MPUC RPS Report 2011 - Review of RPS Requirements and Compliance in Maine

Prepared by London Economics International LLC for the Maine Public Utilities Commission

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Pursuant to An Act To Reduce Energy Prices for Maine Consumers, P.L 2011, ch. 413, sec. 6 (the "Act"), the Maine Public Utilities Commission ("MPUC" or the "Commission") was directed by the Legislature to study Maine's renewable portfolio requirement established in 35-A M.R.S.A. § 3210 (3-A). The Commission engaged London Economics International LLC ("LEI") to conduct an in-depth analysis of the renewable portfolio standards ("RPS") required by the Act which would support the Commission's study and report to the Legislature on the following eight topics:

- ***Item 1: the source and cost of renewable energy credits ("RECs") used to satisfy the renewable portfolio standard ("RPS") requirements;***
- ***Item 2: the impact of RECs generated in Maine on the regional REC market;***
- ***Item 3: the impact of the RPS requirements on the viability of electricity generating facilities in Maine that are eligible to meet the RPS requirement;***
- ***Item 4: the impact of the RPS requirements on electricity costs of Maine ratepayers;***
- ***Item 5: if the RPS requirements result in an increase in electricity costs, to the extent possible, the impact of that increase on economic development in Maine;***
- ***Item 6: the cost of the use of the alternative compliance payment ("ACP") mechanism under Title 35-A, section 3210, subsection 9 for electricity consumers in Maine and, to the extent information is available, the reasons competitive electricity providers use the ACP mechanism;***
- ***Item 7: the best practices for setting the ACP rate; and***
- ***Item 8: to the extent possible, the benefits resulting from the portfolio requirements, including, but not limited to, tangible benefits and community benefits pursuant to Title 35-A, section 3454, economic benefits due to the creation of jobs or investments in this State including multiplier effects, research and development investment in this State, the impact on electricity rates and benefits due to diversifying this State's energy generation portfolio.***

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A. Executive Summary: Key Findings and Observations

London Economic International ("LEI") was retained by the Maine Public Utilities Commission ("MPUC") to prepare a comprehensive analysis of the impacts of the Renewable Portfolio Standard ("RPS") requirements in Maine and to satisfy the legislative directive to study Maine's renewable portfolio requirement. The intent of this Report is to provide a fact-based foundation to assist Maine policymakers in evaluating potential impacts of the existing RPS requirements and inform future policy decisions. This Report intentionally does not make any specific policy recommendations.

Maine, as part of an effort to restructure and deregulate the State's electric industry in 1997, was one of the first states in the region to adopt an RPS in 1999. Maine's current RPS requirement is composed of two classes: Class I (new renewables) and Class II (existing renewables) requirements.[1] The Class I requirement, enacted in 2006, applies only for "new" renewable resources and includes qualifying renewables on-line after September 1, 2005 and increases by 1% annually (from 1% of retail sales in 2008 to 10% of retail sales by 2017). The Class II requirement sets 30% of electric sales as the required renewable percentage to qualify for RPS and allows a broad pool of generation types (including existing projects) to qualify as renewable. This Class II requirement does not have the same in service requirement as Class I. In addition to the on-line distinction, the Class II standard allows a broader list of qualifying resources than Class I; for example, efficient cogenerators and municipal solid waste that use a non-renewable fuel type may qualify for Class II.

Five of the six New England states (Vermont is the exception) have RPS policies similar to those in Maine. Although each state sets its own state policies with respect to eligibility, the similarities between different states' RPSs create a quasi-regional market for the supply of renewable energy credits ("RECs"). Maine's RPS, however, has much lower MWh requirements over time than some other New England states due to its relative lower level of retail electricity sales.

New England's RPS policies and Maine's significant resource potential have led to a large amount of renewable power development in Maine. There is currently 325.5 MW of operational wind power in Maine.[2] Furthermore, Maine's richness in low-cost renewable resources, in particular wind and biomass, as well as the large regional RPS requirements in New England positions the state as a key source of new renewable generation in the future for the region.

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1 The age of the underlying resource is one of the main differentiating factors in Maine's RPS. Many other New England states have a similar differentiation. Therefore, for ease of reference, we refer to Class I as "Class I (new renewables)" in this Report and Class II as "Class II (existing renewables)."

2 Form EIA-860 Annual Electric Generator Report, a generator-level survey that collects specific information about existing and planned generators and associated environmental equipment at electric power plants with 1 megawatt or greater of combined nameplate capacity ("Annual Electric Generator data – EIA-860 data file." U.S. Energy Information Administration. November 30, 2011. Web. <http://www.eia.gov/cneaf/electricity/page/eia860.html >).

The potential cost, specifically rate impacts and benefits of renewables, are key factors to take into account when assessing and developing RPS policy. Renewables are sometimes deemed too expensive with an unfavourable impact on rates, while others see them as an important generation source that yields economic, environmental, and supply diversification benefits. This Report analyzes the impact on consumer rates of Maine's current RPS policy as well as potential RPS requirements set at a higher level and assuming different REC prices. It also examines the potential from new investment in renewables to stimulate job creation and support key segments of the local economy in the State.

The cost of RECs and the impact of RECs generated in Maine on the regional REC market are also key things to consider when evaluating Maine's renewable policies. RECs generated in Maine are - and will likely continue to be - a critical component of the regional REC market. In 2009, RECs sourced from Maine accounted for over 30% of the total New England Class I (new renewables) RPS requirement. Despite the volatility in REC prices across time and between different states, income from the sales of RECs is an important contributor to the overall financial viability of qualified renewable resources.

To evaluate these issues and the overall effectiveness of Maine's RPS policy, LEI has amassed and analyzed key statistics regarding the following eight topics listed in the Act:

- ***Item 1: the source and cost of renewable energy credits ("RECs") used to satisfy the renewable portfolio standard ("RPS") requirements;***
- ***Item 2: the impact of RECs generated in Maine on the regional REC market;***
- ***Item 3: the impact of the RPS requirements on the viability of electricity generating facilities in Maine that are eligible to meet the RPS requirement;***
- ***Item 4: the impact of the RPS requirements on electricity costs of Maine ratepayers;***
- ***Item 5: if the RPS requirements result in an increase in electricity costs, to the extent possible, the impact of that increase on economic development in Maine;***
- ***Item 6: the cost of the use of the alternative compliance payment ("ACP") mechanism under Title 35-A, section 3210, subsection 9 for electricity consumers in Maine and, to the extent information is available, the reasons competitive electricity providers use the ACP mechanism;***
- ***Item 7: the best practices for setting the ACP rate; and***
- ***Item 8: to the extent possible, the benefits resulting from the portfolio requirements, including, but not limited to: tangible benefits and community benefits pursuant to Title 35-A, section 3454, economic benefits due to the creation of jobs or investments in this State including multiplier effects, research and development investment in this State, and the impact on electricity rates and benefits due to diversifying this State's energy generation portfolio.***

Key findings and observations from these eight topics identified by the Legislature as well as a summary table of the costs and benefits to Maine from Maine's and other New England state RPS programs are summarized below:

- RECs generated in Maine are - and will likely continue to be - a critical source of supply for the regional REC market across New England;

- Current Maine Class I (new renewables) REC prices, as well as REC prices in other New England states, do not fully fund the gap between the all-in levelized costs of a new eligible renewable resource and its expected revenue for that new renewable project, but they do still provide material revenue, especially for renewable generators that are already operating;

- Regional RPS requirements and Maine's strong resource potential encourage investment in renewables in Maine, as evidenced by the 1,250 MW of proposed new generation projects in ISO-NE's interconnection queue which are located in Maine (including resources using wind, biomass, and hydro);

- Maine's qualified renewable resources produced more than enough RECs to meet the RPS requirement in 2010 at a cost to Maine ratepayers of 0.07 cent/KWh);

- The current RPS program in Maine increased retail rates by 0.57% of the weighted average of all retail customers' monthly electric utility bill in 2010. Retail rates increase from current levels by 1.9% in 2017 when Maine's RPS requirement reaches 10% of retail sales, assuming a REC price of $24/MWh;

- LEI calculated the impact on Maine's economy from higher electric power rates (due to RPS) holding all else equal, i.e. not including any positive effects on the economy from in-state renewable resource development. If the RPS compliance requirement increases to 10% and, assuming REC prices increase to $33/MWh from the 2010 compliance year cost level of $24/MWh, the additional costs due to RPS compliance on all retail customers will reduce the economy by roughly 0.06%; and

- As RPS policies across New England motivate new power plant construction, investment in Maine renewable generation has the potential to be a meaningful contributor to the state's gross state product ("GSP"). Assuming half of the proposed new wind projects in Maine are built in the future, 625 MW – at a total investment cost of $2,563/kW – this could result in approximately $560 million of investment in the state of Maine, which could lead to $1,140 million or a 2% increase over current GSP, and the creation of roughly 11,700 jobs during construction. These economic development benefits are cumulative for the $560 million of investment, but would in reality accrue over multiple years given the likely staggered timing of this investment.

Item 1: the source and cost of renewable energy credits ("RECs") used to satisfy the renewable portfolio standard ("RPS") requirements

Compliance with RPS requirements in Maine has been met almost completely through the acquisition of RECs rather than through Alternative Compliance Payments ("ACP"). This is not surprising given the abundance of supply from qualified renewables. For Maine Class I (new renewables) RPS requirements, over 80% of purchased RECs were produced within the State of Maine. Biomass has been the major resource for satisfying the Class I RPS requirement in the last three years for which compliance reports are available (2008-2010). For Maine Class II (existing renewables), hydro has been the major compliance resource. According to the annual compliance reports, the average reported procurement cost of Class I RECs was $37 per MWh, $25 per MWh, and $24 per MWh for 2008, 2009, and 2010 respectively.[3]

The current RPS compliance costs are less than 1% of a typical Maine consumers' overall electricity bill.[4] This is due to the fact that the RPS requirement only applies to a small percentage of the total retail load, yet the costs are divided across the entire load. In 2010, the RPS compliance impact was equal to 0.074 cents/kWh, with 0.067 cents/kWh coming from Class I and 0.007 cents/kWh coming from Class II compliance. As the cost of compliance increases as the RPS percentage requirements ramp up to 10% over time (discussed in Item 4 or Section C.4 of this Report), we estimate that compliance costs will represent 1.9% of the customer's overall bill.

Maine's Class I REC prices for the compliance year 2011 are currently averaging roughly $13.50/MWh in 2011, based on over-the-counter market activity from January 2010 through January 25, 2012.[5] However, this may change over time as the excess supply of RECs is absorbed by growing demand and rising RPS requirements in Maine and in other states across New England.

The average cost of Maine's Class II (existing renewables) REC price is much lower than Maine's Class I (new renewables) REC price. This is not surprising given the relative surplus supply and relatively lower costs of continued operation by existing renewable resources as compared to the levelized costs of new renewable resources.

Item 2: the impact of RECs generated in Maine on the regional REC market

Although Maine suppliers satisfy the majority of their RPS requirements through RECs from renewable facilities in Maine, there is no statutory requirement that RECs generated in Maine be used for Maine's RPS. Other New England states satisfy a greater portion of their RPS through

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3 The Maine PUC does not yet have actual procurements costs for compliance year 2011.

4 For example, in 2011, the Maine Class I requirement is 4% of retail sales. For simplicity, let us assume a REC price of $10/MWh. A customer would pay $0.4 per MWh for REC Class I compliance (4% multiplied by $10/MWh), which is less than 1% of current retail rates for electricity in Maine.

5 This REC price reflects all of the available period: Jan 2010 to Jan 25, 2012 (Bloomberg, accessed January 26, 2012).

RECs purchased out-of-state, including RECs sourced from Maine. Although RECs are frequently traded to fulfill a specific state's requirement, a renewable generator can typically qualify to sell its RECs in multiple states. Given similarities in eligibility for renewable resources, there are arbitrage opportunities between different states' RPS programs; therefore, prices of RECs across states move together and have, at times, converged.

RECs generated by renewable generators located in Maine are a critical component of the regional REC market in New England. Renewable resources located in Maine contributed significantly to RPS Class I compliance in other states, such as Connecticut and Massachusetts, accounting for over 30% of New England Class I RPS compliance requirement in 2009.[6] Given that Maine has the greatest amount of new proposed renewable generation with a large potential supply of wind power, it is likely that Maine will continue to supply RECs to other New England states which either lack indigenous and/or low cost renewable resources to satisfy their respective RPS requirements.

In addition to the export of Maine RECs to the region, policy decisions in other states may also affect Maine's RECs. For example, stricter proposed regulations on biomass for Massachusetts Class I (new renewables) RECs may force biomass resources to sell RECs in other states in New England, which are more biomass-friendly, including in Maine. This may result in additional REC supply in states like Maine which, holding all else constant, could lead to a reduction in Maine REC prices (especially Class I) in the future.[7]

Item 3: the impact of the RPS requirements on the viability of electricity generating facilities in Maine that are eligible to meet the RPS requirement

Although there are many drivers behind renewable generation investment, RPS programs that qualify new renewable resources, like Maine's Class I requirement, have contributed to the development of new renewable supply in the region. Renewable generation capacity has increased across New England and specifically in Maine over the last three years. Currently, over 800 MW of eligible renewable resources have been certified for the Maine Class I program. The timing of this investment corresponds to the implementation of the RPS programs across the New England states. Furthermore, based on the ISO-NE interconnection queue ("IQ") as of December 1, 2011, approximately 1,250 MW of the new wind projects (out of the 2,300 MW that are proposed in New England) are located in Maine.

In terms of the level of investment required for a typical new renewable project, REC revenues alone are not currently sufficient to single-handedly promote new investment and fully remunerate a new investor. However, REC revenues do provide a material source of income for both new and existing renewable generation in New England. Conceptually, the economic investment decision for any new power project (including a proposed renewable project)

6 More recent data is not available from all other states.

7 See Appendix B: REC Price Drivers for additional information on the demand and supply drivers of REC prices.

revolves around whether expected market revenues can cover the all-in levelized costs of the investment, including the necessary return on equity and repayment of debt.

LEI reviewed the levelized costs of different renewable technologies and compared those costs to current New England energy and capacity revenues, taking into consideration additional revenue from federal production tax credits. Based on market conditions in 2010,[8] the estimated breakeven shortfalls for various renewable technologies are higher than average Class I REC prices in Connecticut, Massachusetts, and Maine. This suggests that the RPS programs are not on par with full investment recovery needed for new renewables. However, REC prices do contribute to the investment paradigm. For example, based on average prices for 2010 vintage of Class I RECs across New England states, the resulting REC revenues in Connecticut, Massachusetts, and Maine cover 76%, 70%, and 55%, respectively, of the breakeven shortfall for a typical on-shore wind project.[9] In other words, Maine REC prices in 2010 were sufficient to cover more than half of the gap between the all-in levelized costs of a new wind farm and estimated market revenues (from energy, capacity, and production tax credits ("PTC")).

For a renewable generator already in operation, conceptually, the economic decision is slightly different. Notably, a generator cannot receive either Class I or Class II RECs until it produces output (although a generator may negotiate a forward sale of RECs prior to operation and the receipt of those RECs would be contingent on actual operations). For an already operating generator, investment cost is effectively sunk and, therefore, the economic viability of that generation is best judged by reference to minimum going forward fixed costs rather than all-in levelized costs. If we assume that minimum going forward fixed costs only include recovery of debt and fixed operating and maintenance costs, 2010 REC prices in Maine and other New England states for Class I compliance would have been more than sufficient to cover the shortfall between minimum going forward fixed costs and expected revenues for existing renewables like wind and biomass.

Item 4: the impact of the RPS requirements on electricity costs of Maine ratepayers

RPS policies are under review in select New England states, including Connecticut, especially amid concerns regarding the potential for rising costs to ratepayers in a poor economy. The cost to Maine consumers from RPS is impacted by two key factors: 1) the RPS requirement (which is calculated by multiplying the RPS percentage requirement and annual electricity retail sales); and 2) the market price of RECs. To assess the potential impact on retail rates if RPS policies and/or REC market prices change, LEI implemented an analytical "what if" consideration for both a higher RPS requirement and higher as well as lower REC prices (see Section C.4) based on the 2010 compliance cost scenario. The impacts on electricity costs were then measured in

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8 We used the market condition in 2010 to determine energy and REC prices, because REC prices for compliance year 2011 are not yet completely available. REC prices for compliance year 2011 will continue trading throughout mid 2012.

9 The New Hampshire Class I REC price for 2010 averaged around $25/MWh and cannot fully recover the breakeven shortfalls either. The Rhode Island Class I REC price for 2010 was not available from Bloomberg at the time of analysis.

terms of average cents/KWh, percentage increase in overall electricity prices and $/month charge for a residential customer:

LEI started with the baseline where REC prices remain at the 2010 compliance year price of $24/MWh with the 3% RPS requirements, we refer to this as the "status quo." As discussed in Item 1, 2010 Class I RPS compliance costs are equal to 0.072 cents per KWh or roughly 0.57% of a typical retail residential customer's monthly bill.

Next, we tested three illustrative scenarios as shown in Figure 1:[10]

1) the RPS requirement increases to 10% and REC prices increase to where they were in 2010 (i.e., REC prices are at 2010 compliance year levels of $24/MWh);

2) the RPS requirements increase to 10% of retail sales and REC prices increase to $33/MWh, equivalent to the notional break even cost for new on-shore wind generation; and

3) the RPS requirements increase to 10% of retail sales and REC prices are at 2011 compliance year (to date) levels of $13.5/MWh.

Figure 1. Impacts of RPS requirements on Maine ratepayers' electricity costs

Scenario	RPS requirements	REC prices	Impact
Status Quo*	Current RPS requirements for Class I in 2010 (3%)	$24/MWh	REC compliance costs equal to 0.072 cent/KWh, or 0.57%of average current retail rates, or $0.37 of the current residential monthly bill
1	10% of retail sales	$24/MWh	REC compliance costs equal to 0.24 cent/KWh, or 1.90%of average current retail rates, or $1.25 of the current residential monthly bill
2	10% of retail sales	$33/MWh	REC compliance costs equal to 0.33 cent/KWh, or 2.62%of average current retail rates, or $1.72 of the current residential monthly bill
3	10% of retail sales	$13.5/MWh	REC compliance costs equal to 0.135 cent/KWh, or 1.07%of average current retail rates, or $0.7 of the current residential monthly bill

* Assumes 12,000 GWh retail sales and a typical residential usage in Maine of 520 KWh/month

Given the scenarios considered in the "what if" analysis, the ratepayer impact for varying levels of RPS requirement and REC prices ranges from representing 0.57% of the current average retail rate under current RPS requirements and assuming a REC price of $24/MWh to an increase of

10 LEI did not perform any forecasting analysis of REC prices and these selected price levels are meant to illustrate possible impacts and do not reflect any projection of expected REC prices.

2.62% assuming RPS requirements increase to 10% of retail sales and REC prices increase to $33/MWh. LEI did not explicitly examine a lower RPS requirement but this - in addition to resulting in a lower rate impact than the status quo - would also have the potential to impact not only electricity consumers but also other sectors to the extent that a lower RPS requirement (as well as lower REC prices) could motivate generation closures. If Maine REC prices decrease to a level where existing renewables cannot remunerate their minimum going forward fixed costs as discussed in Item 3 (Section C.3), unless they can recover such costs by selling RECs in other New England states, the lower RPS requirement may trigger early retirement of existing renewables which would create a cost to Maine's economy through related job losses.

Item 5: if the RPS requirements result in an increase in electricity costs, the impact of that increase on economic development in Maine

LEI examined the increase in electricity costs due to changes in the RPS requirement and the impact any associated cost increase could have on reducing economic development in Maine (Item 8 examines how RPS requirements through direct investment and job creation may benefit Maine's economic development). LEI measured economic development in terms of impact on economic activity, by looking at the impact on gross state product and employment.

In general, as electricity costs for retail customers rise, those customers would see a reduction in their income, which could then impact their spending habits on other consumables and also investment decisions.[11] LEI measured the direct and indirect impact of increased costs on gross state product by considering multiplier effects for various types of retail customers (residential, commercial, and industrial). In assessing how REC procurement costs impact economic development in Maine, it is useful to consider the economic implications for each class of retail customer. For residential customers, higher costs of electricity would, holding all else constant, reduce household disposable income, which would, in turn, reduce household spending in other sectors of the Maine economy.

LEI applied Maine-specific output multipliers as estimated by the US Bureau of Economic Analysis ("BEA")[12] Regional Impact Multiplier System ("RIMS") II data to measure the potential impact on Maine's economy from changes in income and spending. Output multipliers are commonly used in policy analysis to assess the increase or decrease in a state's economic activity for each dollar of increased/decreased direct investment. Using the BEA output multipliers for Maine in conjunction with the second scenario[13] discussed in Item 4 above, LEI estimated that for a compliance cost increase of $31 million to all retail consumers (or

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11 LEI did not examine or quantify any potential impacts of energy efficiency motivated by higher costs of electricity. Energy efficiency, if it were to be realized as a direct result of higher RPS compliance costs, could in turn provide an offset to those higher compliance costs and possibly reduce energy costs as well.

12 US Bureau of Economic Analysis. *Regional Input-Output Modeling System Multipliers*. Table 2.5: Total Multipliers for Output, Earnings, Employment, and Value Added by Industry Aggregation Maine (Type II). Washington, DC, 2009.

13 Assuming the RPS requirements increase from 3% to 10% and REC prices increase from $24/MWh to $33/MWh.

$12 million to residential consumers), the reduction in household disposable income would lead to a $13.4 million reduction in Maine's GSP, which is 0.03% greater than 2010 GSP levels, and reduce state-wide employment by 129 jobs.[14] The economic impact of increasing costs of RPS procurement could be less if residential customers are able to change their electricity usage over time and reduce overall electricity consumption.

For commercial and industrial customers, the impact of rising electricity costs is more complex and depends on electricity consumption patterns, the relative magnitude of electricity costs to other operating expenses, and the options available to the customer for fuel switching, as well as the competitive nature of the relevant sector.

In the short term, higher electric utility costs generally imply reduced profits as business owners operating in a competitive sector will not be able to pass on their increased cost of operations to their customers. For some firms, the reduced profits may require reduced production, which, in turn, may lead to reduced employment. This would reduce economic development in Maine by way of lower economic output (lower GSP) and higher levels of unemployment.

LEI developed case studies for two large and competitive industries in Maine, the tourism industry, and the pulp and paper manufacturing industry. For these two industries, LEI assessed both the short term and long term potential impacts from changes in Maine's RPS. In the near term, any impact on Maine's Gross State Product due to exposure to higher RPS compliance costs under a higher RPS requirement and higher REC prices is tempered as electricity costs are typically under 5% of total operating costs.

Over time and especially in the longer term, however, higher electricity costs may motivate changes among commercial and industrial users of electricity, including changes in the production process (to reduce use of electricity), re-allocation of inputs and innovation, and in some cases to take advantage of the revenue opportunities provided by RECs. LEI specifically looked at the potential long term implications for the tourism industry and the pulp and paper manufacturing industry. As an example of potential strategic responses to Maine's RPS, LEI observes that a Vermont ski resort has made direct investments in renewable generation (i.e., installed wind turbines). Although the decision to make such an investment is multi-faceted, inevitably the ski resort management considered the potential costs and benefits of self-providing electricity and RECs in their strategic decision. For some of Maine's paper mills, the advent of the state's RPS and monetization of the renewable attribute of electricity production from biomass by-products and hydroelectric resources provides an opportunity to re-vitalize and optimize the value of existing, on-site generation assets.

[14] This negative GSP impact and employment loss compares to a positive GSP impact of $1,140 million or a 2% increase over current GSP and an addition of 11,000 jobs if the RPS policies in Maine and across New England motivate new renewable investment, as discussed in Item 8 (Section C.8).

