BACKGROUND

1.1 Definition and Purpose. A Renewable Portfolio Standard (RPS) is a policy mandate that a given proportion of power supplied by retail electricity providers be derived from approved renewable sources. Generally, an RPS is intended to serve as a market-based policy instrument that encourages increased use of renewable resources in electricity production.

1.2 Renewable Energy. Renewable resources are those that are naturally replenished in a short period of time. Examples include solar (photovoltaic), solar water-heater, biomass, wind, geothermal, ocean, landfill gas, and certain hydroelectric power sources. According

to the Department of Energy's National Renewable Energy Lab, the development of renewable energy production has a positive impact in at least four areas:[4]

1) Sustainable Energy. Expanded use of renewable energy sources increases the diversity of fuels used to supply a state's electricity demands. As a result, the state is less reliant on nonrenewable sources (e.g., fossil fuels), which have finite availability. Thus, encouraging the development of renewable energy helps establish a sustainable energy supply for current and future generations.

2) Safety and the Environment. In general, renewable energy technologies are more environmentally benign than conventional counterparts (fossil fuels or nuclear). Replacing fossil fuels with renewable fuels is expected to decrease soil, water, and air pollution, as well as greenhouse gas emissions.

3) Energy Security. Many conventional energy sources, especially petroleum, are largely imported from outside the United States, making their availability particularly vulnerable to political and economic forces outside the direct control of the state. Greater reliance on locally produced renewable energy (and a concomitant decline in the reliance on foreign energy sources) would strengthen the economic and energy security of the state and nation.

Although many analysts consider increased use of renewable energy sources to be beneficial, they acknowledge certain disadvantages. Often renewable technologies are not the lowest-cost means of producing energy, making the public desire for inexpensive power in the short-term a significant barrier to the development of new renewable energy generation. Secondly, many renewable technologies are dependent upon uncontrollable natural factors (e.g. availability of sunlight or wind speed) that make the availability of their energy production intermittent. Finally, only certain renewable sources can be exploited in a given area due to natural resource availability.[5]

2. HOW RENEWABLE PORTFOLIO STANDARDS WORK

There is no uniform approach to the implementation of an RPS policy. Some common features of current legislation in other states are described below.

2.1 Targets. Most states define the RPS in terms of the percentage of the electricity supply being generated from renewable sources. Alternatively, a few states define the standard as an absolute quantity of power (i.e., megawatt-hours (MWh)) produced from renewable energy sources. The size of the target RPS set by a state depends primarily

[4] National Renewable Energy Lab, *Renewable Energy Basics.* 2006, available at http://www.nrel.gov/learning/re_basics.html
[5] Wiser, Ryan, Porter, Kevin, and Grace, Robert, "Evaluating Experience With Renewable Portfolio Standards in the United States," *Mitigation and Adaptation Strategies for Global Change* (April 2005), Vol. 10, No 2: 237–263.

upon 1) the current amount of renewable energy being used to generate power for the state and 2) the amount of renewable energy production the state wishes to promote. Based on this information, an RPS is used to encourage a targeted quantity of renewable energy production. Other important factors that may affect the choice of an RPS target include:

- the number and type of renewable resources available in the state,
- the number and type of resources and technologies given eligibility in the RPS legislation,
- the time table established by the legislation, and
- applicability of legislation to various electricity suppliers.

Many states, including Massachusetts, calculate the baseline figure for an RPS as the percentage of all energy produced that renewable energy constitutes while controlling for energy lost to transmission and distribution.

2.2 Timing. There are several factors in the timing of RPS to consider. Fairly long time lines are typically established by RPS legislation for several reasons. First, some lead-time is usually necessary to allow companies to determine and plan for cost-effective responses, such as the design and construction of new generating facilities. Sufficient lead-time also prevents windfall profits among lower cost producers. Second, long time lines help encourage new development by inspiring investor confidence: political support for a long-term policy implies that there will be market for the new renewable energy and that there is sufficient time to recoup capital investments. Finally, short time lines with sunset clauses may serve as disincentives for corporations to invest in new infrastructure and technologies as it may be more cost effective simply to pay any non-compliance penalty toward the end of the mandated period.