Item 6: the cost of the use of the alternative compliance payment ("ACP") mechanism and why it is used

The ACP mechanism serves as an effective price cap on Class I RECs in Maine. Under Maine's Class I program, the ACP allows competitive electricity providers to make a payment for RPS compliance when they do not have sufficient RECs. Given the abundance of existing renewable resources (and hence, resulting low REC prices for Maine Class II (existing renewables), there is no equivalent ACP mechanism for Maine Class II (existing renewables)).

During 2008-2010, the level of usage of ACPs in Maine to meet RPS declined from $0.69 million in 2008, to $0.32 million in 2009, and further to $0.02 million in 2010. The $0.02 million represents only 0.3% share of total compliance costs in 2010. The declining usage of ACPs is likely an indicator of surplus REC supply and the growing ease with which electricity providers comply with RPS requirements for Class I.

Although the ACP rate is currently set at about $62.1/MWh in Maine, it is not a significant cost contributor to the RPS program, nor is it likely to raise costs significantly in the future, even if usage of the ACP increases. It should be noted that despite the high level of the ACP, it is still sometimes used by competitive electricity providers. Based on responses to the MPUC Notice of Inquiry[15] ("NOI") from September 2011 and observations in other New England states, competitive electricity providers may opt to use ACP for RPS compliance for a number of practical reasons, including: (i) load forecasting error; (ii) transaction costs; (iii) insufficient supply of RECs; and (iv) general hassle value or unfamiliarity with RPS compliance.

Item 7: the best practices for setting the ACP rate

LEI examined the working history of Maine's ACP and practices in other states, as well as market participants' views of the effectiveness of Maine's ACP elicited by the MPUC's NOI.

First, Maine's ACP policy, and specifically the current ACP rate, is consistent with other surrounding states' ACP mechanisms for RPS. Such consistency reduces any distortions that may be created among state programs in the regional marketplace. In addition, LEI believes that Maine's ACP rate reflects current market expectations and the current cost of new entry for

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15 To obtain information and viewpoints from interested persons on a variety of issues related to the Resolve (related to the RPS), the Commission, on August 17, 2011, initiated an Inquiry, Inquiry into Maine's New Renewable Resource Portfolio Requirement, Docket No. 2011-271 (Aug. 17, 2011). The Notice of Inquiry ("NOI") requested interested persons to provide comments on a large number of questions and issues related to Maine's portfolio requirement. The following interested persons filed comments in response to the NOI: Maine Renewable Energy Association, Maine Waste-to-Energy Working Group, First Wind Holdings, Constellation Energy Commodities Group Maine, Hess Corporation, Ocean Renewable Power Company, Natural Resources Council of Maine, and Conservation Law Foundation. The comments can be obtained through the Commission's virtual docket, http://www.maine.gov/mpuc/, through reference to Docket No. 2011-271.

various renewable technologies that are feasible within New England, such as biomass and wind generation.

Second, Maine's ACP is widely perceived to be working as an effective cap for Class I RECS. Most of the respondents to MPUC's NOI acknowledged that the current ACP rate in Maine is reasonable and functioning properly. The ACP is also recognized as a cost mitigation mechanism for ratepayers as it puts a cap on the potential increase in REC procurement costs. Given that the ACP has been used to account for a small portion of RPS compliance, it has not been a significant contributor to retail rates.

Finally, the current Maine ACP rate overall appears to meet the key ratemaking principles of efficiency, fairness, stability, and practicality. However, there are certain factors that may, in the future, require re-assessment of the ACP, including its level and rate of change. For example, the inflation index may not adequately represent future market price and cost trends. Furthermore, if capital costs decline significantly and market conditions improve, the current ACP rate may become inefficient and over-compensate for the actual levelized cost of a new renewable investment. On the other hand, as other renewable technologies emerge as commercially viable, the ACP may need to be re-visited to ensure that it is efficient in promoting all forms of eligible renewable investment that policymakers want to encourage.

Item 8: benefits of RPS requirements on economic development in Maine

In contrast to the investigation approach for Item 5 where LEI considered how higher costs would affect consumers and then the economy, Item 8 is best analyzed from the supply-side. Maine's RPS and the RPS in the other New England states are meant to motivate new investment in renewable resources throughout the New England region. New investment in renewable generating resources located in Maine that is motivated by the RPS requirements in New England will create various macro-economic benefits and therefore positively contribute to the state economy. As with Item 5, LEI focused on the gross state product and employment as the measurements most relevant for assessing economic development. In 2010, qualified renewable generators in Maine received $5.8 million in proceeds from the sale of Maine generated RECs that were paid by competitive electricity suppliers to procure RECs needed to meet Maine's RPS.[16] This is 0.01% of the state's total GSP in 2010.

Over the longer term, when the RPS in Maine and the other New England states motivates new power plant construction, such investment will generate additional direct and indirect benefits to the Maine economy by creating construction jobs and increasing in-state spending (during the course of construction and possibly during the operations stage if goods and services for ongoing operation of the new power plants are being procured locally), as well as increasing property tax revenues to the state. Based on the past experience of First Wind's project development in Maine, local spending can be expected from construction associated with a new

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16 This if out of a total of $8.1 million in REC related proceeds to satisfy Maine's Class I requirement in 2010 so roughly $2.3 million in REC related proceeds to meet Maine's RPS were from renewable generation resources located outside of Maine (2010 MPUC RPS worksheet).

renewable development. According to Dr. Charles S. Colgan, and discussed in more detail in Section C.8 of this Report, for a total capacity of 257 MW developed by First Wind during 2003-2010, 240 jobs were created. Out of the total investment of $642 million for the new 257 MW of wind generation, 35%, or $223 million, was spent within Maine on various services, mainly including construction, food & lodging, and professional & technical services.

ISO New England ("ISO-NE") predicts that across New England there will be a need for 10,987 GWh to 13,161 GWh of additional qualifying renewables (or equivalent to 3,600 MW and 4,300 MW of wind capacity assuming a 35% load factor) by 2020 to meet the collective RPS requirements.[17] In Maine, as discussed in Section C.2, there are proposals for about 1,250 MW of additional new wind in the IQ managed by ISO-NE. If 50% (or 625 MW)[18] of these projects are built at a cost consistent with the generic capital costs outlined in Item 3, and assuming 35% of the investment stays in Maine, this amounts to roughly $560 million in investment within the state of Maine. Using US BEA RIMS II multipliers for output (economic activity) and employment in Maine for three industries (construction, professional services, and lodging and food), LEI estimates that the $560 million investment will produce a $1,140 million increase in GSP and roughly 11,700 new jobs (during construction).

Furthermore, based on tax revenues collected from other new electric generation facilities in Maine, an additional 625 MW of wind generating capacity could provide $6.3 million in tax revenue for local governments per annum once the projects are operating. Lastly, there are other positive impacts from investing in new renewables, including educational benefits, environmental benefits, potential for reduced electricity costs (if the wind generation displaces other, more costly generation), fuel cost saving benefits, and fuel diversification benefits.[19]

Summary of Costs and Benefits of Maine's RPS

As described in Items 4, 5, and 8, RPS requirements create both costs and benefits. An increase in Maine's RPS requirement will lead to an increase in electricity power costs to ratepayers which will result in a reduction in state GSP and job losses. However, an increase in the RPS requirement in conjunction with the RPS in other New England states will also contribute to more renewable development. This additional renewable development in turn will create in-state investment which will contribute to an increase in Maine's GSP and additional employment, as well as greater property tax revenues. There are also other benefits of the region's RPS requirements, including the potential for emissions reductions, fuel diversification, fuel cost savings and -- through the addition of a large amount of low cost renewable resources like wind -- lower electricity prices as wind displaces existing higher cost generation. This benefit has particular relevance to Maine, where the increasing focus on wind and tides as fuels may allow Maine to increase its export of natural resources and thus help reduce the economic

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17 ISO-NE. 2011 Regional System Planning. Page 136.

18 Although MW estimates based on ISO-NE's interconnection queue are overstated as not all proposed projects are ultimately built, LEI has assumed that only half of the proposed new wind projects are built. LEI chose to focus on wind although other sources of renewables will also likely be built.

19 Providing significant detail on these additional benefits was outside the scope of this Report.

impact of Maine's energy imports. Figure 2 and Figure 3 summarize these benefits from Item 8 and costs from Item 5, respectively. This information should be viewed in the context of any underlying assumptions. In addition, the costs and benefits do not provide an apples-to-apples comparison and thus should not be interpreted as a cost/benefit analysis. It is important to note that there are different underlying timeframes assumed for the costs and the benefits. The costs reflect a near term timeframe (out to 2017 when Maine's RPS is expected to increase to 10% of retail sales) and are based on retail rates that include 2010 compliance costs. The benefits assume a much longer time frame as multiple years would be required to build 625 MW of new wind generation. It is also important to note that the economic benefits of renewable resource development in Maine is not an exclusive function of Maine's RPS, but of the collective impact of the RPS requirements throughout New England of which the Maine RPS is a relatively small part.

Figure 2. Benefits (Due to New England's RPSs) over a Multi-year Period[20]

Benefits to Maine (Assumes 625 MW wind built with a capital cost of $2,563/KW)	
Investment in Maine*	$560 million
Increase in local Jobs (temporary or permanent)	11,700
Increase in GSP	$1,140 million
Annual Tax Revenue	6.3 milllion
LMP Reduction**	$0.375/MWh
Annual Savings to Maine ratepayers from reduced electricity prices***	$4.5 million
Annual Emissions Reductions	$13 million

* Assumes 35% of investment stays in Maine

** Based on ISO-NE 2011 Economic Study Update (adjusted for 625 MW). Wayne Coste, Principal Engineer. September, 2011

*** Assumes retail sales of roughly 12,000 GWh

20 Because this benefit analysis is by definition based on cumulative investment over multiple years, LEI did not attempt to convert the multi-year benefits into annual rate impacts. Additional assumptions would need to be made regarding the specific timing of these investments and their commercial on-line operating dates to conduct this analysis properly.

Figure 3. Costs (Associated with Maine's RPS) reflected on an Annual Basis

Status quo case: RPS at 3% of retail rate, REC price of $24/MWh and 12,000 GWh retail sales	
2010 retail compliance cost	$8.6 million
2010 retail compliance cost for just residential	$3.3 million
Retail rate impact	0.072 cent/KWh
Monthly bill impact (residential)	$0.37
Percentage of average retail rate of 12.6 cents/KWh	0.57%
2010 GSP	$51,643 million
2010 non-farm employments	577,756

Case 1: RPS at 10% of retail rate and REC price of $24/MWh	
Annual retail compliance cost Increase from 2010	$20 million
Annual retail compliance cost Increase for just residential	$7.6 million
Retail rate impact	0.24 cents/KWh
Monthly bill impact (residential)	$1.25
Percentage of average retail rate of 12.6 cents/KWh	1.90%
Decrease in GSP due to higher electricity rates (residential only)	$8.7 million
Decrease in jobs (residential only)	84

Case 2: RPS at 10% of retail rate and REC price of $33/MWh	
Annual retail compliance cost Increase from 2010	$31 million
Annual retail compliance cost Increase for just residential	$12 million
Retail rate impact	0.33 cents/KWh
Monthly bill impact (residential)	$1.72
Percentage of average retail rate of 12.6 cents/KWh	2.62%
Decrease in GSP due to higher electricity rates (residential only)	$13.4 million
Decrease in jobs (residential only)	129

Case 3: RPS at 10% of retail rate and REC price of $13.5/MWh	
Annual retail compliance cost increase from 2010	$7.6 million
Annual retail compliance cost increase for just residential	$2.9 million
Retail rate impact	0.135 cents/KWh
Monthly bill impact (residential)	$0.70
Percentage of average retail rate of 12.6 cents/KWh	1.07%
Decrease in GSP due to higher electricity rates (residential only)	$3.3 million
Decrease in jobs (residential only)	32

B. Overview of RPS regulations and REC markets in Maine and the rest of New England

This section provides a brief overview of RPS regulations in Maine and other New England states that have a mandatory RPS. Specifically, it summarizes the RPS requirement and eligibility, compliance, and banking for these states. In addition, to better assess the impact of Maine RECs on the rest of New England (as addressed in Item 2); we briefly discuss REC market dynamics in New England. Appendix A: RPS Regulations in other New England States is a supplement to this summary introduction.

B.1 Maine

Maine's RPS requirements, which create Class I and Class II RECs, provide a source of REC supply to meet RPS obligations in Maine and in other states across New England, where similar renewable resources are eligible to fulfill RPS compliance. Maine was one of the first states in New England to adopt an RPS. Pursuant to Maine's 1997 electric utility restructuring law, the MPUC adopted rules for Maine's Renewable Resource Portfolio Requirement in September 1999 which required that "each competitive electricity provider in this State must demonstrate in a manner satisfactory to the commission that no less than 30% of its portfolio of supply sources for retail electricity sales in this State is accounted for by eligible resources."[21]

To promote the development of ***new*** renewable resources, effective in calendar year 2008, the Legislature created a new class of RPS compliance and therefore RECs (i.e., Class I).[22,23] The Maine Class I standard required that, beginning January 1, 2008, each competitive electricity provider in Maine, including standard offer suppliers, must account for no less than 1% of its total (annual) sales with Class I eligible renewable resources. Under current legislation, the Class I requirement increases from 1% by 1% annually to 10% in 2017 and thereafter is held fixed at 10% of total sales as shown in Figure 4 below. The 30% requirement from the 1997 restructuring law was retained and became known as the Class II REC requirement in Maine.

The impact of Maine's RPS is fairly small relative to requirements in other New England states, in particular Massachusetts and Connecticut, given the lower relative load numbers from which total requirements are based and the relative lower percentage requirement. The requirement percentage, especially for Class II, may look extremely high in the context of other states' current RPS policies, but it is important to point out that Maine's 1997 law had made eligible all

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21 "Public Utilities Heading: PL 1987, C. 141, PT. A, § 6 (NEW)" Maine 35-A M.R.S. § 3210. *Maine Revised Statutes.* Office of the Revisor of Statutes. Web. <http://www.mainelegislature.org/legis/statutes/35-a/title35-asec3210.html>

22 Public Law 403 established the set of mandatory standards for "Class I" RECs.

23 "Public Utilities Heading: PL 1987, C. 141, PT. A, § 6 (NEW)" Maine 35-A M.R.S. § 3210. *Maine Revised Statutes.* Office of the Revisor of Statutes. Web. <http://www.mainelegislature.org/legis/statutes/35-a/title35-asec3210.html>

existing renewable generation and efficient resources (cogeneration), and therefore there was abundant supply to meet this requirement. As a result, the price for complying with Class II RECs has historically been very low. The requirement percentage under the Class I RPS in Maine is the smallest of the other four states in New England that have an RPS, as illustrated in Figure 5.

Suspensions of scheduled increases in Maine's Class I RPS requirement can be ordered by the MPUC if by March 31st of the years 2010, 2012, 2014, and 2016, the MPUC determines that investment in new renewable resources over the preceding two years has not been sufficient and that the resulting use of RECs and/or the ACP has "burdened electricity customers without providing the benefits of new renewable resources."[24] A suspension in scheduled RPS increases could also occur if ACPs payments collectively comprise more than half of Maine's RPS obligation for three consecutive years.[25] A suspension of the scheduled percentage increase is limited to one year unless the MPUC finds that a longer suspension is justified. After a suspension, the MPUC may resume RPS requirement increases, but these must be limited to no more than one percentage point per year over the previous year, after a minimum of one year.

Figure 4. RPS requirements in Maine – percentage of annual retail sales

Compliance Year	New Renewable Resources (Class I)	Eligible Resource Requirement (Class II)
2000-2007		30%
2008	1%	30%
2009	2%	30%
2010	3%	30%
2011	4%	30%
2012	5%	30%
2013	6%	30%
2014	7%	30%
2015	8%	30%
2016	9%	30%
2017	10%	30%
2018	10%	30%
2019	10%	30%
2020 & thereafter	10%	30%

Source: MPUC CMR 65-407-311

B.1.a RPS eligible supply

Maine has a large indigenous supply of qualifying renewable resources. As of March 2011, over 800 MW of installed renewable capacity has been certified as Maine Class I eligible, pursuant to

24 "Public Utilities Heading: PL 1987, C. 141, PT. A, § 6 (NEW)" Maine 35-A M.R.S. § 3210. Maine Revised Statutes. Office of the Revisor of Statutes. Web. <http://www.mainelegislature.org/legis/statutes/35-a/title35-asec3210.html>

25 Maine Public Utilities Commission. Chapter 311: Portfolio requirement. §3 D. 1.

the Maine certification process. The majority (484 MW) is located in Maine, with the remainder located in New York (111 MW), New Hampshire (161 MW), Vermont (40 MW), Massachusetts (19 MW), Connecticut (3MW), and Rhode Island (1 MW). Additionally, as noted above, the Maine eligible MW typically qualifies for RPSs in other states. Thus, there are significant opportunities for renewable supply located in one state to meet RPS requirements in other New England states. Some of Maine's Class II (existing renewables) resources, however, are not eligible in other states; for example, while existing municipal solid waste is qualified as a Class II renewable in Connecticut and Massachusetts, it is not qualified in New Hampshire and Rhode Island.

The age of the underlying resource is one of the main differentiating factors in Maine's RPS. In addition to the age distinction, there are also some differences in eligible fuel types between Class I (new renewables) and Class II (existing renewables). Class I (new renewables) eligible resources include fuel cell, tidal power, solar arrays and installations, wind power, geothermal, hydroelectric, and biomass generators. Except for wind power, the generation resource may not be greater than 100 MW. Class II (existing renewables) eligible resources are similar to Class I (new renewables) eligible resources except that in addition to the requirement to be online prior to September 1, 2005, eligibility from all resources is restricted to projects that are 100 MW or smaller.[26] Class II (existing renewables) also includes municipal solid waste and eligible "efficient" resources (e.g. cogeneration plants, which are defined as small power facilities with an energy efficiency of at least 60%).[27] Please refer to Appendix A: RPS Regulations in other New England States for a detailed table of eligible resources.

B.1.b Compliance

Compliance is achieved by either acquiring RECs in satisfactory quantities to fulfill the RPS requirement of retail suppliers or by paying the ACP for the portion of the RPS requirement not otherwise fulfilled with Class I (new renewables) RECs.[28] In 2010, approximately 1.1 million MWh, or about 9% of Maine's electricity sales, were exempted from the new renewable resource portfolio requirements as a result of the pre-existing contract exemption. These exemptions include pine tree development zone businesses.[29]

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26 All eligible resources in Class II (existing renewables) are limited to 100 MW, while Class I (new renewables) makes an exception for wind generation, which does not have a capacity size limit.

27 MPUC CMR 65-407-311. Public Utilities Commission. "Chapter 311: portfolio requirement." 2007.

28 Maine's RPS requirements apply to the whole geographic area of the state of Maine. Due to the legacy of transmission investment in the state, Maine is actually two markets with two operators, ISO-NE for the majority of Maine and New Brunswick System Operator ("NBSO") in Northern Maine. The retail business in northern Maine is also governed by the MPUC, thus, it is also subject to the RPS requirements.

29 Sec. 4. 35-A MRSA §3210-E, sub-§5, as enacted by PL 2009, c.627, §5 and affected by §12, is amended to read:
5. Electricity sales. Notwithstanding section 3210, the sale of electricity by a competitive electricity provider to a qualified Pine Tree Development Zone business established under Title 30 A is exempt from the requirements of that section unless the qualified Pine Tree Development Zone businesses requests the commission to waive the exemption for the sale of electricity to that Pine Tree Development Zone business.

As discussed further in Item 1 (Section C.1 of the Report) and Item 6 (Section C.6 of the Report), Maine's RPS compliance has largely been met through RECs purchased and sold through the regional NEPOOL Generation Information System ("NEPOOL GIS") system.

Retail suppliers demonstrate their compliance to the MPUC by filing documentation by July 1st of each year. When the ACP is used, it is paid by the supplier into a Renewable Resource Fund administered by the Efficiency Maine Trust. [30]

Figure 5. Maine Class I (new renewables) ACP rates ($/MWh), 2007-2011

	CPI	ACP Rate
2007	220.512	$ 57.12
2008	229.306	$ 58.58
2009	229.343	$ 60.92
2010	233.868	$ 60.93
2011		$ 62.13

Source: Maine RPS Adjustment for ACP for compliance year 2011.

As shown in Figure 5, the ACP base rate was set at $57.12/MWh for 2007 by the MPUC based on "prevailing market prices, standard-offer service prices for electricity … and investment in renewable capacity resources in the State during the previous calendar year."[31] Thereafter, the ACP rate has been adjusted each calendar year based on the consumer price index ("CPI") and published by the MPUC. The current ACP rate is $62.13/MWh for the compliance year of 2011.[32]

30 The MPUC "shall deposit all funds collected pursuant to this subsection in the Renewable Resource Fund established pursuant to 35-A M.R.S.A. § 3210(6) to be used to fund research, development and demonstration projects related to renewable energy technologies." (MPUC CMR 65-407-311. Public Utilities Commission. "Chapter 311: portfolio requirement." 2007. Page 8). "Most recently, the *Act Regarding Maine's Energy Future* (Public Law 372, June 2009) established a new entity, the Efficiency Maine Trust, which became responsible for Maine's energy efficiency and renewable energy programs. All of the funds in Renewable Energy Fund were transferred to Efficiency Maine Trust July 1, 2010." (DSIRE. Maine: Efficiency Maine Trust. March 17, 2011. Web. <http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=ME07R&state=ME&CurrentPageID=1&RE=1&EE=1>) and State of Maine. *An Act Regarding Maine's Energy Future*. Public Law, Chapter 372. 2009).

31 "Public Utilities Heading: PL 1987, C. 141, PT. A, § 6 (NEW)" Maine 35-A M.R.S. § 3210. *Maine Revised Statutes.* Office of the Revisor of Statutes. Web. <http://www.mainelegislature.org/legis/statutes/35-a/title35-asec3210.html>

32 State of Maine Public Utilities Commission. "Maine Renewable Energy Portfolio Standard: Adjustment for ACP for compliance year 2011." January 27, 2011. Web. <http://www.maine.gov/mpuc/electricity/electric_supply/documents/2010AlternativeComplaincePayment_000.pdf>.

B.1.c Banking mechanism and compliance cure period

Banking of RECs is permitted in Maine. For compliance with Maine Class I (new renewables) and Class II (existing renewables) requirements, electricity suppliers can satisfy up to a third of their obligations using the excess RECs acquired in the prior year (notably, in Maine, this is back one year only), which have not been previously used to satisfy a RPS obligation in another jurisdiction.[33] Furthermore, if the electricity suppliers fail to meet the Maine Class I or II obligation, they may make up the deficiency in the next compliance year. This is sometimes referred to as "borrowing" from future REC vintages.

B.2 Summary of RPS regulations in other New England states

Similar to Maine, four other New England states (Connecticut, Massachusetts, New Hampshire, and Rhode Island) have established mandatory RPS regulations and corresponding compliance rules for the trading of RECs (Vermont is the sixth and only New England State without a legislative RPS).[34] Below, we present the key comparative observations on RPS regulations across New England. A more detailed description of each state's RPS requirements, eligibility of supply, and compliance channels can be found in Appendix A: RPS Regulations in other New England States.

The RPS regulations across these five New England states share several commonalities, including: similar (but not identical) frameworks regarding technology-driven eligibility rules; use of a differentiation between new and existing resources; utilization of an RPS compliance requirement denominated in percentage terms of retail sales, banking mechanisms, and ACP options for compliance. Figure 6 summarizes key facts on RPS policies across New England and Figure 7 provides a snapshot comparison of Maine's RPS with these other New England states.

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33 MPUC CMR 65-407-311. Public Utilities Commission. "Chapter 311: portfolio requirement." 2007.