A second time-related feature of RPS legislation is the inclusion of incremental RPS targets. For example, if a total RPS target of 10% is set for 20 years from now, annual 0.5% increases may be included to ensure progress toward to ultimate goal. In addition, incremental targets allow mechanisms for introducing flexibility in meeting the goal (see **Flexibility** below).

2.3 Eligible Sources. States select eligible renewable sources of electricity based upon legislative goals and a number of particular political, geographic, and environmental outcome factors. Within existing legislation, there is substantial variability in eligibility requirements. In general, states with more expansive eligibility have set higher RPS targets, whereas those with more narrow eligibility requirements have set lower targets.

Technical Eligibility. States often automatically include certain sources for which power-deriving technologies are universally accepted as renewable (e.g. wind and solar-photovoltaic production). For other sources to be deemed eligible, generation facilities are often required to meet certain criteria delineated by the state in the RPS legislation. These commonly include: the exclusion or required use of certain technologies for deriving power from the resource, scale of the generating facility, or performance

characteristics (e.g., low emissions) of the generator. In addition, certain energy sources (e.g., nuclear) may be explicitly excluded from eligibility.

Existing vs. New Generation. RPS legislation generally differentiates between eligibility of new and existing facilities that generate power from renewable sources. Because the enactment of an RPS in intended to spur new renewable energy generation, states often grant eligibility only to *new* renewable production. (This also prevents windfall profits by existing companies.) A start-date distinguishing new and existing facilities is often included in legislation.

Geographic Eligibility. RPS legislation typically defines the geographic zone in which eligible energy production must occur. Because power grids traverse state boundaries, power (generated from renewable or nonrenewable energy sources) used within a state is not necessarily produced within that state. In addition, benefits of increasing renewable energy production are not localized within a state. Thus, states must often determine the availability of renewable resources within their borders and perform cost-benefit analyses to determine appropriate geographic eligibility requirements. States commonly choose to define eligible production zones as either totally within the state or within a regional power pool. Geographic eligibility is only a problem if the production of renewable energy within state is explicitly desired. For New Hampshire, limiting eligible production sources to those within the state is not practical as New Hampshire power production is regulated at the regional level (See **NE-POOL** section**)**.

Preferred Eligibility. Some states establish tiered systems or other weights that provide greater incentive for the development of specific types of renewable energy that would not otherwise be favored by the market. For example, despite the greater expense, many southwestern states have favored solar-photovoltaic energy sources by implementing weighting systems that provide more than one credit for one credit's worth of energy derived from solar sources.[6] This type of preferred eligibility is included as a mechanism for states to meet social, economic, or environmental policy objectives that market-preferred technologies fail to address.

2.4 Compliance and Administration. Three options by which electricity suppliers may comply with RPS requirements are available:

1) own an eligible renewable energy generator and its output electricity;

2) buy electricity generated by an eligible renewable energy generator; or

3) buy tradable Renewable Energy Certificates (RECs).

[6] David Barry, "The market for tradable renewable energy credits," *Ecological Economics* 42 (2002) 369-379.

In most systems, suppliers may meet the target standard using any combination of the three options. A tradable REC system is not necessary to implement an RPS or to track compliance. In cases where REC systems are not in place, states often task an administrative organization to follow compliance by contract-path tracking. Tradable credits are generally considered an efficient way to track compliance with minimal administrative burden for the state. For these reasons, an explanation of RECs is included below.

Renewable Energy Credit Markets. Tradable Renewable Energy Credits (RECs) are created when a specified quantity of electric energy (usually 1 MWh) is generated from eligible renewable resources. RECs are merely credits – units that represent the right to claim the attributes associated with the generation of a specified quantity of electricity from a specific generator. Once issued, they can be completely disassociated from the actual electricity produced. RECs are measured in energy units (i.e., MWh) and may be used to meet an electricity retailer's portfolio requirements in place of actual generation or purchase of electricity, if allowed by the RPS statute.

RECs provide an option for utilities to fulfill the portfolio requirements of a given compliance period when their ability to comply through production or purchase falls short. Temporary shortfalls can be met either through purchasing short term tradable credits or options to buy them before they may be needed. RECs also provide utilities time to defer investment in renewable generating facilities, allowing them to further analyze their options or to negotiate more favorable contracts to purchase or construct renewable generators. Perhaps the most important function of RECs is that they create market efficiencies, favoring generators that can produce renewable energy most cheaply. This drives down the cost of a portfolio standard for the consumer.