34 Currently, Vermont has a voluntary renewable energy development program, Sustainably Priced Energy Enterprise Development ("SPEED"). SPEED aims to encourage long term contracting from eligible renewable resources. No compliance in each year is required. As established via VT S.B. 209, Vermont has a goal of 20% energy from renewable resources by 2020. Currently, no compliance from utilities is required. (30 V.S.A. § 8004). Source: DESIRE. *VT Sustainably Priced Energy Enterprise Development ("SPEED") Goals.* <http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=VT04R&re=1&ee=1>

Figure 6. RPS Regulations in New England

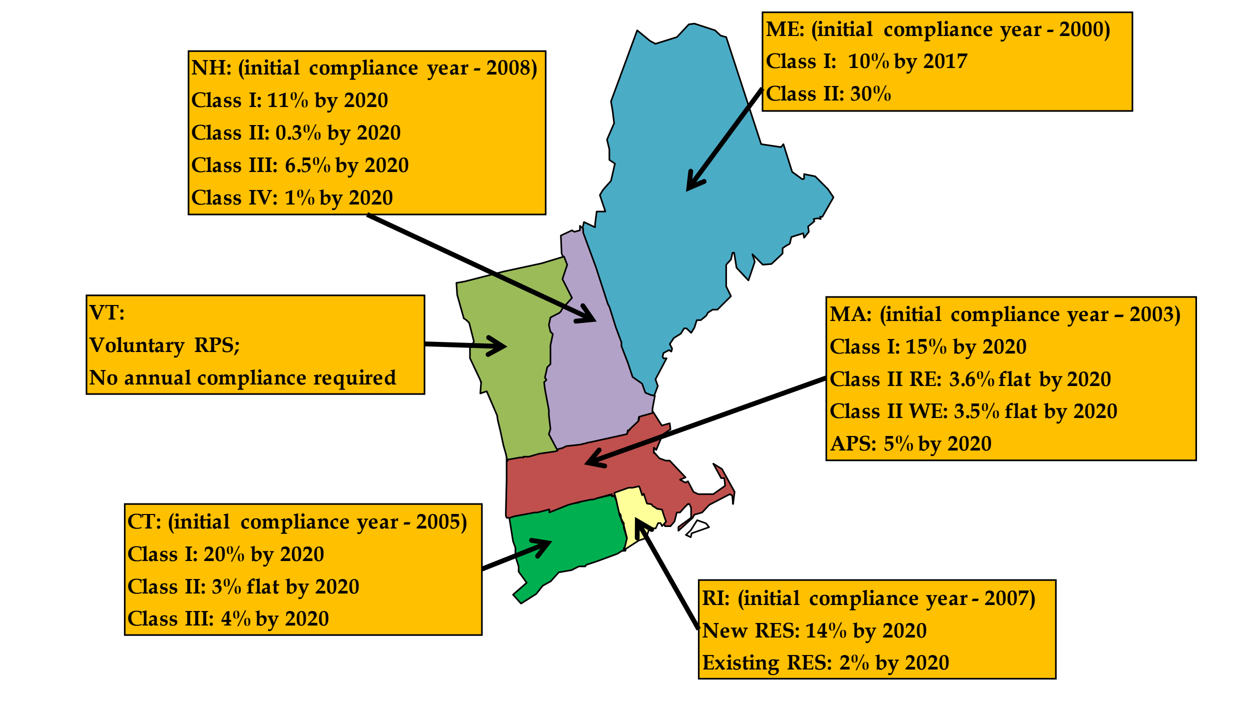


Figure 7. A snapshot comparison of Maine's RPS with New England states with RPS

	ME	Other New England states
RPS requirements	Class I (new) and Class II (existing)	Similar structure with more classes in some states or carve-out program for MA
Eligible renewables	Class I and Class II resources include wind, biomass, solar, geothermal, tidal, hydro	Similar but with different technical and capacity requirements
ACP rates	Base rate set in 2007 and adjusted by CPI annually; ACP only applicable to ME Class I	Similar Class I ACP rates except that CT Class I ACP rates are held fixed (not inflated); different ACP rates may apply for different classes
Banking mechanism	May satisfy 30% of the compliance using excess RECs procured in the prior year	Similar except that excess RECs can be applied toward the next two compliance years

B.2.a Comparative RPS requirements

As shown in Figure 8, Connecticut has the most aggressive target for Class I renewables, requiring 20% of retail sales be provided by qualifying renewables by 2020, followed by Massachusetts, which requires 15% by 2020.

In terms of overall MWh of demand for RECs, it is useful to consider the application of the RPS requirement percentages to projected load and retail sales, shown in Figure 9. For new renewable resources, the Maine Class I (new renewables) RPS is not a significant requirement in MWh terms as compared to RPS policies and MWh demand levels across the rest of New England.

Figure 8. Comparison of RPS requirements in New England in terms of percentage of retail electricity sales, 2008-2020

	Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ME	Class I	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	10.0%	10.0%	10.0%
	Class II	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
	Total	**31.0%**	**32.0%**	**33.0%**	**34.0%**	**35.0%**	**36.0%**	**37.0%**	**38.0%**	**39.0%**	**40.0%**	**40.0%**	**40.0%**	**40.0%**
CT	Class I	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	11.0%	12.5%	14.0%	15.5%	17.0%	19.5%	20.0%
	Class II	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
	Class III	2.0%	3.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
	Total	**10.0%**	**12.0%**	**14.0%**	**15.0%**	**16.0%**	**17.0%**	**18.0%**	**19.5%**	**21.0%**	**22.5%**	**24.0%**	**26.5%**	**27.0%**
MA	Class I	3.5%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	11.0%	12.0%	13.0%	14.0%	15.0%
	Class II RE		3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
	Class II WE		3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
	APS		1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	3.8%	4.0%	4.3%	4.5%	4.8%	5.0%
	Total	**3.5%**	**12.1%**	**13.6%**	**15.1%**	**16.6%**	**18.1%**	**19.6%**	**20.9%**	**22.1%**	**23.4%**	**24.6%**	**25.9%**	**27.1%**
NH	Class I	0.0%	0.5%	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	11.0%
	Class II	0.0%	0.0%	0.0%	0.1%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
	Class III	3.5%	4.5%	5.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
	Class IV	0.5%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
	Total	**4.0%**	**6.0%**	**7.5%**	**9.6%**	**10.7%**	**11.7%**	**12.8%**	**13.8%**	**14.8%**	**15.8%**	**16.8%**	**17.8%**	**18.8%**
RI	New	1.5%	2.0%	2.5%	3.5%	4.5%	5.5%	6.5%	8.0%	9.5%	11.0%	12.5%	14.0%	14.0%
	New/ Existing	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Total	**3.5%**	**4.0%**	**4.5%**	**5.5%**	**6.5%**	**7.5%**	**8.5%**	**10.0%**	**11.5%**	**13.0%**	**14.5%**	**16.0%**	**16.0%**

Note: The first compliance year for Maine Class II (existing renewables) is 2000.

Source: State Public Utilities/Service Commissions

Figure 9. Comparison of RPS requirements in New England by state (Class I or equivalent only), 2008-2020

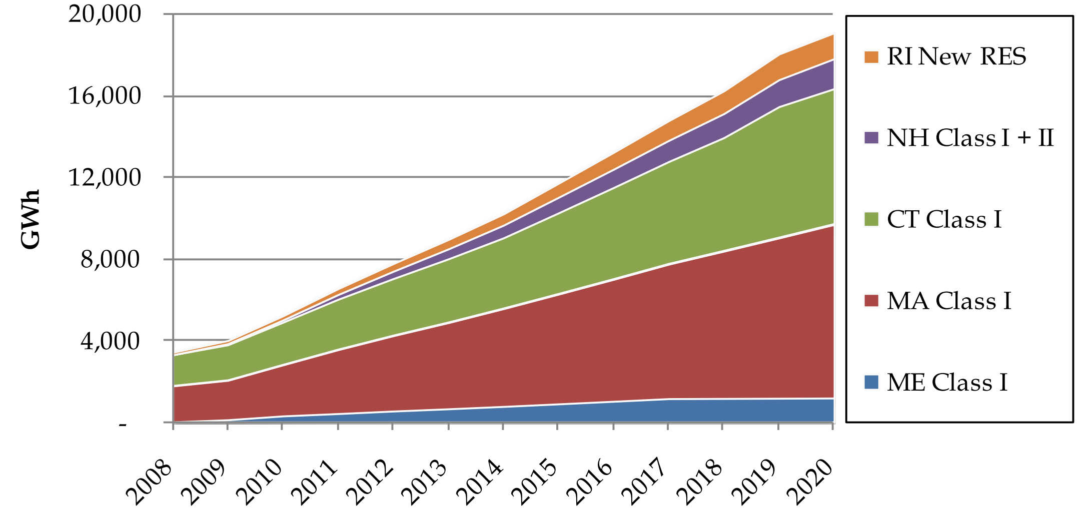
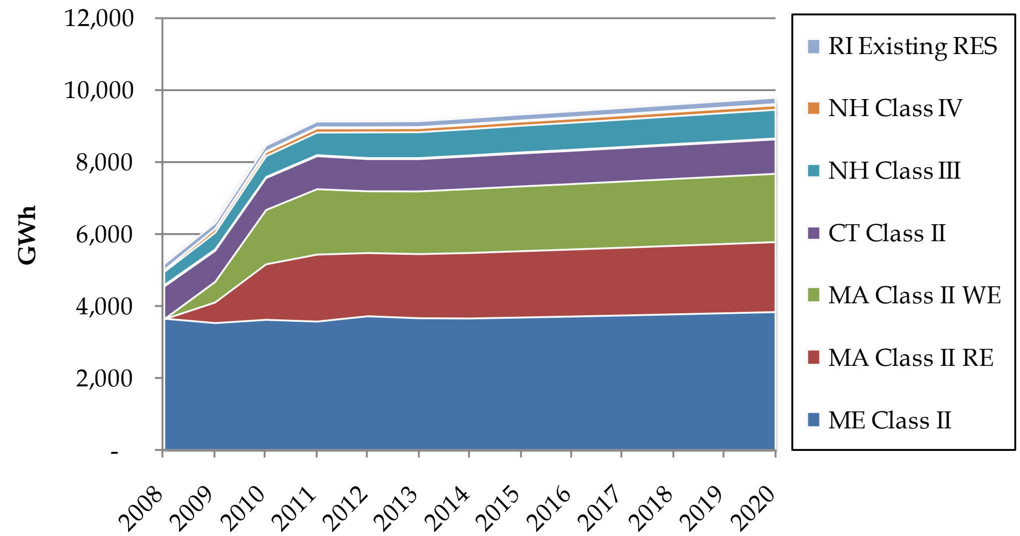


Figure 10. Comparison of RPS requirements in New England by state (for existing renewables only), 2008-2020



Based on ISO-NE's sub-regional demand projections,[35] Maine Class I (new renewables) requirement will increase from 71 GWh in 2008 (i.e., 2% of total RPS requirements in New England) to over 1,200 GWh in 2020 (i.e., 6% of total RPS requirements in New England). In contrast, by 2020, the RPS requirements for new renewables in Massachusetts and Connecticut will account for approximately 15,000 GWh (approximately 80% of New England's RPS requirement).

[35] ISO-NE. *CELT 2011*. Web. <http://www.iso-ne.com/trans/celt/index.html>

By comparison, for existing renewable resources, the state of Maine has the largest RPS requirement. As illustrated in Figure 10, Maine's Class II RPS is estimated to require about 3,800 GWh, or 40% of the total RPS requirement, for existing renewables in New England by 2020. Although a 30% requirement as an overall level is high relative to other states, the ample supply of existing qualifying renewable generation has led to sustained low REC prices for Class II RECs in Maine and thus has reduced the effect of this requirement.

B.2.b Comparison of eligible renewable supply

Eligible resources are typically defined on the basis of technology (fuel type) and are distinguished as a new resource or an existing resource based on a selected on-line cut-off date. Five New England states (excluding Vermont) broadly categorize their RPS requirements into two general classes, namely new renewables and existing renewables. In addition, some states further demarcate the requirement into sub classes or additional sub-categories.

New Hampshire is the strictest with respect to new renewables, mandating that the new resources need to have come into service after January 1, 2006. Massachusetts, on the other hand, is the least restrictive; Massachusetts Class I RECs can include resources that came into service after December 31, 1997.

In terms of technology (fuel type), all of these five states in New England list solar (solar photovoltaic ("PV")/thermal), wind, tidal, small hydro, biomass, and landfill gas as eligible technologies, although with different technical requirements for certain categories of renewables. Some New England states have attempted to encourage specific renewables. For example, cogeneration/CHP facilities only qualify in Maine, Connecticut, and Massachusetts. Energy efficiency projects only qualify in Connecticut, while marine/hydrokinetic projects only qualify in Massachusetts. A more detailed discussion can be found in Appendix A: RPS Regulations in other New England States.

B.3 Overview of REC markets across New England

RECs are the means by which RPS policies are typically fulfilled across New England. Conceptually, a REC is associated with attributes of the power produced from eligible renewable energy resources that may be traded separately from the energy commodity. Unlike energy and capacity products in New England's wholesale power markets, there are no centralized REC market platforms. RECs are traded bilaterally or through brokers. In New England, each state has its own distinct REC product and qualifying guidelines, as discussed in Appendix A: RPS Regulations in other New England States. However, given similarities in state programs and arbitrage opportunities for renewable generators, there is some convergence in the price of state-specific RECs and effectively a regional marketplace.

Technically, each REC represents proof of one MWh of electricity energy that was produced from an eligible renewable resource, which had been certified under the relevant state's RPS program. Many resources get certified in multiple states in order to arbitrage state REC price differences. For purposes of certification and compliance, NEPOOL GIS, administered by APX, Inc., issues RECs to generators.[36]

RECs can be sold separately from the underlying energy and used solely for the purpose of compliance, although there are linkages between RECs and other products sold by generators, like energy and capacity. For example, a REC follows the "location" of energy sales (i.e., in order to qualify to sell RECs in New England, a resource must sell its energy in New England and get its output tracked through NEPOOL GIS).

There is no effective marginal cost of producing RECs as it is co-produced with the energy. The price of RECs is based on break-even economics, specifically the shortfall between the all-in-levelized costs of renewable investment and revenues that the renewable investment receives from the sale of associated energy and capacity.[37] Therefore, high REC prices can be viewed as a market signal for more investment in renewables.

B.3.a REC supply and demand for different RPS programs across New England

By combining RPS requirements with REC supply information tracked by NEPOOL GIS, Figure 11 presents the qualified "supply" and "demand" for RECs among the different RPS programs in each New England state for the 2010 compliance year. As shown, generation eligible for Maine RPS Class II (existing renewables) in the maroon-colored bar significantly exceeds Maine's RPS Class II (existing renewables) obligations in the blue-colored bar, and therefore it is not surprising to observe that Maine Class II (existing renewables) RECs traded at extremely low prices (i.e., less than $0.2/MWh in 2010).[38]

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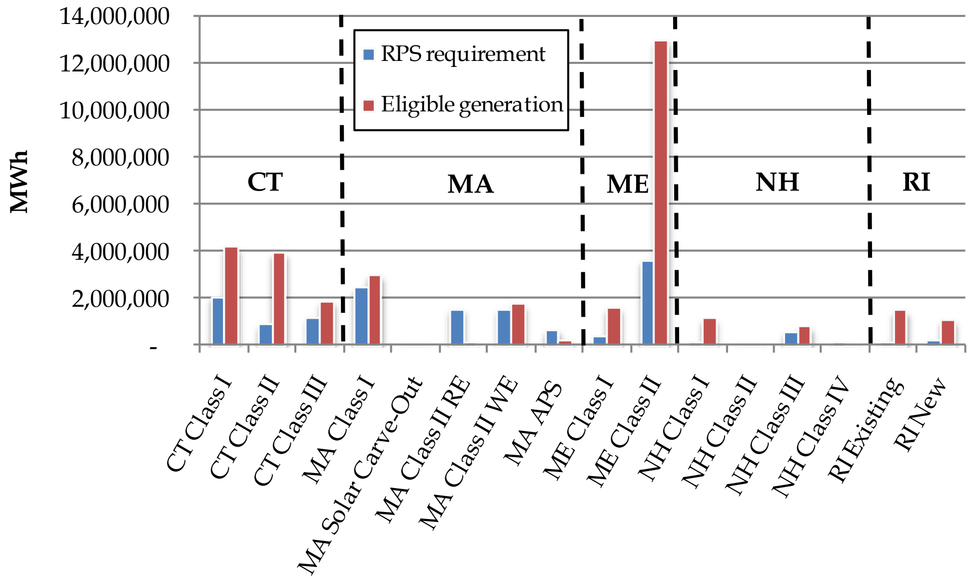
36 NEPOOL GIS is a market platform with multiple functions. One function is to track all the generation and emissions within NEPOOL, neighboring regions and behind-the-meter generation capacity. NEPOOL GIS also verifies and issues RECs for RPS compliance in each state of New England (NEPOOL GIS Overview, Devon Walton, NEPOOL GIS Administrator, APX Inc).

37 In addition, in the response to the Commission's NOI, both HESS and Constellation responded that REC prices are mainly driven by RPS requirements, rather than the costs of individual technology that generated the REC. Constellation further noted that it believes that "[REC] prices [should be] differentiated based on Class I and Class II qualifications rather than based on fuel source alone." These observations suggest the presence of intense competition in the marketplace. Although there is no centralized auction, the observed pricing behavior suggests that the negotiated price is based on opportunity costs of alternative offers, much like a market-clearing price concept in an auction (State of Maine. Maine Public Utilities Commission. *Maine Public Utilities Commission inquiry into Maine's new renewable resource portfolio requirement*. 2011. Docket No. 2011-271).

38 LEI averaged Maine REC Class 2 prices for vintage years 2010 and 2011 (Bloomberg, accessed January 5, 2012).

Figure 11. REC qualified supply and demand for RPS programs in New England for compliance year 2010 (MWh)



Note: RPS requirements are calculated based on estimated retail sales of each state in New England. For eligible generation based on certified resources note that a resource can certify for multiple states and that duplicity is captured in the figure above. Therefore the cumulative eligible generation presented above overstates the actual supply potential of RECs.

Source: NEPOOL GIS, accessed September 2011.

For New England's Class I (new renewables) programs, eligible generation exceeds the requirement in 2010, which indicates sufficient REC supply for compliance.[39] Currently there are REC supply shortages for Massachusetts Class I solar carve-out, Massachusetts Class II RE (existing renewables), Massachusetts Alternative Portfolio Standard ("APS") (efficient thermal resources), and New Hampshire Class IV (existing renewables). Therefore the REC prices for these classes traded at prices close to ACP rates in 2010. For example, Massachusetts Class II RE (existing renewables) RECs for 2010 vintage traded at an average price of $20/MWh compared to the ACP rate of $25/MWh.[40]

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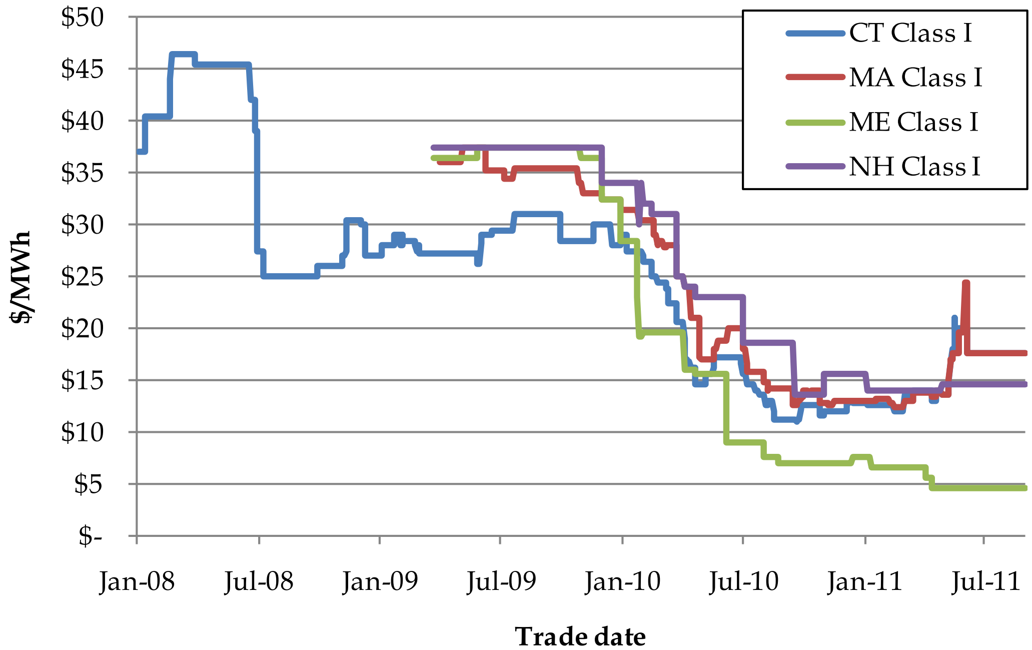
39 The over-supply of Class I RECs may be overstated because a generator may be eligible to sell RECs in multiple states which would cause its generation to appear multiple times in Figure 8. The NEPOOL GIS does not track the sale of RECs for compliance but rather their eligibility.

40 The Massachusetts Class I (new renewables) solar carve-out REC price for 2010 was not available since this was the first compliance year for the solar carve-out program. However, recent Massachusetts Class I (new renewables) solar carve-out REC prices for 2011 traded at $530/MWh on average, while the ACP rate for 2011 is set at $550/MWh. Therefore, a shortage of supply is also expected by the market for compliance year 2011 (Bloomberg).

B.3.b REC prices across New England

REC prices across New England for compliance year 2010 declined over time as shown in Figure 12.[41] Due to the anticipatory nature of RPS requirements and the potential for generators to sell their RECs forward based on projected generation, RECs can start trading before their vintage and compliance year. For example, Connecticut competitive electricity providers bought Class I (new renewables) RECs for the compliance year of 2010 starting in January 2008 to meet their RPS obligations and for banking purposes.

Figure 12. Historical REC prices in New England for compliance year 2010



Trade Period	CT Class I	MA Class I	ME Class I	NH Class I
2008	$ 35.05	N/A	N/A	N/A
2009	$ 28.82	$ 35.09	$ 36.58	$ 37.12
2010	$ 16.70	$ 19.23	$ 12.67	$ 21.79
2011YTD	$ 15.36	$ 15.42	$ 5.35	$ 14.28

Note: 2011YTD = January 1, 2011 – August 31, 2011

Source: Bloomberg, accessed September 2011.