It is important to note that RECs are *only* credits, and their possession by in-state utilities does not necessarily translate into greater renewable energy production within the state or region. This is because the credits can be traded over extended geographic areas without the actual transmission of electricity. If the goal of RPS legislation is to encourage local development of renewable energy production, this fact should be taken into account by defining geographic eligibility for RECs.

2.5 Alternative Compliance Payments and Cost Caps. Another common feature of RPS legislation is the establishment of a penalty for non-compliance with the RPS. A penalty should serve as an incentive to invest in eligible renewable technology; therefore, the amount should be set higher than the projected cost of meeting the target standard. Penalties may primarily be intended to punish willful disregard of an RPS statute, but they have also been used as fair compliance alternatives to account for the possibility that poor development of the renewable market makes normal compliance difficult for or even unavailable to a supplier. In such a capacity, these mechanisms are termed Alternative Compliance Payments (ACPs) and may be used to meet all or a portion of a

suppliers RPS requirement. The revenue from ACPs is often added to a fund used to encourage renewable energy development.[7]

Importantly, ACPs may also serve as a price cap for suppliers and consumers, limiting any cost increases associated with renewable development. For example, if the price of renewable energy becomes too high, utilities can choose to avoid excessive costs by paying the ACP. To accommodate this function, it is important that ACP levels be balanced between an acceptable cost cap and an appropriate incentive for renewable development.

2.6 Flexibility. Uncertainties in the renewable energy market caused by the inherent production limitations of certain renewable sources (e.g. wind and solar-photovotaic energy) and the possibility of technical or other production setbacks for utilities create a need for flexibility in evaluating compliance with an RPS. Some RPS regulations include the possibility of extra credit for excess renewable energy generated during a compliance period. This may take the form of credit for early compliance or the ability to "bank" RECs for later use. For instances where suppliers fall short of the RPS, flexibility is often provided by an account balancing mechanism in which an electricity provider can be given extra time to meet the previous compliance period's required standard, as long as the full RPS requirement is achieved on average over a designated period.

3. ANALYSIS AND EXPERIENCE

3.1 Benefits. The benefits of renewable energy in general were described above. The potential operational benefits of instituting an RPS to stimulate renewable energy production include the following:

- An RPS can be used to stimulate a targeted quantity of renewable energy development.
- RPS legislation ensures a market for new renewable energy, thereby encouraging investment in an otherwise uncertain industry.
- If applied to all electricity suppliers, RPS legislation can be competitively neutral.
- Flexible, market-based RPS guidelines can lower the cost of renewable energy development by placing the burden for deciding how to meet those guidelines on industry and by encouraging competition among developers or suppliers.
- Administrative costs of an RPS program can be low.
- Costs of meeting RPS requirements are spread among all consumers.

3.2 Drawbacks. The potential drawbacks of instituting an RPS to stimulate renewable energy production are the following:

- Costs to providers and consumers may increase and are difficult to predict in advance.

[7] Ibid.

- RPS legislation amounts to a subsidy for renewable energy technologies at the expense of conventional technologies (although the potential for competitive neutrality *with respect to energy suppliers* exists, as mentioned above).
- Environmental benefits stemming from RPS legislation will not necessarily accumulate within the state.
- A RPS does not necessarily increase the diversity of renewable energy produced in the state because the market will promote greater development of the least expensive resource. This could be a drawback if production diversity is a desired outcome.
- Experience indicates that the effective design and implementation of an RPS policy may be difficult and efforts may be unsuccessful.

3.3 Projected Impact. The costs of RPS are difficult to estimate due to the natural volatility of energy markets but also because of the limited time frame in which RPS have been in place; the oldest having been implemented in 2000. A number of attempts to extrapolate the costs of a RPS to both the consumers and producers of electricity have been made, each with varying results. The EPA released the following estimated impact of several statewide RPS:[8]

State	Incremental Target[9]	Overall Rate Impact	Average Impact on Residential Bill
California	41,000 GWh (2010)	Savings: 0.5% in 2010	Savings: $3.5/yr in 2010
Colorado	4,500 GWh (2020)	Savings: 0.5% expected value	Savings: $2.4/yr expected value
Washington	14,300 GWh (2023)	No impact	No impact
Minnesota	6,300 GWh (2010)	Savings: 0.7% on average	Savings: $4.6/year on average
Indiana	4,400 GWh (2015)	Savings: 0.3% on average	Savings: $3.4/year on average
Wisconsin	7,500 GWh (2013)	Cost: 0.6% on average after 2010	Cost:$3.3/year on average after 2010
Pennsylvania	17,000 GWh (2015)	Cost: 0.46% on average	Cost: $3.5/year on average
New York	12,000 GWh (2013)	Cost 0.32% in 2009	Cost: $3/year in 2009

A Department of Energy study, published in 2005, found the impact of an incremental federal 10% RPS beginning in 2020 and lasting until 2030 to be the following: [10]

[8]Environmental Protection Agency, *Renewable Portfolio Standards Fact Sheet*; 2005. Available at http://www.abanet.org/environ/committees/renewableenergy/teleconarchives/111605/epa.pdf
[9] RPS targets in terms of gigawatt hours of renewable energy produced.
[10] Office of Integrated Analysis and Forecasting of the Energy Information Administration, *Analysis of a 10-percent Renewable Portfolio Standard,* Washington DC; Department of Energy: May 2003

- The retail electricity price impact of the RPS are projected to be small because the price impact of buying renewable credits and building the required renewable energy sources is projected to be limited.
- The cost is projected to be relatively small when compared with total electricity costs; also higher renewable costs are somewhat offset by lower natural gas prices that result from reduced natural gas demand.
- Because of reduced demand for natural gas by the electric power industry, natural gas prices to all users decline slightly with the RPS. Wellhead natural gas prices by 2025 are 1.5 percent lower with the RPS than projected without the RPS.
- The total cost of electricity to the end-use sectors (residential, commercial, industrial, and transportation) in 2025 increases from $351.9 billion when no RPS is projected to $353.4 billion when the RPS is included in projections—an increase of 0.4 percent. For natural gas, total end-use expenditures in 2025 decline from $136.0 billion to $135.2 billion, a decrease of 0.6 percent. Combined total end-use expenditures are 0.1 percent higher in 2025 due to the RPS.

3.4 Experience in Other States. The design of a state's RPS is determined by three factors: *electricity market characteristics, particular state policy objectives,* and *renewable resource potential*.[11] Because these factors influence states differently, there is a high level of variability between the guidelines of a state's RPS. The consideration of any state's experience as being relevant to New Hampshire should ultimately take into account the particular needs and goals of the state.

There are numerous lessons from other state's experiences that New Hampshire can use to evaluate RPS legislation. The criteria used to evaluate the progress of these states provide valuable information on the successful components and common pitfalls of RPS programs:[12]

- Outcome-based criteria
  - Amount of new renewable energy development
  - Full compliance with RPS policies
  - Reasonable and stable cost impacts
- Policy design criteria
  - Broad applicability
  - Sufficient duration of targets
  - Credible and effective enforcement
- Market context criteria
  - Stable political and regulatory support
  - Adequate and accessible renewable resource potential

[11] United States Environmental Protection Agency, *Guide to Action*. Available at http://www.epa.gov/cleanenergy/stateandlocal/guidetoaction.htm
[12] Ryan Wiser, et al., *Evaluating State Renewables Portfolio Standards: A Focus on Geothermal Energy*, 2003.

While it is premature to assess the overall impact of any particular state's effort, an evaluation of the early experiences that states have faced in the different aspects of their program provides valuable lessons that pertain to every RPS.