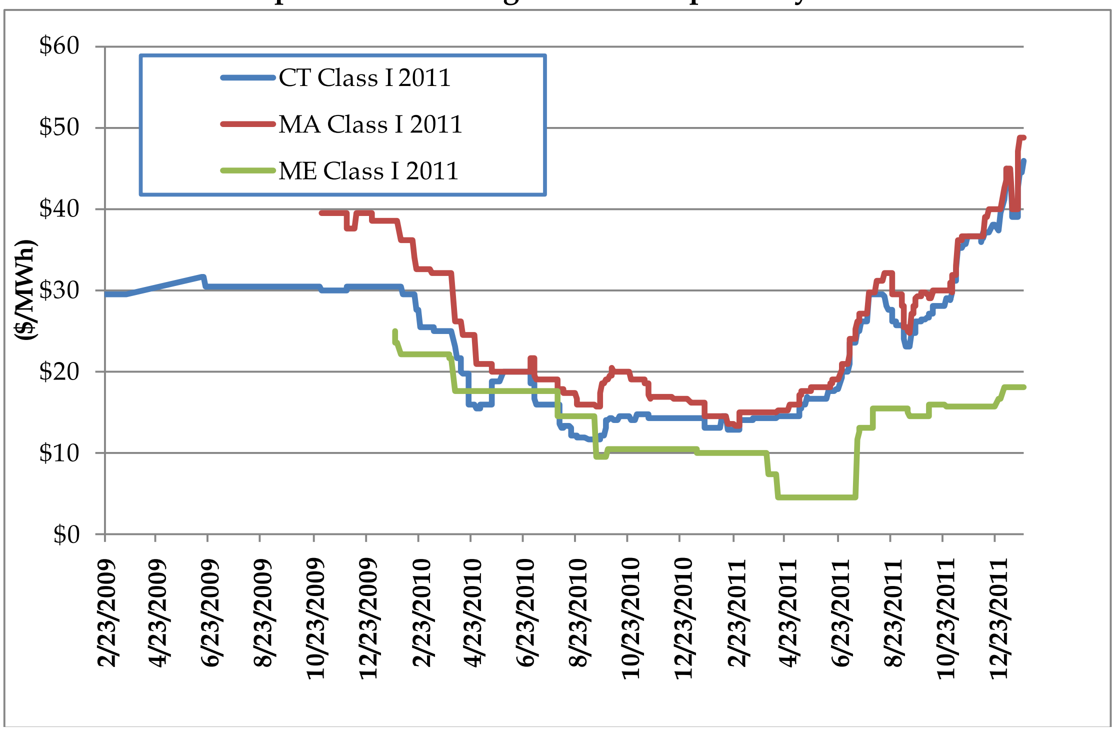
REC prices usually start at a higher level and gradually decline as the end of the compliance period approaches. This reflects the fact that over time more RECs are acquired by electric

41 REC prices are based on bilateral trades for RECs and are not necessarily representative of compliance costs which reflect all of the REC trades reported for compliance.

power suppliers bringing them closer to fulfilling their RPS requirements; thus, the demand for RECs declines, which depresses REC prices. This general pattern in REC prices is observed in Figure 12 for the 2010 compliance year. Class I REC prices (2010 vintage) declined significantly from 2009 to 2010 as more REC supply materialized (see Appendix B: REC Price Drivers for a more detailed discussion on potential supply and demand drivers of REC prices). For compliance year 2010, Maine Class I (new renewables) RECs traded at roughly \$4/MWh to \$7/MWh lower than 2010 Class I REC prices for Connecticut and Massachusetts RECs, respectively.

As seen in Figure 13, the Maine Class I (new renewables) average REC price for all trade dates for 2011 vintage is roughly \$13.5/MWh compared to \$20/MWh for Connecticut and Massachusetts. This REC price discrepancy suggests an oversupply of Maine Class I RECs and a much tighter supply-demand balance in Massachusetts and Connecticut. Reported REC prices may also be influenced by liquidity (or the lack thereof).

Figure 13. Historical REC prices in New England for compliance year 2011



Time Period	CT Class I	MA Class I	ME Class I
all periods	\$23.27	\$25.07	\$13.47

Note: New Hampshire REC prices were not included due to data quality issues.

Source: Bloomberg, accessed January 26, 2012.

Alternative Compliance Payment

For compliance purposes, each state with a mandatory RPS requirement also established ACP rates to cap the price of RECs and offer REC buyers a reference for a maximum price or ceiling. This mechanism serves to cap ratepayer cost exposure to RPS. The payment of the ACP can be used to satisfy the RPS requirement in case the competitive electricity supplier fails to procure sufficient RECs for compliance. The cost of the ACP is addressed in Item 6 (Section C.6 of this Report). A review of ACP mechanisms in other states is a part of the analysis of best practices for ACPs and is discussed in Item 7 (Section C.7) of this Report.

Banking Mechanisms

The banking mechanism provides a tool allowing the compliance entities (for example, competitive electricity providers in Maine) to bank excess REC purchases in previous year(s) and use "banked" credits to satisfy RPS requirements in the future.[42] Generators are not allowed to bank their RECs. The banking mechanism in Maine is stricter when compared to those in other New England states. Maine's RPS allows electricity suppliers to use banked excess RECs from only the prior year to satisfy up to one-third of the RPS requirement, while other states in New England allow compliance entities to satisfy up to 30% (10% for Massachusetts Class I Solar Carve-out) of the RPS obligation by banked excess RECs obtained in the previous two years. Appendix A: RPS Regulations in other New England States provides an overview of the various banking mechanisms currently employed in other New England states.

The banking mechanism provides some degree of flexibility for compliance entities and tends to lower the cost of compliance and the impact on rates. It could promote a more stable REC price as short-term over-supply can be used to mitigate future periods of tight supply-demand, especially given the "lumpy" profile of new renewables development and the impacts that the timing of new development can create in a REC market where demand is otherwise virtually inelastic (given the firm requirement).

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42 For example, generators cannot sell RECs based on generation in 2009 for RPS compliance in 2010.

C. Items for review

C.1 Item 1 - Source and cost of RECs used to satisfy Maine RPS requirements

- **Maine's RPS requirements (Class I) in 2008, 2009, and 2010 were met primarily by Maine resources, and at an average REC procurement cost of approximately $37 per MWh, $26 per MWh, and $24 per MWh, respectively.**
- **For Maine Class I (new renewables) RPS requirements:**
  - **over 80% of purchased RECs were produced within the State of Maine**
  - **ACP only accounted for a small portion of the total compliance costs**
  - **biomass to date has been the major compliance resource**
- **For Maine Class II (existing renewables) RPS requirements, hydro has been the major compliance resource.**
- **The average cost of the Maine Class II (existing renewables) REC price is much lower than that of the Maine Class I (new renewables) given the relative quantity of eligible supply. A difference in price is also theoretically expected given the relative levelized costs of existing versus new eligible resources.**
- **The RPS compliance cost in 2010 was equal to 0.074 cents per KWh or roughly 0.6% of a typical retail residential customer's monthly bill (0.067 cents per KWh constituted compliance for Maine Class I (new renewables) and 0.007 cents per KWh for Maine Class II (existing renewables).**

To fully assess Maine's RPS it is important to understand the source and cost of RECs used to satisfy the state's RPS requirements. For this analysis we relied on compliance reports filed with the MPUC by retail suppliers serving Maine customers. As part of the *Act to Stimulate Demand and Renewable Energy, 2007,*[43] the MPUC is required to put together an annual report based on the status of Class I (new renewables) renewable resource developments and RPS requirement compliance.[44] Other New England states have similar requirements for compliance reports, although release of data differs, as well as the timing of the report issuance. This section focuses on the Maine RPS, while Appendix C: RPS Compliance in other New England States provides a summary of compliance costs for RPS programs in other New England states.

C.1.a Maine RPS Class I (new renewables) compliance

Costs of Class I compliance

LEI calculated the costs of compliance for Class I RPS and found that for 2008 through 2010, the cost ranged from 0.02 cents/KWh to 0.07 cents/KWh (see Figure 14). For example, in 2010 the

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43 P. L. *Act to Stimulate Demand and Renewable Energy, 2007.* Chapter 403 (Codified at 35-A M.R.S.A. § 3210 (3-A)).

44 In 2008, the MPUC was only required to report on the status of Class I (new renewables) resource development and RPS compliance. Starting in 2009, The MPUC also reported on Class II (existing renewables).

RPS requirement for new renewable resources was 3%, or close to 333,000 MWh. The cost of purchased Class I RECs ranged from $5.76/MWh to $43/MWh with a total cost of $8.1 million, which was 76% higher than the compliance cost in the prior year of 2009. The higher compliance cost from REC purchases was due to the higher RPS requirement rather than systemically higher REC prices. Only two (2) out of thirty (30) suppliers chose to pay ACP at the rate of $62.13/MWh for a total cost of $22,500 in 2010. The total compliance cost for Class I and Class II was about $9.0 million, which translated into a rate impact of 0.07 cent per KWh in 2010 (or roughly 0.6% of the retail rate).

Note that reported REC purchase costs would not necessarily figure directly into ratepayer costs, as actual RPS compliance costs (including ACP payments) are not recouped from ratepayers on a flow through basis. Most, if not all, customers pay for supply based on prices established before the fact, either through standard offer service or retail contracts. These prices are reflective of the prevailing competitive market conditions at the time the prices are fixed, including anticipated RPS compliance costs. However, ACP payments are not required until July of the following year after the compliance year ends and, would typically not have been assumed in retail price offers made.[45] Therefore, to the extent that a retail supplier does not anticipate using ACP for RPS compliance, the ACP amount would not directly result in higher rates to Maine ratepayers. Even if a supplier intended to use the ACP, its ability to flow through the higher ACP cost (compared to lower REC prices) would be constrained by the competitive market.

Figure 14. Summary of Maine Class I (new renewables) compliance between 2008 and 2010

	Satisfied through ... (RECs/ ACP)	Cost breakdown between REC and ACP	Average REC purchase price	rate impact (cent/KWh)	REC share of reail costs (%)
2008	75.0%/ 25.0%	$1.4 million/ $0.69 million	$37.19/MWh	0.02	0.1%
2009	97%/ 3.0%	$4.6 million/ $0.32 million	$26.28/MWh	0.06	0.5%
2010	99.7%/ 0.3%	$8.1 million/ $0.02 million	$24.40/MWh	0.07	0.6%

Source: Maine RPS Compliance Report 2009 and MPUC staff

Figure 14 provides a quick summary of the compliance statistics for Maine Class I from 2008 through 2010. Compliance statistics for 2011 will not be available until July 2012, at the earliest. During 2010, approximately 1.1 million MWh or about 9% of Maine's electricity sales were exempted from the new renewable resource portfolio requirements as a result of the pre-existing contract exemption. These exemptions per legislation enacted in 2010 include the sale of electricity to qualified pine tree development zone businesses. Importantly, to the extent that pine tree customers are not charged for Maine's RPS the rate impacts as well as any impact on state economic development would be less. Had there been no exempted sales, Maine would have needed an additional 32,000 MWh of Class I (new renewables) RECs to meet the requirements in 2010.

Sources of Class I RECs

As of December 2011, the MPUC had certified over 800 MW of qualified generation for Class I (new renewables) RECs, although not all are in service at this time.[46] According to NEPOOL GIS, as of December 2011, 50 renewable facilities are qualified for Maine Class I (new renewables) RECs, as shown in Figure 15, more than two thirds of the facilities are located within New England, while the remainder are located in New York (as long as they sell their energy into New England, they will generate RECs that are qualified for Maine's RPS). In terms of technology, the majority of facilities are landfill gas followed by wind power, biomass, and hydroelectric.

Figure 15. Location and fuel mix of eligible facilities for Maine Class I (new renewables) RECs (# of facilities)

	Biomass	Hydro	Landfill gas	Solar	Wind	Total
New England	7	6	9	1	13	36
New York	1	0	12	0	1	14
Total	8	6	21	1	14	50

Source: MPUC, accessed December 12, 2011.

In terms of the location of generators supplying RECs, resources in Maine satisfied over 80% of Maine Class I (new renewables) compliance between 2008 and 2010.[47] The other 20% was satisfied by renewable resources from other states in New England and New York.

Regarding compliance, eligible biomass resources accounted for the majority of RECs used to comply with Maine's Class I (new renewables) RPS, followed by wind and landfill gas resources. The share for biomass increased from 55% in 2008 to 77% in 2010 (see Figure 16, Figure 17, and Figure 18). The share for wind is currently at about 20%.

RECs are generally procured through either brokers or bilateral contracts. Despite the fact that the vast majority of Maine's RPS requirements has been met by Maine RECs, some Maine suppliers have noted in the NOI responses that they are indifferent between sourcing RECs from in-state and out-of-state generators. These same suppliers additionally noted that it is difficult for them to procure RECs on a forward basis for compliance with Maine's RPS, given regulatory uncertainty.[48]

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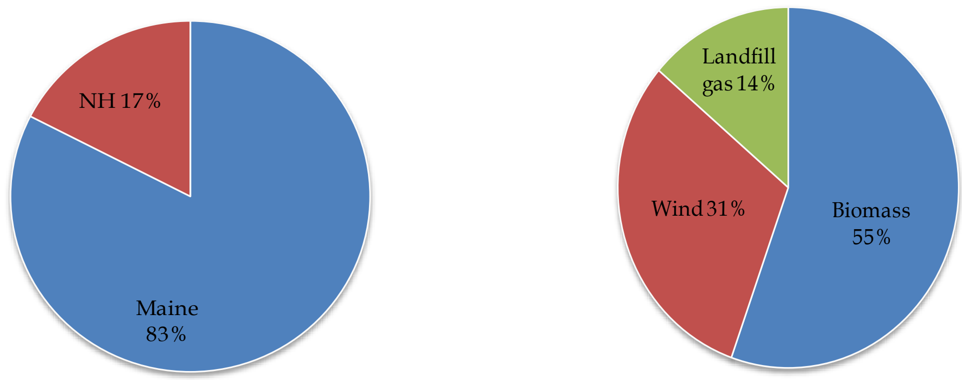
46 "RPS Class I Renewable Resources Applications." *Office of the Maine Public Utilities Commission*. MPUC. Web. <http://www.maine.gov/mpuc/electricity/rps-class-I-list.shtml>.
Note: Many of these RECs are also eligible to satisfy RPS requirements in other New England states.

47 MPUC 2008 and 2009 Annual Report on New Renewable Resource Portfolio Requirement.

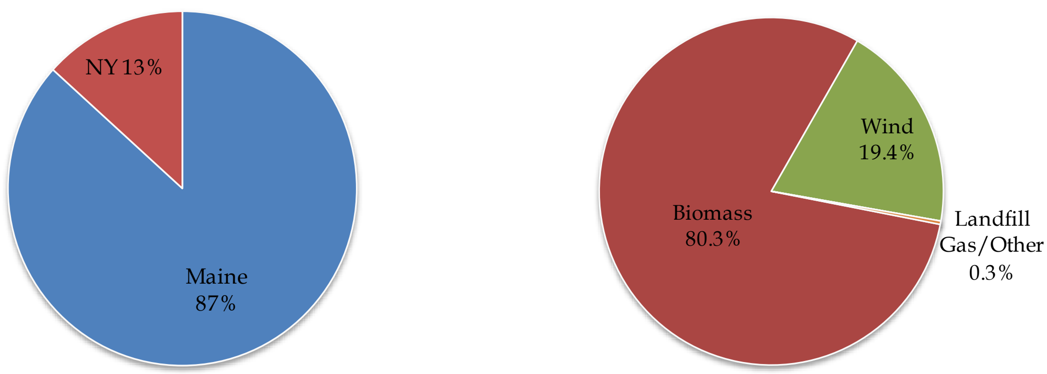
48 Response to the NOI, State of Maine. Maine Public Utilities Commission. *Maine Public Utilities Commission inquiry into Maine's new renewable resource portfolio requirement.* 2011. Docket No. 2011-271.

Figure 16. Distribution of compliance sources for Maine Class I (new renewables) in 2008



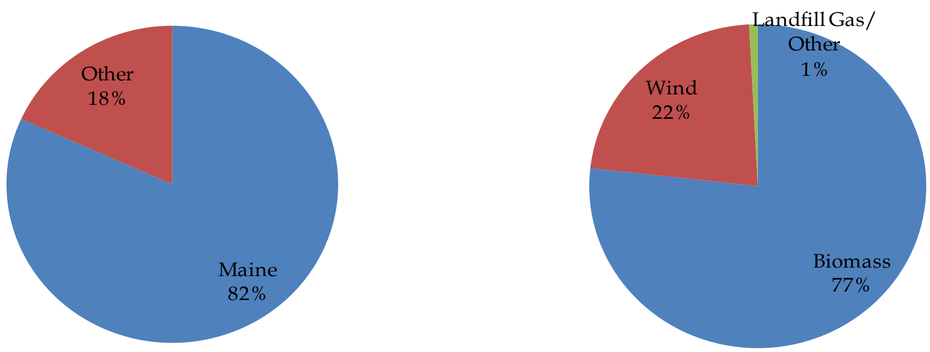
Source: MPUC 2008 and 2009 Annual Report on New Renewable Resource Portfolio Requirement

Figure 17. Distribution of compliance sources for Class I (new renewables) in Maine in 2009



Source: Ibid

Figure 18. Distribution of compliance sources for Class I (new renewables) in Maine in 2010



Source: MPUC staff

C.1.b Maine RPS Class II (existing renewables) compliance

Costs of compliance

Maine is one of five states in New England that has an RPS applicable to "existing" renewables. In percentage terms, the Maine Class II (existing renewables) requirement is the largest (at 30%) compared to other New England states. However, as noted above, given the broad eligibility standards and the resulting abundance of qualifying existing renewable resources, the compliance cost has been low.[49] The cost of Class II compliance has been very stable. In 2009, Maine Class II RECs were procured at a unit cost in the range of $0.00-0.35/MWh with a total cost of approximately $852,000 (some RECs were free as part of energy transactions). In 2010, Maine Class II RECs were procured at a unit cost in the range of $0.00-$0.31/MWh[50] with a total cost of roughly $824,000. The REC Class II compliance costs in 2009 and 2010 both translated into a rate impact of 0.007 cent/KWh or 0.056% of retail rates.[51] Accordingly, the Maine Class II RPS has provided a small contribution to the continued operation of existing renewable generators.

Sources of Class II RECs

Generation within Maine accounted for about 80% of RECs for Maine Class II (existing renewables) compliance in 2009, followed by generation from Massachusetts and Connecticut, which accounted 6% and 7%, respectively.[52] As shown in Figure 19 in terms of eligible renewable technology, hydroelectric resources accounted for over 80% of total RECs purchased to satisfy the Maine Class II (existing renewables) RPS requirement followed by biomass and municipal solid waste (4%). This trend was also observed in 2010.

Effectiveness of the Maine RPS Class II

The intent of Maine Class II (existing renewables) is not to promote new renewable resources, but rather support existing renewable resources. The cost of RECs procured for compliance with Class II (existing renewables) is remarkably low. Stakeholders noted in response to the Commission's NOI that the Maine RPS Class II (existing renewables) program administration costs are possibly higher than the total market premium to generators, leading to the question of whether the Class II requirement should be repealed. However, Maine Renewable Energy Association ("MREA") and First Wind argued that Maine should preserve its Class II RPS as it reflects Maine's historic commitment to a significant renewable component in Maine's energy

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49 According to EIA, renewable generation accounted for 50% of the total generation of Maine in 2009 ("EIA renewable – Maine profile." EIA. Web. <http://205.254.135.24/cneaf/solar.renewables/page/state_profiles/maine.html>).

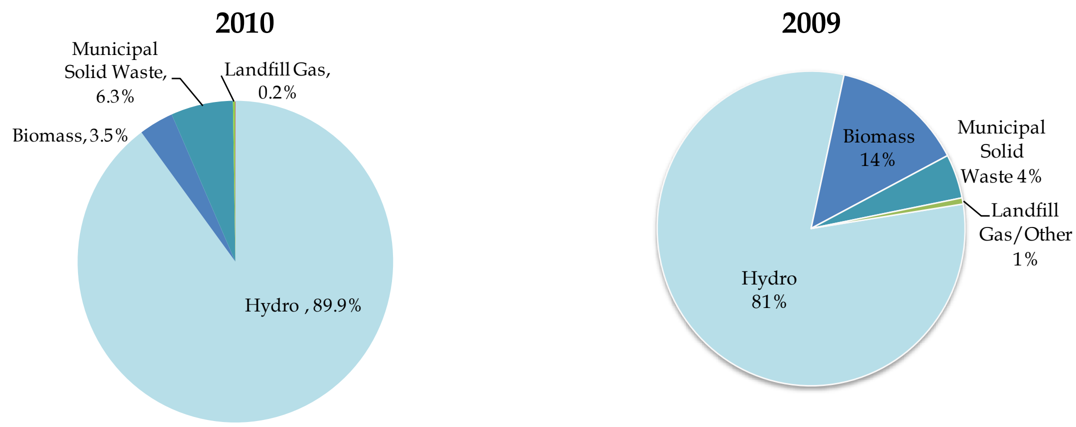
50 Two companies (Calpine and Dynegy) purchased RECs at a much higher price. However, they should be considered as outliers.

51 Maine Class II compliance information for 2008 is not available in the Maine RPS Annual Compliance Report 2008.

52 The same information for 2010 compliance is not yet available.

supply. Furthermore, Maine Waste-to-Energy Working Group ("WTEWG") also acknowledged its support for Maine Class II RECs.[53]

Figure 19. Fuel mix of Maine Class II (existing renewables) RECs purchased



Source: MPUC Annual Report on New Renewable Resource Portfolio Requirement 2009 and MPUC staff

53 Responses to NOI, State of Maine. Maine Public Utilities Commission. Maine Public Utilities Commission inquiry into Maine's new renewable resource portfolio requirement. 2011. Docket No. 2011-271

C.2 Item 2 - Impacts of RECs generated in Maine on the regional REC market

- **Renewable resources within Maine contributed significantly to RPS Class I (new renewables) compliance in other states, such as Connecticut and Massachusetts.**
- **Maine has the greatest amount of new proposed renewable generation in New England. Maine alone cannot absorb all the potential new renewables as its requirement for RPS is smaller than the potential generation of the proposed new supply. Additional supply of renewable resources (e.g., wind sourced from Maine) will tend to lower REC prices.**
- **Policy decisions of other states also affect Maine. Stricter proposed regulations on biomass for Massachusetts Class I (new renewables) RECs may force biomass resources to sell RECs in other states in New England, which are more biomass friendly, including in Maine. This may lower Maine REC prices (especially Class I) in the future.**

C.2.a Interaction of Class I (new renewables) resources by location and fuel mix in 2009[54]

RECs generated in Maine are critical to the compliance strategies in other New England states. This is not surprising, given the relative MWh demand in other states and the resource availability in Maine. Maine's RPS is a relatively small share of the New England regional RPS market simply because of its small share of the electricity demand in New England. The RPS requirement shares for each of the five New England states, as well as the sources of Class I (new renewables) qualifying supply are shown in Figure 20. In 2010, Maine accounted for 6% of total New England RPS demand based on retail sales yet it provided 37% of RPS supply.

Currently, all states in New England accept out-of-state renewables to meet their RPS program (so long as the energy is sold into New England and certified by NEPOOL GIS). Therefore, a renewable resource located in Maine may be eligible to sell RECs in multiple states across New England. That said, changes in RPS regulations/policies in any one state may impact RPS compliance and hence REC market performances in other New England states. As a result, generators are likely to arbitrage any perceived market price differences by ensuring eligibility across multiple states. For example, as of the second quarter of 2011, many of the 43 facilities that then qualified for Maine RPS Class I (new renewables) also qualified for Class I (new renewables) programs in other New England states (i.e., 31 of them qualified for Connecticut Class I (new renewables), 30 qualified for Massachusetts Class I (new renewables), 14 qualified for Rhode Island's new renewable resources, and 23 qualified for New Hampshire Class I (new renewables)).[55] Currently, 51 facilities qualify for Maine RPS Class I (new renewables).[56]

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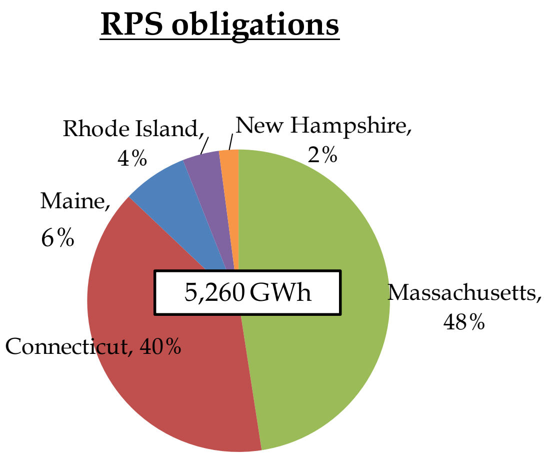
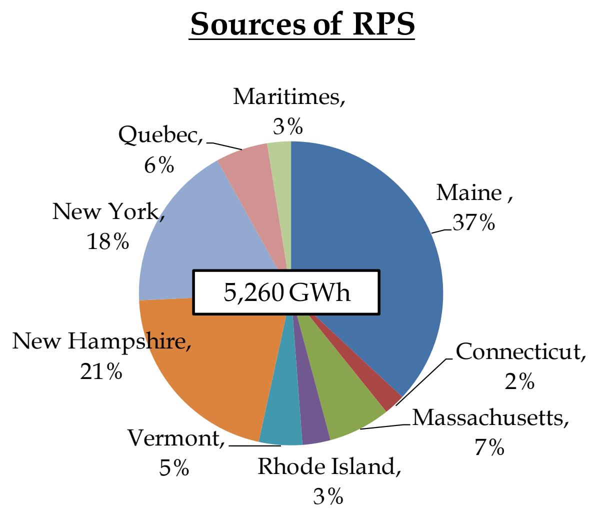
54 2010 data on Class I resources by location and fuel mix is currently not available for the New England states.