Texas
Texas has been cited by advocates and policymakers as having established the most successful RPS to date. Enacted in 2000, the RPS was set to reach 2000 MW (approximately 3%) by 2009. Their program is a convincing example of the possibility of providing effective support for the development of renewable energy. This success has mainly been the result of two factors:

- Appropriately set high requirements and state targets have triggered market growth
- Costs passed on to the consumer have been limited through competitive pricing mechanisms that were made available for wind development

Another factor contributing to the state's success has been the clear delineation of its penalties for noncompliance. The penalty is set at the lesser of $50/MWh per deficient Tradable Renewable Credit (TRC) or 200 percent of the average market TRC value for the deficient credits. However, the term "noncompliance" is relatively flexible. The Public Utilities Commission (PUCT) does not impose a penalty if it determines that "events beyond the reasonable control" of the retail electric provider prevented compliance with the RPS. Such events include weather-related damage, mechanical failure, strikes, and lockouts.

Another important component of the noncompliance penalty system is the monitoring and verification of the state's retail electricity providers. This function is handled by the Electric Reliability Council of Texas (ERCOT) and the PUCT. ERCOT is responsible for administering the program and submitting an annual report to the PUCT, which in turn tracks participation and compliance of electricity retailers.

Hawaii
The large use of easily accessible renewable resources in Hawaii makes its RPS program an interesting example of likely success.[13] For instance, twenty percent of the state's electricity is provided by geothermal energy on the Big Island. A study commissioned by the state in 2004 found that this innovative use of renewable energy may actually enable consumers to experience a net savings in electricity costs through the increased use of renewable energy. Prior to the program's existence, Hawaii's renewable energy production accounted for 8% of the state's total energy use. The state aims to meet 20% by 2020.

While the outlook of the state's program is generally positive, the actual legislation enacting it has been revealed as being problematic. This is a result of the ambiguity

[13] Costello, Ken, *Implementing Renewable Portfolio Standards: The Case of Hawaii*, The Electricity Journal, June 2005, 18 (5): 51-58

behind the language of Act 95, which establishes the standards and targets for the use of renewable resources. Multiple interpretations of the legislation have emerged from different parties and have subsequently increased the difficulty for the state's Public Utilities Commission to promulgate rules.

Such ambiguity has resulted in the Public Utilities Commission having discretion in interpreting the legislation. This type of involvement on the part of the regulator (PUC) can lead to effects on the development of renewable resource policies in Hawaii that are not aligned with the original intentions of the legislation. The fundamental issue of this ambiguity is determining whether the specific standards in the legislation are binding or mandatory; without clarification in the legislation, the regulator will assume an important role in making this determination.[14]

Connecticut
Connecticut's RPS was first established in 2000 and was immediately assessed by experts as being completely ineffective.[15] The primary failure was a loophole in the legislation that exempted nearly the entire energy load for the state from the RPS requirements. As a result of being purchased through the state's distribution utilities' standard service, approximately 95% of the state's energy load was labeled a "wholesale" product and was not subject to RPS requirements. Changes to the legislation in 2003 closed this loophole by requiring retail electricity suppliers and electric-distribution companies to comply with the standard.

Maine
Maine's experience with its RPS design clearly illustrates the importance of appropriately establishing the initial goals and targets of the program. The goal of reaching 30% of total retail sales by 2005 is revealed as problematic when the existing state of electricity consumption is taken into account: Maine's renewable electricity consumption had already reached 50% when the RPS was enacted in 1999.[16]

As a result of the RPS's ineffectiveness in developing renewable energy consumption and its general poor performance, the program has sustained continuous efforts by different policymakers to alter the program or even eliminate it altogether. This lack of regulatory and legislative stability also hinders the possibility for success in the future of the program.

4. NH INFORMATION RELEVANT TO RPS LEGISLATION

4.1 New England Power Pool – Generation Information System. All of the electric generating facilities in New England belong to an organization known as the New England Power Pool or "NEPOOL" which is administered by a non-profit organization

[14] Ibid.
[15] Ryan Wiser, et al., *Evaluating State Renewables Portfolio Standards: A Focus on Geothermal Energy*, 2003.
[16] Ibid.

known as Independent System Operator - New England (ISO-NE) under Federal Energy Regulatory Commission (FERC) guidelines. The NEPOOL generating facilities transmit power into a common grid to which all customers are connected. One can think of the New England grid as one huge equivalent generating plant.

NEPOOL operates a database, the Generation Information System (GIS), that tracks RPS eligibility, generation attributes, and emissions factors from *all* electricity generation in the NE-ISO control area. Through this system, a New England wide web-based REC market, administered and regulated by the APX Corporation, has been established.

While the GIS is tailored to measure generation attributes according each state's legislation, it also allows for interstate renewable credit trading. Thus, even though New Hampshire currently lacks an RPS, electricity producers within the state already actively participate in renewable credit trading.

Throughout the year, the NEPOOL REC market operates four trading periods in which credits earned during a given quarter are tradable. For example, credits generated in January, February, and March are tradable between July 15 and September 15 of that year. Credits are "bankable" for trade in subsequent periods but become retired if not used by the corresponding trading period of the calendar year in which they were generated. Therefore, a credit generated in January of 2006 (quarter 1) will initially be tradable between July 15 and September 15 of 2006 (trading period 1). This credit can be banked for the next three trading periods but must be used by the conclusion of the last trading period (June 15 of 2007) to avoid retirement.

If New Hampshire were to establish a renewable portfolio standard, the NEPOOL GIS represents an existing organization that could serve as an oversight entity, limiting the administrative costs. A US Department of Energy assessment of New Hampshire's renewable energy capacity found that the state demonstrates great potential for renewable energy. The results are summarized in the following table:[17]

Resource	*Potential*
Biomass	Mill wastes, urban wastes, forest residues, agricultural residues and energy crops provide New Hampshire with "excellent biomass resource potential"
Geothermal	Low to moderate temperature resources that can be tapped for direct heat or for geothermal heat pumps. Electricity cannot be generated from these sources.
Flat Panel Solar	For flat-plate collectors, New Hampshire has useful resources throughout much of the state.
Concentrating Solar	New Hampshire has a marginal resource. Although certain technologies may work in

[17] US Department of Energy, *Energy Efficiencey and Renewable Energy – State Energy Alternatives: New Hampshire*. Available at http://www.eere.energy.gov/states/alternatives/resources_nh.cfm

	specific applications, most concentrating collectors are not effective with this resource.
Hydroelectric	New Hampshire has a good hydropower resource as a percentage of the state's electricity generation.
Wind	New Hampshire has wind resources consistent with utility-scale production. The excellent wind resource areas in the state are on the ridge crests. The White Mountain region in northern New Hampshire is the most prominent area. Certain ridge crests in the western part of the state can also have excellent wind resource. In addition, small wind turbines may have applications in some areas.

In quarters 3&4 of 2004 and 1&2 of 2005 (the last available data) 5.11% of all energy produced on the ISO New England grid originated from renewable resources.[18] The breakdown is as follows:

Source	% Energy Produced
Biomass*	0.04
Coal	10.13
Diesel	2.30
Fuel Cell*	<0.01
Hydro*	3.48
Jet	1.22
Landfill Gas*	0.01
Solid Waste*	0.04
Natural Gas	35.78
Nuclear	30.83
Oil	6.44
Photovoltaic*	<0.01
System Mix	8.19
Trash*	1.18
Wind*	<0.01
Wood	0.35
% of All Sources that are Renewable[19]:	5.11
Total Sources:	100.0

6. CONCLUSION

When forming an RPS it is important to implement a policy that allows producers to meet mandates in the most efficient way and at the lowest cost to the consumer while still

[18] New England Power Pool, Generation Information System available at https://www.nepoolgis.com/myModule/rpt/myrpt.asp?r=112
[19] Sources with an * indicates a renewable resource.

maintaining strong incentives to produce clean energy. In order to help ensure these goals, three things are essential:

4) Established time lines should be long enough in order to foster a stable market for renewable energy.
5) Alternative Compliance Payments (ACPs) should be set to serve as a price cap but should be established at a level high enough to still maintain the incentive to invest in renewable production.
6) Compliance periods should be flexible enough to account for natural variance in renewable energy production

Additionally, eligible sources should be defined with the following criteria:

1) Technical Eligibility - the exclusion or required use of certain technologies for deriving power from the resource (e.g., excluding nuclear or hydroelectric energy).

2) Existing vs. New Generation – RPS should serve as an incentive for *new* clean energy production and not provide windfalls for those already producing electricity from renewable sources.

Finally, three options by which electricity suppliers may comply with RPS requirements are available:

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