55 NEPPOOL Generation Information System as of Q2 2011.

Figure 20. 2010 RPS obligation by state compared to source of RPS supply



RPS obligations are based on estimated retail sales except for Maine where reported sales were available.



The geographic sources are based on 2010 data for Maine, 2009 data for Massachusetts and Rhode Island, and 2008 data for Connecticut.. New Hampshire data is from 2009 data but is based on eligible resources.

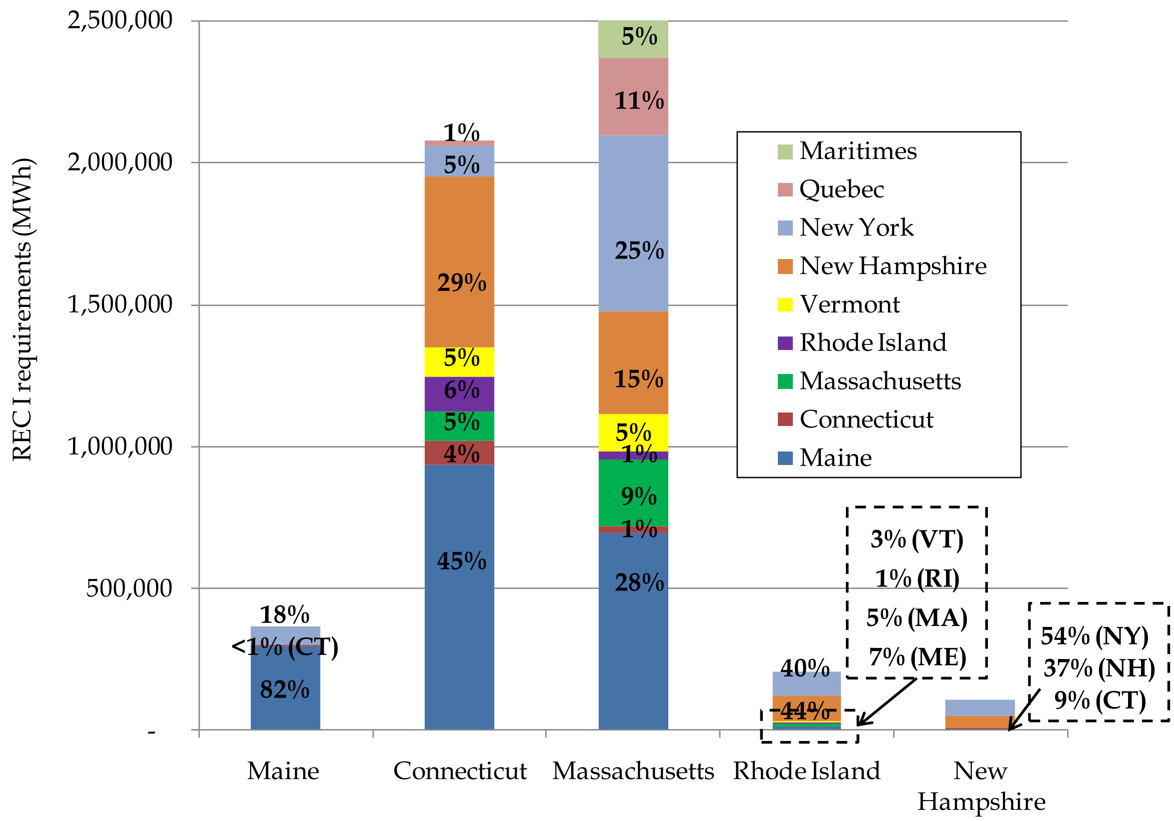
Source: Available RPS compliance reports of states in New England

Renewable resources in Maine accounted for the vast majority of RECs for compliance in Maine in 2009. It is notable that no other state in New England has been using in-state resources for RPS compliance at a level comparable to Maine. This is not the result of statutory requirements, but rather market dynamics. Furthermore, Maine resources also accounted for 45% of Class I (new renewables) RECs in Connecticut in 2008 and 28% of Class I (new renewables) RECs in Massachusetts in 2009. As shown in Figure 21, LEI calculated the RECs sourced by location for each New England state (in MWh). In total, for the 2009 compliance year, RECs sourced from Maine accounted for over 30% of the total New England Class I (new renewable) RPS requirement (3.8 million MWh).

<https://www.nepoolgis.com/myModule/rpt/myrpt.asp>

56 MPUC: RPS Class I Renewable Resources Applications. Office of the Maine Public Utilities Commission. <http://www.maine.gov/mpuc/electricity/rps-class-I-list.shtml>

Figure 21. State REC sources by location in MWh



Note: The geographic sources are based on 2010 data for Maine, 2009 data for Massachusetts and Rhode Island and 2008 data for Connecticut. New Hampshire data is from 2009 data but is based on eligible resources.

Source: Available RPS compliance reports of states in New England

Figure 22 below shows the fuel mix eligible for Class I (new renewable) by state in New England. Similar to Maine's situation, wood (which is a sub-category of biomass) is the main renewable resource used in compliance of Connecticut's Class I program currently. Massachusetts' Class I requirements are satisfied by RECs sourced in close to equal shares from biomass, wind, and landfill gas. New Hampshire's Class I RPS is primarily satisfied with wind, while Rhode Island's new Renewable Energy Standard ("RES") is primarily met with biomass and landfill gas. In addition, for Maine Class I (new renewables) compliance for 2009, most of the RECs were sourced from local biomass and one-third of the RECs sourced from wind were also local to the state of Maine.[57]

57 Maine RPS compliance information for 2010 was provided by the MPUC.

Figure 22. Fuel mix matrix of resources for RPS Class I (new renewables) compliance in 2009 by state

	Biomass	Wind	Landfill Gas	Hydro	Anaerobic Digester	Solar	Fuel Cell	Total
ME	80.3%	19.4%	0.3%					100%
CT*	74.0% **	2.0%	20.0%	3.0%			1.0%	100%
MA	26.8%	37.1%	32.4%	2.2%	1.3%	0.1%		100%
NH***	20.2%	43.6%	27.0%	9.2%				100%
RI	43.0%	2.0%	46.0%	9.0%				100%

MWh	Biomass	Wind	Landfill Gas	Hydro	Anaerobic Digester	Solar	Fuel Cell	Total
ME	140,169	33,864	524					174,557
CT*	1,283,669	34,694	346,938	52,041			17,347	1,734,688
MA	518,573	715,839	626,770	43,086	25,504	2,319		1,932,089
NH***	10,805	23,323	14,443	4,921				53,492
RI	68,031	3,164	72,778	14,239				158,212

Note: * for compliance year of 2008; ** wood accounts for the major source of RECs from biomass; *** for capacity only

Source: RPS compliance reports of states in New England for compliance years 2008 and 2009

C.2.b New investment and certification of more renewable resources will change the fuel mix of RPS compliance

In New England's supply mix in 2011, existing biomass-related capacity totals 1,326 MW,[58] while existing wind capacity totals 439 MW.[59] Historically, wind has not contributed significantly to compliance of state RPS programs. However, wind generation's share of eligible REC supply is expected to increase due to the wind resource potential across New England, especially in Maine, and its cost effectiveness relative to other more expensive renewables.

Wind capacity accounts for 59%, or nearly 3,900 MW, of proposed renewable new entry for the next five years in the ISO-NE IQ as of December 2011 (see Figure 23).[60] Of this 3,900 MW, nearly 2,300 MW are wind projects, and wind projects in Maine account for over 50% of the wind total (even after considering the disproportionately larger size of off-shore wind projects like Cape Wind).[61] Since wind is qualified for RPS Class I (new renewables) compliance in all

58 Biomass includes biomass gases, biomass solids, municipal solid waste, wood waste solids and wood.

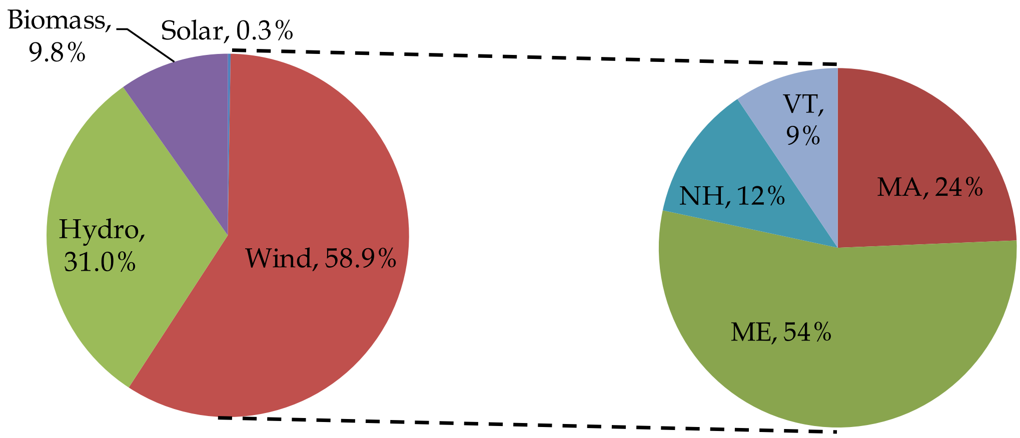
59 Ventyx, the Energy Velocity.

60 The 3,900 MW of proposed renewable capacity could be slightly overstated as some of the projects maybe be duplicated and the size of existing plants include any uprate capacity, e.g. for hydro facilities.

61 ISO-NE. Interconnection Queue as of December 1, 2011. Web. <http://www.iso-ne.com/genrtion_resrcs/nwgen_inter/status/>

five states in New England, additional wind capacity in Maine is expected to impact RPS in other New England states and facilitate REC procurement (by way of increasing supply and reducing REC prices).

Figure 23. ISO-NE interconnection queue of renewables[62] as of December 1, 2011



Note: Wind projects include both on-shore and off-shore wind projects (e.g., Cape Wind).

Source: ISO-NE Interconnection Queue as of December 1, 2011.

C.2.c Revised Massachusetts RPS Class I (new renewables) regulation on biomass

Policy developments in other states could impact Maine and regional RECs. One example relates to biomass regulation. In August 2008, the Massachusetts Global Warming Solutions Act ("GWSA") was enacted by the Massachusetts Legislature, with targets on carbon emission, including: (i) between 10% and 25% below statewide 1990 green house gas ("GHG") emission levels by 2020; and (ii) 80% below statewide 1990 GHG levels by 2050. [63]

In line with the GWSA, in September 2010,[64] the Massachusetts Department of Energy proposed a revised RPS regulation, which imposed stricter regulations for biomass resources in order to be eligible to earn Massachusetts Class I (new renewables) RECs. Under the proposed

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62 Capacity from ISO-NE Interconnection queue could has some duplicity as a project may apply for multiple queue requests.

63 "Overview of the Global Warming Solutions Act (GWSA)." *Massachusetts Department of Environmental Protection*. MassDEP. Web. <http://www.mass.gov/dep/air/climate/gwsa.htm>

64 Specifically, the following revisions were proposed: (i) a Generation Unit achieving 60% or higher Overall Efficiency in a quarter will receive one RPS Class I Renewable Energy Attribute for each MWh of RPS Class I Renewable Energy Generation; (ii) a Unit achieving 40% Overall Efficiency in a quarter will receive one-half RPS Class I Renewable Energy Attribute for each MWh of RPS Class I Renewable Energy Generation; and (iii) a Unit achieving between 40% and 60% Overall Efficiency in a quarter will receive one RPS Class I Renewable Energy Attribute for each MWh of RPS Class I Renewable Energy Generation times a pro-rating fraction calculated as follows: 0.5 + 2.5 x (Overall Efficiency – 0.4), in which case Overall Efficiency is expressed as a decimal.

regulation changes, existing and new biomass generators seeking qualification for Massachusetts Class I RECs need to:

- show that fuel supply is from eligible sources, which are narrowly constrained in the statute to prohibit construction and demolition waste or whole trees harvested for fuel;
- demonstrate overall efficiency of 40% to obtain half-REC credit, and 60% overall efficiency to receive full RECs; and
- submit a Lifecycle Greenhouse Gas Emissions analysis that demonstrates a 50% GHG emissions reduction per unit of useful energy over 20 years compared to a Natural Gas Combined Cycle generating plant.

Currently, the proposed changes are in the process of obtaining approval from the Massachusetts Legislature and are likely to be enacted given current support from the Massachusetts governor's office. Both Gov. Devil L. Patrick and Lt. Gov. Timothy P. Murray have publicly stated their positions in favour of the new requirements on biomass power plants to meet strict emission standards to earn the full credit from the Massachusetts Class I (new renewables) REC.[65] Once this regulation revision is passed, the share of Massachusetts Class I (new renewables) RECs produced from biomass will be expected to decrease and the supply of RECs sourced from biomass to meet RPS requirements in other states in New England that allow for biomass (for example, in Maine, New Hampshire, and Rhode Island) is expected to increase, which would put downward pressure on REC prices and RPS compliance costs in these other states. Consequently, the different standards of eligibility would expand the regional REC price difference between Massachusetts and Maine. Similarly, if Maine were to change its RPS policies, it would impact REC compliance markets in other New England states.

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65 Crowe, Robert. "Massachusetts Proposes GHG Restrictions on Biomass Power." *Renewable Energy World*. May 11, 2011. Web. <http://www.renewableenergyworld.com/rea/news/article/2011/05/ma-proposes-ghg-restrictions-on-biomass-power>

C.3 Item 3 - Impacts of RPS requirements on the viability of electricity generating facilities in Maine eligible to meet the RPS requirement

- **RPS requirements in Maine, as well as other New England states, are met primarily through the purchase of RECs from eligible renewable electricity generating facilities.**
- **Current Maine Class I REC prices do not fully fund the gap between the all-in levelized costs and expected revenues of a typical new renewable project.**
- **Class I REC prices are, however, more than sufficient to cover minimum going forward fixed costs for an already operating (existing) renewable generating plant.**
- **Although Maine's Class I REC prices are lower than other New England states, RECs still provide a significant source of income for qualified generators.**
- **Based on average REC prices for the 2010 vintage of Maine Class I, REC sales contributed 25% of the total revenues for a typical biomass plant, and 26% of total revenues for a typical run of river hydroelectric plant and a typical wind plant in 2010.**

The presence of RPS requirements in Maine and other New England states creates an income generating opportunity for qualified renewable resources. That income then contributes positively to financial viability. One indicator of the positive impact of RPS is the investment trend in new renewables. In Section C.3.b below, LEI describes how REC sales income contributes to overall cost recovery for a typical renewable generating plant. In summary, Class I REC prices in Maine and across New England are currently not at levels currently sufficient to, on their own, promote new investment and fully remunerate a new investor. However, REC revenues do provide a material source of income for both existing and already operating renewables. [66]

C.3.a The effectiveness of RPS policies in promoting renewable generation development in New England

The investment decision for building new renewables is complex. There are many contributing factors, including: the presence of favorable natural resources (for example, abundance of wind, sunshine, water, fuel for biomass, etc.); suitable energy market conditions; relative ease of siting; and interconnection and regulatory stability. RPS policies and other state and federal subsidy mechanisms also help to support investment. Based on a review of summary statistics on new build, there appears to be an increasing trend in renewable generating capacity that coincides with development of the Maine Class I RPS, as well as the initiation of other RPS programs across New England.

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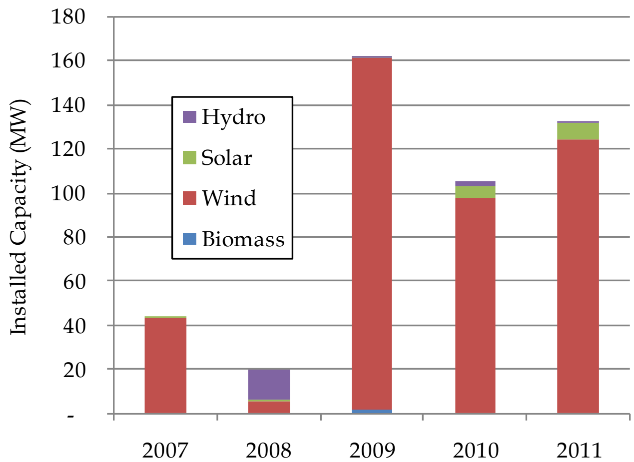
66 As mentioned earlier in this Report, current prices for Maine Class II (existing renewables) RECs are currently close to zero. Therefore, the focus for this discussion item will be on the Maine Class I (new renewables) RPS requirement and RECs for Class I (new renewables) resources.

As shown in Figure 24, installed capacity of wind across the New England region increased by 160 MW in 2009 and another 98 MW in 2010. In 2011 (as of November 30, 2011), an additional 124 MW of wind achieved commercial operation. By comparison, there was less than 60 MW of installed wind capacity added to the New England system in the ten previous years (1997-2008).[67] Furthermore, most of the renewable new entry across New England since 2007 is wind-based.

Figure 24. Incremental Renewable new entry in New England since 2007



Sources: Ventyx, the Energy Velocity

Overall, key statistics on new renewable generating capacity suggest that the combination of market dynamics, availability of natural resources (wind regimes) and RPS policies in New England is favorable to new renewable generation development. However, it is difficult to isolate the impact of Maine's RPS from the other states', since many generators qualify for multiple states' RPS programs (and actually hold multi-certifications, so that they can arbitrage any REC price differences).

In discussing potential contribution of the RPS to the promotion of new investment, it is also important to keep in mind that the Maine RPS program is relatively small. Maine accounts for about 11% of total New England retail load and, in terms of RPS MWh requirements, Maine accounted for 6% of the regional obligation in 2010. In 2017 when Maine's Class I requirement reaches 10% of retail sales, Maine Class I (new renewables) will account for 7% of the regional market for RPS involving new renewables. The RPS obligation of 1,200 GWh in 2020 is equivalent to the total annual generation from biomass resources with a capacity of 170 MW (assuming a capacity factor of 80%) or the total annual generation from wind resources with a total capacity close to 400 MW (assuming a capacity factor of 35%). Therefore, given the electricity consumption of Maine consumers, the Maine RPS program is limited in the quantity of renewable generators it can support directly. Moreover, modest increases in the requirement are not likely to motivate additional capacity for some time given the commercial scale of new

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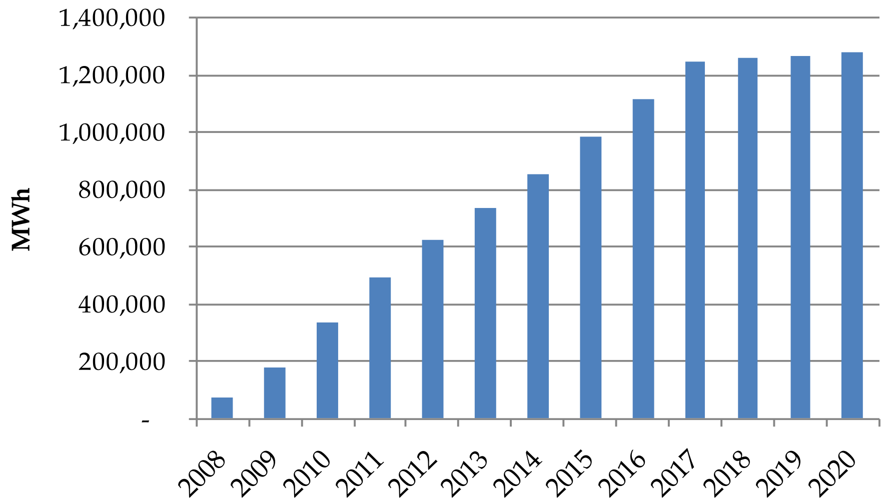
67 Ventyx, the Energy Velocity.

generation (since most costs are fixed, it is more economic for developers of new generating plants to build large scale facilities, whereby the cost per unit of output is smaller and more easily recoverable from market revenues).

Figure 25. Required Maine RPS Class I (new renewables) RECs from 2008 to 2020



Source: Maine RPS Compliance Report in 2009 and ISO-NE CELT 2011

Nonetheless, as evidenced by historical data and proposed new developments Maine is favored among wind developers due to its quality wind regime and other economic factors like the cost of siting. Therefore some of the new wind development in Maine will likely be built to meet the RPS needs of other New England states and thus paid for ratepayers in these other RPS states.

C.3.b Quantifying the economic viability of renewable facilities

In practice, whether new renewables projects are built depends on whether the invested capital cost can be recovered through expected revenues, including energy markets, capacity markets, and REC markets, as well as applicable subsidies, such as federal investment grants and the PTC. Therefore, in order to analyze the implications of RPS on economic viability of new generation investment, it is important to first identify the levelized costs of new entrants and the revenues they can expect from markets. Then, based on the all-in levelized costs and expected market revenues, we can calculate the breakeven shortfalls for different renewable technologies. We compare the breakeven shortfalls against actual REC prices below to assess how current RPS policies contribute to the economics of new generation investment.

For renewable generators already operating, the economic decision is different from the developers' decision to invest. For an existing renewable generating facility, the investment has already been made. Therefore, the equity portion of that investment is "sunk." The existing renewable generator will need to decide whether to continue to operate or not. Going-forward, economic viability is judged by reference to the fixed costs it can avoid if it were to shut down operations – in economics, this is commonly referred to as "minimum going forward fixed costs." Minimum going forward fixed costs will be less than all-in levelized costs as they would not include the equity component associated with the initial investment. This type of economic decision applies to both Class I (when the market is oversupplied and already operating renewable capacity is setting REC prices) and Class II operating facilities.

<u>Assessing investment decisions for new renewable resources and an optimal Class I REC price</u>

Step 1: Identifying levelized costs of new renewables

LEI's New Entry Trigger Price ("NETP") model was used to estimate the required all-in levelized costs for different eligible renewable technologies. The all-in levelized costs are calculated based on forecast capital costs, operating & maintenance ("O&M") costs, cost of capital, fuel price (where relevant), and projected operating regime.

Step 2: Estimating expected market revenues for new renewables

Next, we estimate available market revenues (from the energy market, and capacity market), and applicable subsidies (such as investment grants and the PTC).

Step 3: Calculating the shortfall between levelized all-in costs and expected market revenues

The break-even shortfall represents the optimal revenues per unit that a renewable generator would like to earn from RECs in order to earn a reasonable return on investment and recoup capital costs.

As we discuss further below, current REC prices – especially in Maine, but also in other New England states – are not at levels sufficient to motivate new entry and fully remunerate a new entrant, but they are at levels necessary to support and pay for the minimum going forward fixed costs of already, operating renewable generators.

C.3.b.a Economic viability of new renewable generators by reference to their all-in levelized costs

A comparison between the all-in levelized costs and potential revenues in ISO-NE markets (including energy, capacity, and the PTC) enables a determination as to whether, given prevailing RPS policies and REC prices, new renewable projects will be motivated to enter the market.

Based on our analysis of various renewable technologies, historical Maine Class I (new renewables) REC prices would not fully fund the gap between all-in levelized costs and expected revenues (so there would continue to be a "break-even" shortfall).[68] As illustrated in Figure 26 below, the maroon-colored bars show the breakeven shortfalls by technology type. For example, an on shore wind plant in Maine would have a breakeven shortfall of $33/MWh,

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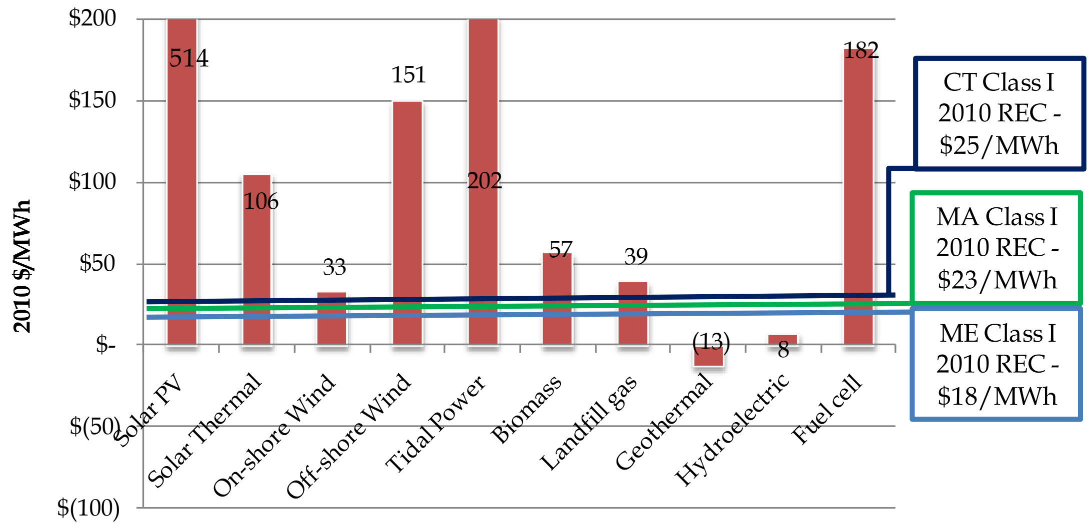
68 Class I REC prices are based on surveyed bilateral REC trades and may differ from reported compliance costs.

taking into account energy and capacity revenues and the PTC. Maine Class I RECs at $18/MWh (the average price for 2010 vintage RECs) then are providing about 55% equity recovery for new on-shore wind generators, and less than 25% equity recovery for new biomass plants.

Figure 26. Comparison of "break-even" shortfalls for new renewables and vintage 2010 REC prices ($/MWh) [69]



Note: The maximum of the Y-axis is fixed at $200/MWh to show the relationship between breakeven shortfalls and Class I (new renewables) REC prices of Connecticut, Massachusetts, and Maine for 2010, which are calculated as an average based on historical data.

Source: Bloomberg, accessed September 2011.

Notably, the higher Class I REC prices in other states, like Massachusetts and Connecticut, are not sufficient to fully fund a new renewable generation project. Resulting REC revenues in Connecticut and Massachusetts cover 76% and 70% respectively of the breakeven shortfall for a typical on-shore wind project. Appendix D: Assessing the Optimal REC Price for Promoting New Investment Based on the Break-Even Shortfalls between all-in levelized costs and revenues for various renewable technologies describes the step-by-step mechanics and key assumptions used in these calculations.

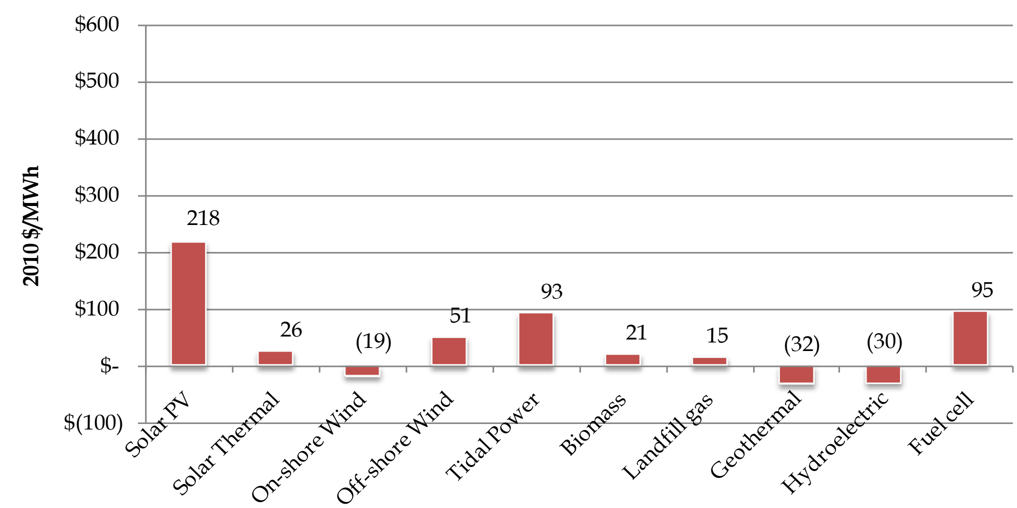
69 Because reported average compliance costs for 2010 for Connecticut and Massachusetts were not yet available in the same format as Maine when this analysis was being conducted, LEI relied on bilateral over-the-counter Class I REC price data for 2010 compliance year products. For reference, the 2010 Class I average compliance cost in Maine was $24/MWh as discussed in Item 1 (Section C.1 of this Report) and the 2011 compliance year Class I REC price (for RECs traded from January of 2010 through to January 25th, 2012) for Maine is $13.5/MWh.

C.3.b.b Economic viability of existing renewable generators by reference to their minimum going forward costs

In contrast to new renewable generation, REC prices are more than sufficient to cover minimum going forward fixed costs. Economic theory suggests that it is rational for renewable generation owners to opt to sell their RECs under their all-in levelized costs (and sacrifice some portion of the equity return) in order to recover at least their minimum going forward fixed costs.

As shown in Figure 27, on-shore wind, landfill gas, and biomass plants have a negative value – this means that market revenues plus PTCs are sufficient to cover fixed operating costs and notional debt payments. Therefore the REC price is effectively representing some of both the return on and return of the equity contribution. As of December 2011, the traded value for Maine Class I RECs for 2011 compliance was $13/MWh, which implies an equity recovery rate of 10% for a generic, on-shore wind project and an equity recovery rate of 14% for a generic biomass plant.[70,71] From the perspective of an already operating renewable resource, Maine's RPS may be an important contributor to maintaining going forward economic viability and avoiding the decisions to shutdown.

Figure 27. Breakeven shortfalls of existing renewable generators – based on minimum going forward fixed costs less expected market revenues and PTC



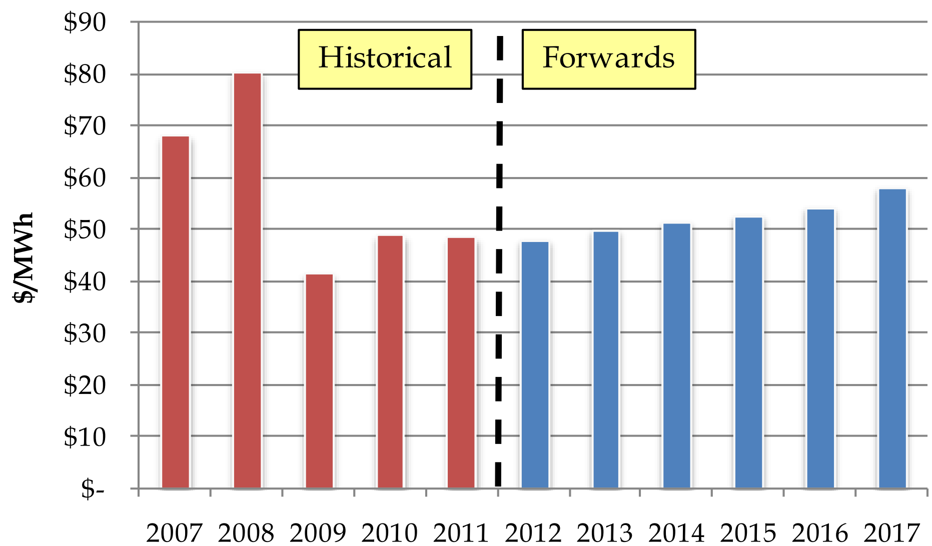
70 The calculation of the equity return is based on LEI's assumptions in the NETP model with a notional leverage and certain assumptions on debt rate, operating regime, and overall investment costs. The calculation of return on equity is meant to be illustrative.

71 The equity recovery includes both the return on and the return of the equity portion of invested capital.

C.3.b.c Implications for the future

With increasing electricity prices and the potential for decreasing capital costs of some eligible renewable technologies due to technical improvement,[72] the relationship between the REC price and the breakeven shortfalls is expected to improve over the time. For example, as shown in Figure 28, historical ISO-NE annual average prices ranged from $42/MWh to $80/MWh (2007-2011 YTD). At the same time, NEPOOL market forwards currently suggest an average New England price starting from $48/MWh in 2012 and escalating to $58/MWh in 2017. For example, if electricity prices rise by 16% in the next few years from current levels, an on-shore wind farm would be economic at REC prices in the mid $20s per MWh (assuming the Federal PTC is extended).[73] Appendix D: Assessing the Optimal REC Price for Promoting New Investment Based on the Break-Even Shortfalls between all-in levelized costs and revenues for various renewable technologies presents a more detailed discussion on the relationship between energy market revenues, PTCs, and REC revenues with respect to a generator's economic viability.

Figure 28. ISO-NE Internal Hub day-ahead locational marginal prices ("LMP"), historical price vs. market forwards



Source: Ventyx, the Energy Velocity; Bloomberg, accessed September 2011.

Access to the lowest cost renewable resources is not boundless. Maine's current RPS policies create competition among different renewable resources. For example, as seen in the illustrative

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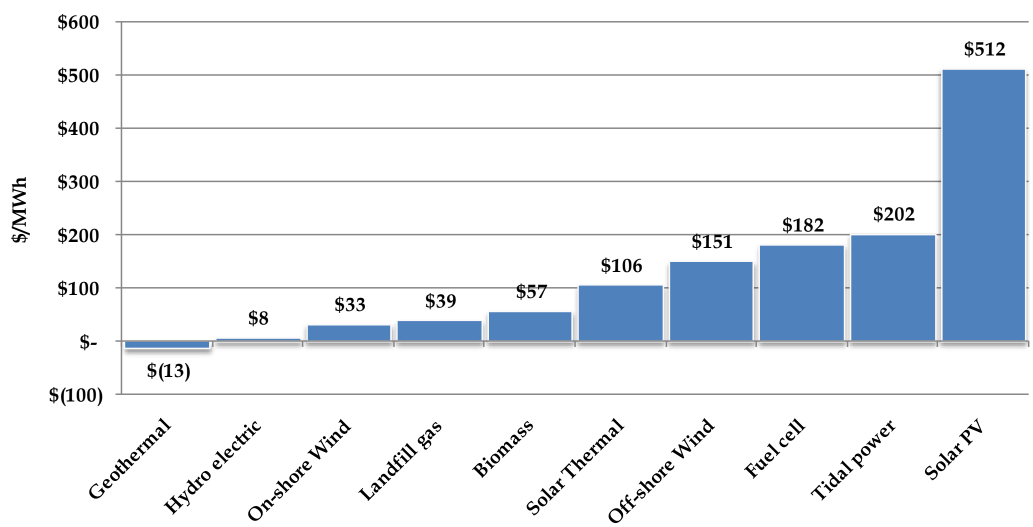
72 Renewable developers (i.e., Ocean Renewable Power Company ("ORPC") and Constellation) also acknowledged that the capital costs of solar PV and wind technologies have decreased significantly over the past 10 years (Responses to the Notice of Inquiry ("NOI"), State of Maine. Maine Public Utilities Commission. *Maine Public Utilities Commission inquiry into Maine's new renewable resource portfolio requirement*. 2011. Docket No. 2011-271).

73 In reality, market dynamics may be more complicated. For example, renewable developers may not be able to predict future energy prices perfectly and therefore create some lag between actual energy market outcomes and REC prices they are willing to accept as a signal for investment.

renewable resource supply curve below in Figure 29, geothermal and hydroelectric resources would require the lowest REC price to breakeven on their levelized costs (under current energy market conditions), and therefore the lowest REC price to motivate investment. Geothermal capabilities are minimal in New England, however, and hydroelectric development is also constrained as most feasible and economic sites have already been developed.

This illustrative renewable resource supply curve shows that with time, as RPS policies exhaust lower cost, available renewable resources, we expect REC prices to increase to the next viable technology. Not surprisingly, on-shore wind is the next most cost-effective renewable resource given current market conditions – requiring a generic REC price of $33/MWh to break-even on the all-in levelized costs. After on-shore wind, the next most economic renewable under current market conditions is landfill gas, followed by biomass. Although this is a stylized supply curve that uses generic levelized cost information, it may be useful for policymakers to keep this information in mind as they consider RPS policies and the implications for renewables. For example, if policymakers want to encourage new off-shore wind generation, this supply curve shows that REC prices will need to be much greater than current levels. Similar to off-shore wind, significantly higher REC prices or a solar carve out for RPS with an appropriate solar ACP, similar to the one employed in Massachusetts, would be required for meaningful solar power development.

Figure 29. Illustrative supply curve for Maine Class I (new renewables) based on breakeven shortfalls assuming 100% of equity recovery



Source: Detailed assumptions can be found in Appendix E: Key Assumptions used in the NETP Model

C.4 Item 4 - Impacts of RPS requirements on Maine ratepayers' electricity costs

- **Maine's RPS requirements translate into a 0.57% increase of a typical customers' monthly electric utility bill in 2010.**
- **This level increases to 1.9% by 2017 when the RPS requirement reaches 10% of retail sales (assuming an average REC price of $24/MWh).**
- **Over the long term, as RPS policies motivate new renewable investment to a significant scale, energy price reductions will occur in the wholesale market, due to the introduction of low marginal cost renewables, which may partially offset the costs of higher REC prices and higher RPS requirements.**

RPS costs are included on retail customers' monthly electricity bills, typically embedded within the supply charges for competitive electricity providers or standard offer service. As mandated by Maine's RPS, 3% of the total retail sales in 2010 had to come from eligible Class I (new renewables) resources in 2010 and 30% from Class II (existing renewables) resources.[74]

The question of retail rate impact in the future requires an analysis of how REC prices are influenced by RPS policies. Appendix B: REC Price Drivers describes the various drivers of REC prices, including both the direct and indirect influences of changing RPS requirements and other policy mechanisms. In order to provide a quantitative element for policymakers' consideration, LEI has performed a hypothetical "what if" analysis to capture how RPS changes impact REC prices and costs to ratepayers, the results of which are shown in Figure 30. More detailed discussions can be found in Appendix F: Cost Impacts of RPS Requirements on Maine Customers.

LEI started with the baseline where REC prices remain at the 2010 compliance year price of $24/MWh with the 3% RPS requirements, we refer to this as the "status quo." Next, we tested three illustrative scenarios:[75]

1) the RPS requirement increases to 10% and REC prices increase to where they were in 2010 (i.e., REC prices are at 2010 compliance year levels of $24/MWh);

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74 Thus for each MWh of electricity consumed by Maine customers, 30 KWh needs to be produced from eligible Class I (new renewables) resources and 300 kWh from Class II (existing renewables) resources. Based on the average REC procurement costs reported for compliance year 2010, a typical Maine customer paid 0.07 cents/KWh on average for RPS (both Class I and Class II) As of 2010, the average retail rates for Maine ratepayers are 12.6 cents/KWh for all consumers. Therefore, the cost of 0.07 cent/KWh for RPS compliance is equivalent to a .57% increase in the retail rates for all three retail consumer classes in 2010.

75 LEI did not perform any forecasting analysis of REC prices and these selected price levels are meant to illustrate possible impacts and do not reflect any projection of expected REC prices.

2) the RPS requirements increase to 10% of retail sales and REC prices increase to $33/MWh, equivalent to the notional break even cost for new on-shore wind generation, as discussed in Item 4 (section C.4); and

3) the RPS requirements increase to 10% of retail sales and REC prices are at 2011 compliance year (to date) levels of $13.5/MWh.

Figure 30. Impacts of RPS requirements on Maine ratepayers' electricity costs

Scenario	RPS requirements	REC prices	Impact
Status Quo*	Current RPS requirements for Class I in 2010 (3%)	$24/MWh	REC compliance costs equal to 0.072 cent/KWh, or 0.57% of average current retail rates, or $0.37 of the current residential monthly bill
1	10% of retail sales	$24/MWh	REC compliance costs equal to 0.24 cent/KWh, or 1.90% of average current retail rates, or $1.25 of the current residential monthly bill
2	10% of retail sales	$33/MWh	REC compliance costs equal to 0.33 cent/KWh, or 2.62% of average current retail rates, or $1.72 of the current residential monthly bill
3	10% of retail sales	$13.5/MWh	REC compliance costs equal to 0.135 cent/KWh, or 1.07% of average current retail rates, or $0.7 of the current residential monthly bill

* Assumes 12,000 GWh retail sales and a typical residential usage in Maine of 520 KWh/month

Based on these scenarios, the ratepayer impact for varying levels of RPS requirement and REC prices ranges from representing 0.57% of the current average retail rate under current RPS requirements and assuming a REC price of $24/MWh to an increase of 2.62% assuming RPS requirements increase to 10% of retail sales and REC prices increase to $33/MWh. LEI did not explicitly examine a lower RPS requirement but this - in addition to resulting in a lower rate impact than the status quo - would also have the potential to impact not only electricity consumers but also other sectors to the extent that a lower RPS requirement (as well as lower REC prices) could motivate generation closures.

RPS requirements create both direct and indirect cost implications for Maine customers. In general, in the short term, RPS compliance costs increase costs of electricity service for Maine customers. However, in the long term, when New England's' RPS policies motivate new renewable investment to some significant scale, wholesale energy price reductions due to the introduction of low marginal cost renewables will occur and will moderate, at least to some extent if not fully, the cost of the RPS.[76] For example, ISO-NE has estimated in its studies that in the single study year of 2016, the energy price can decrease by $0.6/MWh per 1 GW of new on-

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76 The additional renewable capacity, assuming it a low marginal cost resource would shift the supply curve of New England to the right, displacing other generation – in or out of state – and thereby cause LMPs to decline.

shore wind generation in the region.[77] Notably, even as higher RPS requirements increase, the total costs of compliance, the energy costs are estimated to decline. Moreover, the development of renewables in New England serves as a hedge against price volatility that can result with changes in natural gas prices. The investment activity of constructing new renewable generators may also create other benefits, as discussed in Section C.8 of this Report.

77 ISO-NE Planning Advisory Committee. *2011 Economic Study Update*. Wayne Coste, Principal Engineer. September 21, 2011. <http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2011/sep212011/2011_eco_study.pdf>

C.5 Item 5 - Impacts of an increase of electricity costs due to RPS requirements on economic development in Maine

- **Economic development is traditionally measured in terms of impact on economic activity, which is well represented by measures such as gross state product and employment**
- **Electric power consumer cost increases due to RPS will cause a reduction in economic activity, both direct and indirect, by cutting spending and investment. LEI measured the direct and indirect impact of increased costs on gross state product by considering multiplier effects for various types of retail customers (residential, commercial, and industrial).**
- **If RPS compliance increases from 3% to 10% and REC prices increase from the 2010 compliance year level of $24/MWh to $33/MWh, the additional costs due to RPS compliance on residential customers will contract economy activity in Maine by about 0.06%.**
- **For large commercial and industrial customers of electricity, like the tourism sector and the pulp and paper manufacturing industry, the impact on Maine's Gross State Product from exposure to higher RPS compliance costs under a higher RPS requirement and higher REC prices is tempered by the fact that electricity is typically under 5% of total operating costs.**
- **In the long run, RPS requirements may promote additional renewable power development by commercial and industrial customers.**
- **In addition, RPS policies may promote innovation – some pulp and paper manufacturing facilities in the state and other parts of New England have re-positioned existing assets that formerly served manufacturing load to sell electricity on-grid and produce renewable energy to take advantage of associated REC revenues.**

This section analyzes the impact of a potential increase in electricity costs as a result of RPS on economic development in Maine. Economic development is traditionally measured in terms of impact on economic activity, which is represented by measures such as gross state product[78] and employment. As electricity costs rise, customers should experience reduced disposable income, which could then lead to a decrease in both their level of spending and investment, and therefore reduce the GSP.[79] The impact of RPS on electric power rates, addressed in Item 4 (Section C.4) of this Report, is estimated to be between an increase of 0.57% to 2.62% of the 2010 retail customer's bill, and this would produce an impact of 0.02% to 0.08% in reduced spending.

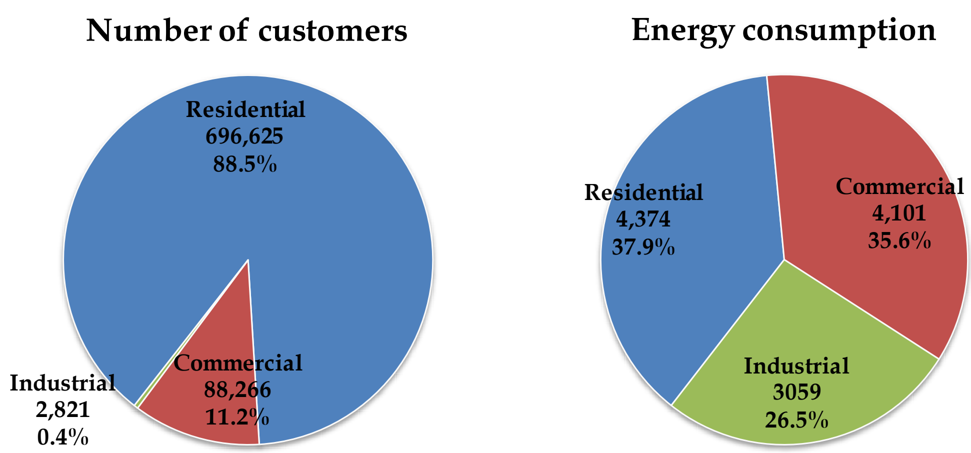
78 Gross state product measures the economic value of outputs from all activities performed within the state.

79 LEI did not examine or quantify any potential impacts of energy efficiency motivated by higher costs of electricity. Energy efficiency, if it were to be realized as a direct result of higher RPS compliance costs, could in turn provide an offset to those higher compliance costs and possibly reduce energy costs as well.

The RPS requirement requires competitive electricity providers to procure RECs or pay the ACP for compliance. Competitive electricity providers then seek to recover RPS compliance costs by increasing retail rates charged to Maine customers.[80] Cost increases will cause a reduction in economic output, both direct and indirect, by cutting spending and investment. LEI's analysis took into account the different ways electric cost increases could impact different customer classes: residential, commercial and industrial.

As shown in Figure 31, in 2010, residential customers accounted for over 88% of total customers but only accounted for 38% of total energy consumption. Commercial and industrial customers, although they had significantly fewer customers than residential, consumed roughly 36% and 26% respectively of total energy. Therefore, in the context of Maine RPS policy, the impact on all segments of the customers is important to consider.

Figure 31. Breakdown of Maine customer number and energy consumption (GWh) in 2010



Source: "Electric Sales, Revenue, and Average Price." U.S. Energy Information Administration. November 15, 2011. Web. <http://www.eia.gov/electricity/sales_revenue_price/index.cfm>

C.5.a Measuring economic development impact - direct and indirect effects

Spending and investment in an economy are understood to produce indirect – sometimes referred to as "second-order" - benefits beyond just the initial dollar amounts spent. The reason relates to what economists refer to as the "velocity of money" – i.e., how quickly money is exchanged from one transaction to another. The basic idea is that, when the initial receiver of an amount of money spends or invests some portion of it, this second-order action creates economic activity that feeds back into the local economy. In economics, this is known as the multiplier effect. A cost increase would curtail spending and investment and therefore would have a second-order effect in contracting economic activity.

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80 MPUC. "Annual report on the New Renewable Resource Portfolio Requirement." March 31, 2009.

LEI applied Maine-specific output multipliers as estimated by the US BEA[81] to measure the impact on the Maine economy from changes in income and spending. Output multipliers are commonly used in empirical analysis to assess the increase or decrease in a state's economic activity for each dollar of increased/decreased direct investment.[82] BEA RIMS II model multipliers have been used extensively in both public and private sectors to assess economic impacts of proposed projects, including the Department of Defense (e.g., to estimate the regional impacts of military base closings), various state Departments of Transportation (e.g., to estimate the regional impacts of airport construction and expansion), and project developers (e.g., to estimate the impacts of theme parks and shopping malls). In addition, the BEA RIMS II model has also been employed to assess the economic impacts of new generation infrastructure investment.

Multiplier effect is an empirical concept in economics that postulates that every dollar increase in spending produces more than a dollar increase in income and economic output, and vice versa. The typical example begins with a firm. If the firm invests and builds a factory to expand its output, it will need to hire construction workers to build the factory. Once the factory is built, the firm will also buy more input from suppliers for its production process. Therefore, other industries will see an expansion of their economic activities. In addition, the construction workers who work on building the factory will in turn stimulate other local businesses, like restaurants, hotels and other local businesses where the construction workers may spend their wages while they work on the factory.

For residential customers, LEI quantified the impact of reduced spending on the state economy by applying multipliers from the BEA RIMS II model for the "household" sector and further assumed an inelastic demand (i.e., the energy consumption will not change in response to the additional RPS compliance costs). A higher RPS requirement or higher REC prices would raise electricity costs to some degree. The average income per household in Maine was $45,708 in 2009.[83] For a typical household in Maine, the disposable income, after paying for taxes (assuming a total tax rate of 30%), is in the range of $32,000. Electric utility bills are only a small

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81 US Bureau of Economic Analysis. *Regional Input-Output Modeling System Multipliers*. Table 2.5: Total Multipliers for Output, Earnings, Employment, and Value Added by Industry Aggregation Maine (Type II). Washington, DC, 2009.

82 The US BEA developed RIMS over 30 years ago. The RIMS II enhanced method for estimating regional input-output multipliers is structures as a three-step process. In the first step, the producer portion of the national input-output table is made region-specific by using six-digit NAICS location quotients. In the second step, the household row and the household column from the national input-output ("I-O") table are made region-specific. In the last step, the Leontief inversion approach is used to estimate multipliers. This inversion approach produces output, earnings, and employment multipliers, which can be used to trace the impacts of changes in final demand on directly and indirectly affected industries. A typical I-O table in RIMS II is constructed mainly from two data sources: BEA's national I-O table (i.e., input and output structure of nearly 500 U.S. industries) and BEA's regional economic accounts (used to adjust the national I-O table to reflect each region's industrial structure and trading patterns). These data are based on actual historical data of different industries within a region, including outputs, prices of goods and services.

83 "State & Country QuickFacts: Maine." US Census Bureau. Web. <http://quickfacts.census.gov/qfd/states/23000.html>.

portion of the typical household's annual disposable income – about 3%. Nevertheless, an increase in the electricity bill would reduce the household's disposable income, albeit to a small degree, which would negatively impact the local economy.

For commercial and industrial customers of electricity, it is more difficult to apply a single multiplier as there are many industries with varying levels of multipliers. Therefore, it is more useful to use a qualitative case study approach. In the short-term, higher electricity costs for commercial and industrial customers reduce profits and potentially production if electricity is a critical (and large) input to the production process. However, unlike a household, commercial and industrial customers have more flexibility to change their electricity consumption profile over time. For example, a paper manufacturing company may implement lay-offs, reduce capital expenditure on new equipment, and pay out fewer dividends to shareholders (by opting to absorb reduced earnings). Or, as an example of a positive response to an economic challenge, an industrial consumer may choose to react to the increased costs of electricity by improving the efficiency of its production and pursuing energy efficiency measures or building a renewable facility for its own use. Depending on these decisions, the impacts on Maine's economy will vary. To complement the understanding of how RPS can impact economic activity of commercial and industrial customers, LEI prepared two case studies, one on the tourism industry and the second on the paper and pulp manufacturing industry, which are discussed in Section C.5.c below.

C.5.b Residential Customers

Economic Modelling

LEI adopted the BEA RIMS II multipliers (Type II) for households for output and employment.[84] Type II multipliers measure direct, indirect and induced impacts – or ripple effects from a change in economic activity, e.g. indirect (induced) employees, who provided various services and support consumption by household sector (for example, various services industries, retail, etc.).[85] As shown in Figure 32, the final-demand multiplier of output is 1.1381 and the final-demand multiplier for employment is 11.0118. This means that for every $1 decrease in the final expenditure of households, state economic output (as measured by GSP) will decrease by $1.1381. For the multiplier of employment, a $1 million total decrease in annual spending by households will result in a loss of 11 jobs.

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84 To best reflect the impacts on Maine's economic development due to the RPS compliance costs and renewable development, final-demand (Type II) multipliers are employed in the analysis. Furthermore, since earning multipliers describe the income change of affected employment, which is just a different presentation of changes in employment, only final-demand (Type II) multipliers of output and employment have been applied throughout the analysis.

85 "RIMS II Online Order and Delivery System." U.S. Department of Commerce – Bureau of Economic Analysis. <https://www.bea.gov/regional/rims/rimsii/help.aspx#WhatAreType>.

Figure 32. BEA RIMS II multipliers for households

	Final-demand multipliers (Type II)
Output	1.1381
Employment	11.0118

Source: BEA RIMS II model

Impacts from increased costs borne by residential customers on Maine's economic development

Assuming a complete pass-through of the RPS compliance cost to households, the impact of higher RPS compliance costs on economic development in Maine can be quantified. As of 2010, there are 699,625 residential households with an average monthly energy consumption of 521 KWh and an annual consumption of 6,252 KWh per household. Therefore, annual energy consumption of Maine's residential customer class is approximately 4,374 GWh, which will be fixed throughout the cost impact analysis for simplicity.[86]

As discussed in Item 4 (Section C.4), by moving from baseline conditions to a higher RPS requirement (10%) and higher REC price ($33/MWh), total costs of compliance for all retail customers could rise by $31 million per annum. Residential customers are only a portion (37.9% as shown in Figure 31) of total retail sales. Thus, the residential class of customers' share of increased compliance costs would be approximately $12 million. Using the multiplier in Figure 32, this translates into a reduction in GSP of $13.4 million and a loss of 129 jobs. (This negative GSP impact and employment loss compares, although over a different time frame, to a positive GSP impact of $1,140 million or a 2% increase over current GSP and an addition of 11,700 jobs due to an increased investment in renewables as discussed in Item 8 (Section C.8).

Currently, Maine's GSP is $52 billion[87] and total employment stands at 577,756[88] in 2010. If RPS compliance increased to 10% and REC prices rose to $33/MWh, the additional costs due to RPS compliance on residential customers will reduce the economy by about 0.06% in both GSP and employment terms.

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86 "Electricity: Table 5A. Residential Average Monthly Bill by Census Division, and State." U.S. Energy Information Administration. November 2010. Web. <http://www.eia.gov/cneaf/electricity/esr/table5_a.html>

87 Bureau of Economic Analysis. <http://www.bea.gov/regional/index.htm>

88 Quarterly census of employment and wages for Maine. 2010 Employment and wages by industry sector. <http://www.maine.gov/labor/cwri/qcew.html>

C.5.c Commercial and Industrial Customers

To analyze the potential impacts of higher electricity costs due to higher RPS requirements on commercial and industrial users, LEI profiled two industries vital to Maine's economy, tourism and pulp and paper, an important manufacturing industry in Maine. As neither industry is a defined category in the US Bureau of Economic Analysis North American Industry Classification System ("NAICS"), LEI relied on imperfect proxies. For tourism, LEI used a combination of "accommodation and food services" "transportation and warehousing" as well as a small portion from "arts, entertainment, and recreation", resulting in 6.5% of Maine's GSP or 5.6% without "arts, entertainment, and recreation."[89] For pulp and paper, LEI used paper manufacturing as an industry proxy which accounted for 2% of Maine's GSP in 2009.[90]

As of 2010, there were 155,000 (or 27% of Maine's non-farm employment) direct employees of tourism in Maine while direct employees of the pulp and paper industry numbered 7,400 (or 1.3% of Maine's non-farm employment) with over 37,000 indirect employees.[91] Energy is a major operating expense for both industries, but energy includes steam and other fuels (not just electricity). For pulp and paper, due to the reuse of energy in the form of steam as a part of the production process as well as the use of on-site generation electricity, electricity alone is not a major operating expense item. The majority of energy for pulp and paper manufacturing comes from steam (67%), with 25% from electricity and 8% from direct fuel.[92] In other words, electricity accounts for approximately 4% (16% x 25%) of the companies' operating cost. Regarding Maine's tourism industry, no direct data is available for electricity expense as a percentage of total operating costs or revenues given that the tourism sector is compromised of many different firms providing a variety of services. LEI did examine the hotel industry; however, for which electricity contributes 4% to 7% of total operating revenues.

Both industries operate under a highly competitive environment, suggesting that business owners cannot easily pass through additional costs in terms of higher prices to their customers. The pulp and paper industry competes with global markets and consumers are typically

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89 "Quarterly Census of Employment and Wages." *Center for Workforce Research and Information*. Government of Maine. 2011. Web. <http://www.maine.gov/labor/cwri/qcew.html> This link contains multiple reports and spreadsheets on employment data. "Accommodation and food services" (industry code 174) "transportation and warehousing" (industry code 136) as well as a small portion from "arts, entertainment, and recreation" (industry code 171) ("About ME: Statistics: Demographics & Population." Government of Maine. <http://www.maine.gov/portal/facts_history/statistics.html>). Not all activities in these industries are fully exclusive to the tourism industry.

90 Industry code 129 (IBID). Under NAICS classification, there is a separate "Wood Product Manufacturing" in addition to "paper manufacturing". We have not included that sector or its multiplier in this analysis. However, it is likely that some business activities under this industry classification also reflect the pulp and paper industry.

91 Quarterly census of employment and wages for Maine. 2010 Employment and wages by industry sector. <http:// http://www.maine.gov/labor/cwri/qcew.html>

92 "Pulp and Paper Industry Energy Bandwidth Study." Institute of Paper Science and Technology (IPST) at Georgia Institute of Technology. August 2006. <http://www1.eere.energy.gov/industry/forest/bandwidth.html>

sensitive to price increases and will seek lower prices in the absence of a clear quality distinction from alternative paper products. Maine's tourism industry competes against tourism industries in neighbouring states such as Vermont and New Hampshire. Although New Hampshire has an RPS, Vermont does not, so there are differences in the associated cost burden across the competitive landscape. Unless a hotel is able to offer a unique value proposition in terms of specific location (e.g., it is conveniently located on the ski slopes), it does not have a comparative advantage and must compete primarily on price rather than services offered.

Maine's RPS requirement does impose additional operating expenses for the tourism industry (including restaurants and hotels, ski resorts, amusement parks and local retailers). Given the competitive environment, such additional expenditures are unlikely to be passed onto tourists in the form of higher prices, but are likely to be absorbed by business owners as reduced profits.[93] Over time, reduced profits may lead to reduced investment to expand business and reduction in employment. However, the tourism industry is a large and growing segment of the economy and the portion of electricity costs relative to total operating costs as mentioned is about 4%. For the pulp and paper industry, higher RPS compliance costs will raise operating costs and reduce profits, although likely not by much in the short term. A paper mill may respond to higher electricity costs by curtailing production or changing the production process.

In the long run, as a result of RPS, businesses may change their consumption pattern, becoming more efficient in their consumption. Furthermore, commercial and industrial consumers may become suppliers of renewable energy. By internalizing the cost of electricity, larger consumers have found that they could better control their operating costs and the quality of the electricity service they receive. There are a number of examples where commercial and industrial businesses made investments in electricity generation and distributed energy.

Tourism-oriented businesses can build renewable energy by themselves, as evidenced by examples of ski resorts building small scale wind generation, e.g. Bolton Valley ski resort in Vermont.[94] Although the decision to make such an investment is multi-faceted, inevitably the ski resort management considered the potential costs and benefits of self-providing electricity and RECs in their strategic decision. Hotels have also been known to install solar photovoltaic panels and solar water heating systems to attract eco-tourists, trim their operating costs, and create additional revenue streams (rooftop solar qualifies in some states for RECs). Such investments would contribute to an expansion of the state economy, as discussed in Item 8 (Section C.8). However, tourism businesses will need to exercise caution as some renewable energy projects may also reduce aesthetics and dull tourist appeal. For example, the Alliance to Protect Nantucket Sound has argued that "[t]he Cape Wind plant would dramatically alter the

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93 To the extent these costs may be passed through to customers, any associated cost impacts would be neutralized for this sector and would instead be passed on to the residential class. For example, in the past there are examples of hotels adding a surcharge on the bill to cover higher electricity costs.

94 "First Wind Turbine at Vt. Ski Area Built at Bolton Valley." WCAX.com. September 10, 2009. Web. <http://www.wcax.com/Global/story.asp?S=11110405>

natural landscape and negatively impact numerous historic landmarks… from Hyannis, over 40% of the natural horizon would be marred by the presence of turbines."[95]

In the pulp and paper manufacturing industry, on-site generation is common and there are a number of cases where paper mills re-configured existing assets to produce RPS-eligible renewable energy and take advantage of REC revenues while consuming the electricity produced by those on-site generators. In Maine, several large paper mills are equipped with commercial scale co-generation capacity. For example, both Rumford Paper Company and Verso Paper Corporation ("VPC") have a cogeneration capacity of over 100 MW each.[96] At the time of paper production, these paper mills can also try to optimize the electricity generation on-site by selling any unneeded energy back to grid when prices are high. VPC is an active participant of active demand response ("DR") programs in New England. With a capacity obligation of over 30 MW on average,[97] VPC may reduce its paper making operation during peak hours to sell more electricity back to the grid to increase its revenue flows.

Furthermore, the RPS requirement and associated electric power costs may lead paper mills to restructure their facilities to qualify for the RPS programs and sell RECs, which will increase their revenue flows.[98] In January, 2011, the MPUC directed Central Maine Power Company ("CMP") to enter into a long-term contract with VPC for capacity value and RECs in connection with the recent VPC Renewable Capacity Project. Through this long-term contract, VPC is able to sell, on an annual basis, to CMP a REC equivalent of 35 MWhs per hour and the financial equivalent of 21MW of capacity.[99] Similarly, VPC's biomass facility was certified for Maine Class I RECs by the MPUC in November 2011.[100] Another example is the Lincoln Paper and Tissue mill which has a biomass facility with a total capacity of 13.5 MW that was certified for Maine Class I RECs by the MPUC in January 2009.[101] Since then, Lincoln Paper and Tissue has sold 70,000 RECs on average during 2009-2010.[102]

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95 "Save Our Sound." Alliance to Protect Nantucket Sound. Web. <http://www.saveoursound.org/myths_vs_facts/view/>

96 ISO-NE. *CELT 2011*.

97 "FCM Calendars and Auction Results." ISO-NE. 2011. <http://www.iso-ne.com/markets/othrmkts_data/fcm/cal_results/index.html>

98 Such revenues contribute to the overall financial viability of the industrial complex. To determine associated REC revenues relative to broader costs and revenues of the mills requires access to non-public information.

99 State of Maine Public Utilities Commission. Order granting new renewable resource certification in Verso Bucksport LLC: Request for certification for RPS eligibility. Docket No. 2011-102. 2011.

100 State of Maine Public Utilities Commission. Order directing utilities to enter into long-term contract, in Maine Public Utilities Commission: long-term contracting bidding process. Docket No. 2010-66. 2010. Pages 1, 5.

101 State of Maine. Maine Public Utilities Commission. *Lincoln Paper and Tissue, LLC: Request for Certification for RPS Eligibility*. 2009. Docket No. 2008-173.

102 Maine RPS compliance data from MPUC for 2009 and 2010.

C.6 Item 6 - The cost of and reasons for using the ACP mechanism for Maine RPS compliance

- **The Alternative Compliance Payment mechanism serves as an effective price cap on Class I (new renewables) RECs in Maine.**
- **There is no equivalent ACP mechanism for Maine Class II (existing renewables).**
- **The ACP is not a meaningful cost contributor to the RPS program currently, and will unlikely be so even if usage of the ACP increases because the RPS requirement covers only a small percentage of total retail load.**
- **Competitive electricity providers may opt to use ACP for RPS compliance for a number of practical reasons, including: (i) load forecasting error; (ii) transaction costs; (iii) insufficient supply of RECs; and (iv) general hassle value or unfamiliarity with RPS compliance.**

As explained in Section B of this Report, the ACP mechanism allows suppliers to make a financial payment (at the scheduled ACP rates) for RPS compliance in lieu of demonstrating ownership of sufficient RECs. In Maine, the ACP mechanism only applies to the compliance of Class I programs. Moreover, because it sets the opportunity cost of alternative compliance for suppliers, the ACP rate serves as an effective price cap on Maine Class I RECs. The MPUC collects the ACPs made by competitive electricity providers and deposits those funds in Efficiency Maine Trust, the entity that controls the state's public benefits fund.[103] The ACP rate for Maine's Class I RPS was initially set at $57.12/MWh in 2007 and has since been adjusted annually by the CPI. The ACP rate is $62.13/MWh for compliance year 2011.

C.6.a Usage of ACP in Maine for RPS compliance

Over the last three years, we have observed the competitive electricity providers' usage of ACP as a percentage of the REC obligation has declined from 25% in 2008 to 3% in 2009, and down again to 0.5% in 2010 (see Figure 33 below). Similarly, the total costs for retail suppliers in Maine from using ACPs declined from $690,000 in 2008, to $320,000 in 2009 and to $20,000 in 2010. In 2010, retail sales in Maine totaled 12,153,959 MWh. Therefore, the incurred ACP cost per MWh of electricity consumed was not significant.

The declining usage of ACPs by retail suppliers may also be an indicator of the ease with which suppliers can purchase RECs given their increased familiarity with the overall RPS and Maine REC Class I program and, more generally, the surplus REC supply environment.

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103 The public benefits fund in Maine supports grants for renewable-energy demonstration projects to Maine-based nonprofits, consumer-owned electric transmission and distribution utilities, community-based non-profit organizations, community action programs, municipalities, quasi-municipal corporations or districts, and school administrative units. As of June 2011, the public benefit fund has also been authorized by the state legislature (HB 568) to support Maine's solar and wind rebate program.

Figure 33. Summary of ACP use for Maine RPS Class I (new renewables) compliance, 2008-2010

Compliance year	ME Class I requirement	ME Class I REC obligation (MWh)	% of using ACP	ACP rates ($/MWh)	ACP costs ($ million)
2008	1%	70,826	25%	$ 58.58	$ 0.69
2009	2%	174,557	3%	$ 60.92	$ 0.32
2010	3%	332,617	0.5%	$ 60.93	$ 0.02

Source: Maine RPS compliance data 2008-2010

C.6.b Cost impacts of ACP on Maine customers

ACP has not had a meaningful impact on the retail costs for Maine's electric power consumers and it is unlikely to do so for the foreseeable future.[104] First, the majority of compliance is achieved through the procurement of RECs and REC prices have been trading much lower than the ACP. Second, a very small amount of compliance in Maine has been met through the ACP, and some of the costs of ACP may not be directly reflected in the retail rates that consumers pay, given that those rates are set in advance when competitive electricity providers may not anticipate fully whether they will have to use ACPs. A large portion of compliance will be met by ACP only if and when REC prices rise to levels close to or above the ACP rate. If REC prices rise to this level, it would make sense to re-examine the ACP.

C.6.c Why do Competitive Electricity Providers use ACP for RPS compliance?

By definition, the ACP is a mechanism for suppliers that have failed to procure sufficient RECs for RPS compliance. Therefore, the ACP represents the highest price suppliers would willingly pay to procure RECs and thus acts as a cap on ratepayer RPS cost exposure. Although the use of ACPs for compliance has declined markedly, some suppliers still rely on the ACP for part of their compliance strategy. Based on responses to MPUC's NOI and observations from other New England states' RPS programs, there are a number of practical reasons for using the ACP, even in light of such low REC prices and the general over-supply:

- ***Miscalculation due to load adjustments***– Load forecasting errors are a common feature of electricity market operations, because of the strong correlation between load levels and weather.[105] REC procurement is typically executed mid-year through the end of the year. Final retail sales are only tallied after the end of the calendar year and annual compliance reports are due by July 1st; therefore the supplier may have a limited window to reconcile any forecasting errors with additional purchases or sales of RECs after final settlement of retail sales. The ACP can provide a flexible option for suppliers to satisfy their REC deficiencies due to retail load forecast error. Constellation Energy Group

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104 The cost impact is about 0.0002 cent per KWh in addition to the retail rate.

105 For example, in short-term forecasts released by ISO-NE, the day-ahead load was about 720 MW, or 5%, lower on average than the real-time load in 2010 ("Hourly Zonal Information." ISO-NE. Web. <http://www.iso-ne.com/markets/hstdata/znl_info/hourly/index.html>).

("Constellation") commented in response to the MPUC NOI that the ACP mechanism is a flexible option for compliance, noting that they had used ACP because of inadequate procurement of RECs due to "internal miscommunication on transactions."[106]

- ***Marginal scale of REC procurement –*** As suggested by Natural Resources Council of Maine ("NRCM") in response to the MPUC NOI, the ACP mechanism could "be more convenient and have a lower overall transaction cost than REC purchases for small and/or marginal compliance requirements." There is no single, centralized market for RECs. Therefore, retail electricity suppliers need to search out REC suppliers and engage in bilateral negotiations and execution of contracts for which there is an associated cost. If the required amount of RECs is relatively small, it may be more cost effective to use the ACP mechanism. As confirmed in the RPS compliance data for 2009 and 2010, retail suppliers whose RPS obligations are less than 10 RECs have typically chosen to satisfy the RPS requirement through the ACP mechanism.

- ***Insufficient supply of RECs*** – In some other New England states, a shortage of REC supply has been another driver for the use of the ACP mechanism. For example, 94% of the Massachusetts Class II Renewable Energy obligations were satisfied through ACPs due to lack of Class II qualified resources for 2009.[107] Similarly, 42% of New Hampshire RPS Class IV (existing renewables) RECs were satisfied through ACPs due to a shortage of qualified Class II renewable resources.[108]

- ***Unfamiliarity with RPS compliance*** – The ACP mechanism is a safety net, for both customers (in terms of limiting cost exposure) and suppliers who are required to demonstrate compliance. As observed with respect to Maine's Class I, the use of the ACP mechanism was highest in the first years of compliance, when some suppliers may still have been gaining knowledge about the RPS compliance protocols and REC procurement. This trend has been seen in other states as well. For example, the usage of ACP for Rhode Island's New RES was equal to 30% of the total compliance amount in 2007, and has since declined to less than 0.24% in 2008. As noted in the Rhode Island RES compliance report, the higher usage of ACPs in 2007 was due to "the market's lack of experience with implementing the RES regulations."[109]

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[106] State of Maine. Maine Public Utilities Commission. Maine Public Utilities Commission inquiry into Maine's new renewable resource portfolio requirement. 2011. Docket No. 2011-271.

[107] Commonwealth of Massachusetts. Department of Energy Resources. *RPS & APS Annual Compliance Report for 2009*. November 2010, revised January 2011.

[108] 2011 RPS Review: Public stakeholder kick-off meeting. New Hampshire PUC. February 14, 2011.

[109] State of Rhode Island and Providence Plantations. Rhode Island Public Utilities Commission. *Annual RES Compliance Report for Compliance Year 2008*. February 2010.

C.7 Item 7 - Best practices for setting the ACP rate

- **Maine's ACP policy and rate is consistent with other surrounding states.**
- **It is generally perceived to be working as an effective cap on prices for Class I RECs.**
- **The ACP has not been a significant cost contributor to retail rates.**
- **Maine's ACP rate appears to generally meet the key ratemaking principles of efficiency, fairness, stability, and practicality.**
- **In the future, re-assessment of the ACP may make sense to ensure appropriate overall investment as well as investment in select renewables, as dictated by state policy.**

In LEI's review, Maine's ACP rate was appropriately set and its policy is consistent with the ACP policies in surrounding states as a conventional approach to setting maximum prices, more generally, in a market. The ACP is meant to be reasonably reflective of the costs of renewables, but also not extremely high to allow for the ability of REC suppliers to extract super-profits from retail suppliers (and consumers). Although Maine's ACP is currently above market, this is due to the current oversupply of Maine Class I (new renewable) RECs. Overall, the ACP appears to be working as intended. It is important to note that the structure and pricing of the ACP bears little relevance to the cost of compliance in Maine today as evidenced by the fact that current REC prices are substantially lower than the ACP and are likely to remain so for the foreseeable future. Over the long-term, however, as the excess REC supply is utilized, it will be important to re-evaluate the structure of the ACP to ensure desired outcomes.

C.7.a Factors affecting the ACP rate

The ACP rate is a regulatory mechanism in a regulatory market, namely the REC market. It is set through legislation or regulation. Therefore, best practices for setting the ACP rate are grounded in general regulatory ratemaking principles. The ACP rate should be set at a level to be:

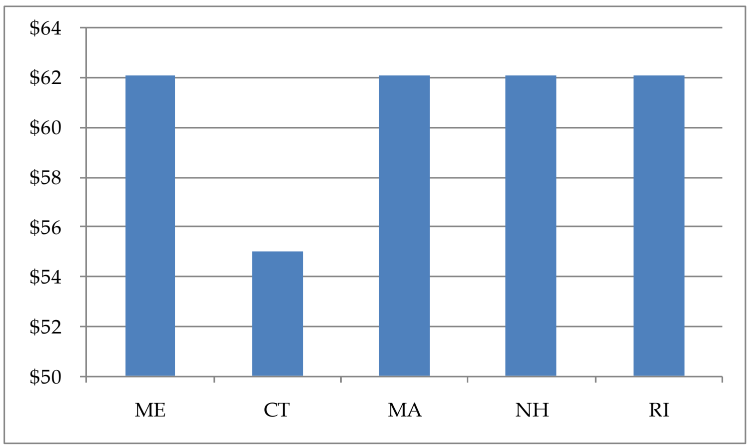
- ***efficient***, so that the ACP is not too low as to preclude new investment in renewables but also not too high as to be irrelevant; and, so that ultimately, renewable energy projects are promoted;
- ***fair***, so that the ACP rate provides the right incentives to retail suppliers to procure RECs and that the costs of RPS compliance are managed prudently, so as not to be overly burdensome on customers;
- ***stable and predictable***, so that market players, including both CEPs and renewable developers, can make long term business decisions with some certainty; and
- ***practical and easy to implement***, so that the regulatory costs of compliance are minimized.

Notably, there are trade-offs among these principles. For example, the "efficiency" criteria may lead to implementations that are more complex and therefore move the ACP rate design away from the last principle, which promotes "practical and easy-to-implement" rates.

Since the ACP is effectively the price ceiling for RECs, there are a number of factors that should be taken into account when setting ACP rates in order to ensure an efficient REC market. The key factors include: (i) capital cost of renewable technology; (ii) prevailing market conditions; (iii) availability of federal subsidies; (iv) technical improvement; (v) price inflation; (vi) transaction costs of REC procurement; and (vii) ACP rates in neighbouring states within the same regional market. For example, in order to prevent inefficiencies, the ACP should be consistent with other states in the same regional REC market.

As mentioned above, most New England states' ACP rates have been set within a similar range, based on (implicit) consideration of the costs of new renewable resources. This similarity in ACP levels (see Figure 34 below) serves to reduce distortions that may otherwise be created given different state RPS programs and thereby improves REC market efficiency.

Figure 34. Class I/New RES ACPs in 2011, $/MWh



The ACP mechanisms do differ in terms of escalation, but that has not yet contributed to significant differences in ACP levels. Furthermore, we observe that the Maine ACP rate is reflective of current market expectations and the current cost of new entry for various renewable technologies that are feasible within New England, such as biomass and wind generation. As the costs of technologies decline, the Maine Legislature may want to consider suggesting to the MPUC to re-visit the ACP levels to verify that they are efficiently set to motivate new investment. Indeed, the current legislation on RPS already allows for the Commission to re-set the ACP. Section 9 A. of §3210 under Title 35-A, Part 3, Chapter 32 states that the

> *"The commission shall set the alternative compliance payment rate by rule and shall publish the alternative compliance payment rate by January 31st of each year. In setting the rate, the commission shall take into account prevailing market prices, standard-offer service prices for electricity, reliance on alternative compliance payments to meet the requirements of subsection 3-A and investment in new renewable capacity resources in the State during the previous calendar year."*

If alternative ACP mechanisms are considered in the future, it will be important for the ACP levels to be cost-reflective (such that it does not practically limit REC markets or otherwise distort incentives). In addition, as with any other regulatory rate design project, the ACP mechanism needs to be stable and relatively simple. Stability is important for purposes of providing the right signals to the market regarding investment, while simplicity is critical for managing regulatory costs.

C.7.b Case studies of best practices of setting ACP rates

Currently, 25 states in the United States have RPS programs. As shown in Figure 35, ten states do not have a pre-set ACP rate mechanism. Another ten states have adopted flat ACP rates without annual adjustment, including Connecticut. Among the remaining five states, four New England states (Maine, Massachusetts, Rhode Island, and New Hampshire) have adopted inflation-adjusted ACP rates, and Texas has an ACP mechanism where the penalty is the lesser of a flat rate of $50/KWh or 200% of the value of REC traded in the prior year.

As described in detail in Section D.7, we selected three jurisdictions (Massachusetts, Connecticut, and Germany) as case studies for evaluating industry practice as it relates to the ACP mechanism. Massachusetts and Connecticut were selected as case studies because they are neighbouring states to Maine and they effectively share the same supply (qualified renewable resources) and demand (RPS requirements) given the one consolidated New England REC market. Massachusetts provides strong incentives for new renewables as pointed out by Constellation. The feed-in tariff ("FIT") in Germany was selected as a case study because of the similarities in the objectives of the pricing structure under the FIT and the ACP in REC markets. Furthermore, Germany's FIT has provided an effective mechanism for renewable power development, making Germany one of the most advanced markets in promoting renewable energy.[110]

Overall, the structure of Maine's ACP is similar to Connecticut and Massachusetts, except Connecticut's APC does not adjust with inflation and Massachusetts has a solar carve-out and a solar-specific ACP. Germany provides a very different example whereby a FIT price was employed that changed as market developments evolved. The German experience with a FIT suggests that setting rates initially was not sufficient, as the legislature was forced to amend the law and make further reductions. However, it is important to keep in mind that the ACP rate, in contrast to the FIT, is not likely to affect consumer costs as directly and substantially.

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110 Germany achieved its renewable target of 12.5% by 2010 in 2007.

Figure 35. Summary of ACP rate mechanisms in US

State	ACP mechanism	ACP setting type
Arizona	State regulators may impose but amount(s) not specified	Uncertain
California	5.0¢/kWh noncompliance penalty	Flat
Colorado	State regulators may impose but amount(s) not specified	Uncertain
Connecticut	5.5¢/kWh noncompliance penalty	Uncertain
Delaware	ACP system • 2.5¢/kWh (first year of noncompliance) • 5.0¢/kWh (second year of noncompliance) • 8.0¢/kWh (third year of noncompliance and subsequent years) ACP for solar: • 25¢/kWh (first year of noncompliance) • 30¢/kWh (second year of noncompliance) • 35¢/kWh (third year of noncompliance and subsequent years)	Flat from the 3rd years
District of Columbia	ACP system • 2.5¢/kWh for Tier 1 resources • 1.0¢/kWh for Tier 2 resources • 30.0¢/kWh for solar	Flat
Hawaii	State regulators may impose but amount(s) not specified	Uncertain
Illinois	State regulators may impose but amount(s) not specified	Uncertain
Maine	ACP for new capacity requirement start at 5.712¢/kWh, adjusted for inflation.	Annual Adjustment with CPI
Maryland	ACP system • 2.0¢/kWh for Tier 1 resources • 1.5¢/kWh for Tier 2 resources ACP for solar: • 45¢/kWh for solar in 2008 • 40¢/kWh in 2009, decreasing by 5¢ bi-annually until it reaches 5¢/kWh in 2023 and beyond.	Flat for most renewables; decreasing for solar
Massachusetts	ACP system: • 5.0¢/kWh • In 2003, adjusted annually for inflation	Annual adjustment with CPI
Minnesota	State regulators may impose but amount(s) not specified	Uncertain
Montana	1.0¢/kWh noncompliance penalty	Flat
Nevada	State regulators may impose but amount(s) not specified	Uncertain
New Hampshire	ACP varies according to the four classes of eligible resources: • 5.712¢/kWh for Class I (new renewables); • 15¢/kWh for Class II (solar); and • 2.8¢/kWh for Class III and IV (existing biomass, methane and hydroelectric). • Starting in 2008, ACP will be adjusted annually using the Consumer Price Index.	Annual Adjustment with CPI
New Jersey	ACP system • 5.0¢/kWh for Class I and II resources • 30.0¢/kWh for solar	Flat
New Mexico	State regulators may impose but amount(s) not specified	Uncertain
North Carolina	State regulators may impose but amount(s) not specified	Uncertain
Oregon	PUC establishes ACP for each compliance year for each electricity supplier	Uncertain
Pennsylvania	ACP system (not recoverable in rates) • 4.5¢/kWh for Tier 1 and Tier 2 resources • For solar, 200% of average market value of solar credits	Flat for most renewables; ACP for solar is indexed to market value
Rhode Island	ACP system: 5.0¢/kWh (2003$, adjusted annually by the Consumer Price Index)	Annual Adjustment with CPI
Texas	Noncompliance penalty is the lesser of 5¢/kWh or 200% of the average cost of credits traded during the year	Indexed to REC prices during the year
Washington	5.5¢/kWh noncompliance penalty	Flat
Wisconsin	Noncompliance penalty of up to $500,000	Fixed total amount penalty instead of fixing penalty price

Source: National Renewable Energy Laboratory ("NREL").

Therefore, the monitoring and adjustment needed for an efficient (and reasonably priced) FIT rate regime may not be as necessary for an ACP mechanism. Also, as discussed earlier in this section, adjusting the APC as market conditions change would decrease certainty and simplicity although it may promote greater market efficiency.

C.7.c Conclusion

Maine's ACP was appropriately established to reflect the all-in levelized costs of new renewable technology and reasonable expectations of market revenues. The fact that REC prices are currently below the ACP reflects an oversupply of RECs in the market and not that the ACP was established on unsound principles. In addition, the fact that the ACP is static and only increases with the CPI makes the ACP easier to understand for potential buyers and also ensures uniformity with other states in the New England region.

The current Maine ACP rate appears to generally meet the major ratemaking principles; however, there are certain factors that may – in the future – recommend a re-assessment of the ACP. For example, if capital costs decline significantly and market conditions improve, the current ACP rate may become irrelevant (in fact, too high) and may need to be adjusted downward (see Appendix H: Factors affecting the ACP rate).

C.8 Item 8 – Benefits of RPS requirements on economic development in Maine

- **RPS policies across the New England states motivate new renewable power plant construction in Maine where there is an abundance of low cost Class I qualifying resources.**
- **Investment in Maine Class I (new renewables) has the potential to contribute to Maine's economy by creating construction jobs, increasing in-state spending, and increasing property tax revenues.**
- **Assuming half of the wind generation proposed in the Interconnection Queue for Maine is developed over time (625 MW installed capacity) at a total investment cost of more than $2,000/KW and that 35% of the capital costs are spent in Maine this could result in approximately $560 million of investment in Maine. This level of investment will result in a roughly $1,140 million increase in GSP and 11,700 jobs created during construction – a 2% cumulative increase over current measures of economic activity.**
- **There are also economic benefits associated with new investment after construction is complete, such as property tax revenues and other local community benefits.**
- **The addition of a large amount of low cost renewables, like wind, in New England may also result in lowering electricity prices as wind displaces existing higher cost generation, which can also create indirect and induced economic benefits.**
- **Renewable investment could also lead to a stronger industry knowledge base, improved air quality, fuel cost savings and diversification benefits.**

RPS policy across New England was adopted in large part to encourage investment in new renewable generating supply. This investment, in turn, can create economic benefits which positively contribute to a state's economy. In parallel to the analysis of the macroeconomic costs of a higher RPS compliance in Item 4 (section C.4 of this Report), LEI analyzed the opportunity for economic benefits resulting from investment in Maine (motivated as a result of the RPS requirements in New England). Changes in gross state product and employment are two key measurements most relevant for assessing economic development.

In addition to economic development, there are other benefits from new investment undertaken under a RPS requirement, as mentioned in Title 35-A, section 3454. For example, other benefit categories include:

- environmental benefits (reduction in emissions);
- diversification benefits (away from fossil fuels) and reliability benefits stemming from reduced exposure to natural gas (a strategic market issue that has concerned the ISO-NE recently);
- energy cost reductions (additional low marginal cost resources, such as wind, hydroelectric, and solar generation, can effectively reduce the market clearing price for energy in the New England wholesale electricity market);

- energy security benefits through reduced price volatility given less reliance on natural gas prices which have historically fluctuated significantly;
- increased tax revenues (associated with property tax payments and other payments to local communities in lieu of taxes, where relevant); and
- other community benefits (e.g. payments under community benefit agreements, payments that reduce local energy costs for locality where new investment is made, corporate donations for land or natural resource conservation, etc.).

C.8.a Economic Benefits of RPS today

The existence of RPS requirements in five of the six New England states creates economic benefits for Maine's economy that are direct and measurable. Today, there are 484 MW of qualified new renewable generators (Class I) in Maine which represents about 10% of Maine's overall generating capacity under the jurisdiction of ISO-NE. These qualified renewable resources can sell RECs into Maine or neighbouring REC markets in other New England states and New York. In the calendar year of 2010, qualified Class I resources received $8.5 million in selling RECs to suppliers, according to compliance reports for Maine RPS Class I requirements. Among all REC suppliers, $5.2 million (62% of total paid for Maine Class I (new renewables)) went to Maine generators. Qualified Class II (existing renewables) resources received $0.8 million in selling RECs to suppliers serving Maine load.[111] A sub-total of $0.6 million (76% of the total Maine Class II REC sales) went to Maine generators. In aggregate, Maine generators received $5.8 million in 2010 from selling RECs. Although this is equivalent to approximately 0.01% of Maine's GSP, these REC revenues are an important source of income to the renewable generation sector. This estimate also significantly understates total REC revenues received by Maine generators, as many of Maine's renewable resources sold their RECs in other states (as discussed in Item 2, Section C.2 of this Report).

C.8.b Benefits of RPS in the long run for Maine's economy

In the long run, the presence of regional RPS policies with increasing requirements will motivate new investment which may also create associated economic benefits. As shown in Figure 36, the impacts of renewable investment on Maine's economy include benefits accrued from new investment during the construction and the operations stages of a project. During the construction period, a significant portion of investment will be spent in Maine on related services, including (but not limited to): construction, food & lodging, and professional and technical services. Temporary construction jobs will be created. The increased expenditure will also boost employment in other sectors.

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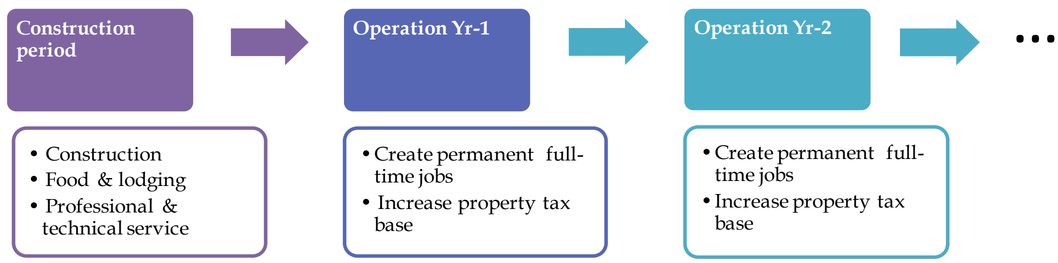
[111] Note that this number is slightly different from the RPS compliance cost mentioned before. The compliance strategy may include multiple sources of compliance such as banked RECs, RECs purchased in a given calendar year, and ACP. RECs sold in a calendar year may be higher than the RECs purchased if the excess RECs are banked. Similarly, RECs sold in a calendar year may be lower than the RECs purchased if banked REC are used.

After a new renewable project reaches commercial operation, additional permanent full-time jobs would likely be created. Subject to a certain scale of new investment, Maine ratepayers could enjoy reduced costs of electricity -- as for example new wind displaces existing higher cost generation -- and further reduction in emissions. The new renewable generator can also contribute to local communities through property tax payments and other community benefits.

Figure 36. Illustration of impacts of renewable investment on economic development in Maine



A number of studies have considered the potential benefits in the long run from new investment. It is also possible to look at the direct and indirect benefits of investment using the BEA RIMS multipliers, similar to the analysis conducted in Section C.5 for Item 5.

C.8.b.a Employment impacts of renewable power development in Maine based on past experience in Maine and academic studies

Based on factual responses from renewable development groups in Maine and BEA RIMS II multipliers, the impact on economic output and job creation in Maine during the construction period and the operations period can be estimated.

A wind developer in Maine commissioned a study of employment impacts arising as a result of wind power development in Maine; the study was published in February 2011. Based on 257 MW of developed wind capacity from 2003 to 2010,[112] the study estimated 240 jobs were created in Maine during that period. Moreover, during the peak year of construction, over 600 jobs were created. The total investment costs were $642 million, of which $223 million ($907/KW), or 35%, was spent within Maine on services related to construction, food & lodging, and professional & technical services. Construction accounted for 89% and professional & technical services accounted for approximately 11% of the total expenditure within Maine (food and lodging was a separate category and under 1%).

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112 Developed wind projects include First Wind's Kibby Wind (132 MW), Mars Hill (42 MW), Stetson I (57 MW) and Stetson II (26 MW) (Colgan, Charles S. "*The employment impacts of wind power development in Maine 2003-2010*". February 2011. <http://windforme.org/pdfs/economy/Colgan_Report_Wind_Power_Economic_Impact.pdf>).

Another example of employment impacts from renewable generation is provided by Ocean Renewable Power Company ("ORPC"). In response to MPUC's NOI[113] ORPC commented that more than 60% of its tidal power project development cost (4.95 MW) was spent in Maine over the past several years. If the proportion of Maine costs will continue through construction, then given a total project cost of $48 million, over $28 million will be spent in Maine constructing the demonstration tidal power project. Maine WTEWG also noted that four operating RPS-qualified waste-to-energy facilities in Maine employ over 220 people, and commented that these are "high paying Maine-based jobs with a total payroll of over $15 million." Importantly, some of these facilities would not be economic to operate without the REC revenues they currently receive.

The examples above focus on Maine; however, there are other, more general studies that confirm potential job creation arising from renewable development. A study done by Renewable and Appropriate Energy Laboratory ("RAEL")[114] concluded that over the life of a facility, a wind project creates 2.51 jobs/MWa[115] during the construction, manufacturing and installation periods and 0.27 jobs/MWa during the operating period.

In 2001, the California Energy Commission's Public Interest Energy Research program sponsored a study from the Electric Power Research Institute ("EPRI") that included job creation estimates from renewable energy development based on existing and planned projects in California. These include a construction stage employment rate of 2.57 jobs/MW and an operating stage employment rate of 0.29 jobs/MW for wind.

As a result of the aggregate demand for renewables across New England due to respective state RPS requirements discussed in Section B of this Report, there are proposals for about 1,250 MW of new wind capacity in Maine according to the ISO-NE's IQ. Assuming 50% of these projects are built (i.e., 625 MW installed or 219 average delivered MW assuming 35% load factor), and utilizing the employment ratios from the reports mentioned above, over 560 jobs for the construction period (temporary) and over 60 jobs for the operating period (permanent) would be created.

C.8.b.b Impact on state economy from new renewables investment (GSP, tax revenues, land royalties)

New renewable investment will positively impact related industries, namely construction, food service and drinking places, and professional, scientific and technical services. BEA's output

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113 State of Maine. Maine Public Utilities Commission. Maine Public Utilities Commission inquiry into Maine's new renewable resource portfolio requirement. 2011. Docket No. 2011-271.

114 Kammen, Daniel, Kamal Kapadia, and Matthias Fripp. "Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Create?" UC Berkeley: Renewable and Appropriate Energy Laboratory (RAEL). April 2004 (updated January 2006). <http://rael.berkeley.edu/files/2004/Kammen-Renewable-Jobs-2004.pdf>

115 MWa refers to average installed megawatts de-rated by the capacity factor of the technology.

multipliers (Type II) for construction, food services & drinking places, and professional, scientific and technical services are shown in Figure 37.

Figure 37. BEA RIMS II multipliers for industries related to renewable energy development

Industry	Final Demand: Output multiplier ($)	Final Demand: Employment multiplier (number of jobs)
Construction	2.0491	21.1377
Food services and drinking places	1.9062	27.4521
Professional, scientific, and technical services	1.9108	19.379

Source: BEA RIMS II model

LEI assumed a capital cost of $2,563/KW for generic on-shore wind, as described in Appendix E: Key Assumptions used in the NETP Model. LEI further assumed that, conservatively, 35% of the investment cost will be spent in Maine. If 50% of the proposed, Maine-based wind projects in the IQ are built (i.e., 625 MW in nameplate terms), that would yield about $560 million of potential investment to be sourced in Maine over future years. Assuming a breakdown of this total investment value to the various affected industries, it is possible to estimate the increased spending for each industry and that industry's contribution to increasing Maine's GSP. (Maine's current GSP is estimated at $51.6 billion dollars.[116]) Based on allocations suggested by developers in Maine, it is reasonable to expect that spending in (i) the construction industry, (ii) food service & drinking places industry, and (iii) professional, scientific and technical services industry will be allocated (i) $498 million, (ii) $3 million, and (iii) $60 million, respectively.

Using the multipliers outlined in Figure 37, the direct, indirect, and induced impact of this hypothetical investment in 625 MW of new wind generation projects would increase Maine's GSP by $1,140 million (or 2% of Maine's GSP in 2010) and create nearly 12,000 jobs (also 2% of Maine's 2010 average non-farm employment) (i.e., $1.8 million/MW and 19 jobs/MW) during the construction phase, with the majority associated with the construction sector ($1,020 million and over 10,500 construction jobs).

In addition to job creation, there are also benefits for local governments. Based on the tax benefit mentioned in First Wind's response to MPUC's NOI, their four wind projects in Maine will contribute local and state tax revenues totalling $1.9 million per annum, or over $10,000/MW during the lifetime of the projects. 625 MW of wind development, employing a similar ratio, will result in $6.3 million of tax revenues for local governments in Maine.

[116] "Economic Recovery Widespread Across States in 2010." June 7, 2011. Bureau of Economic Analysis. Web. <http://www.bea.gov/newsreleases/regional/gdp_state/2011/pdf/gsp0611.pdf>

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Private landowners can also benefit from wind development in Maine. According to a study done by Northwest Economic Associates,[117] wind developers tend to lease land from landowners rather than purchase the land outright, although in some instances easements are purchased. An older study suggested that each megawatt of turbine capacity requires 25 to 50 acres and typical a annual royalty payment to landowners ranges from $40 to $50 per acre. Using the mid-point estimates of $45 per acre and 37.5 acres per MW, then 625 MW of new wind generation would result in an additional $1 million of revenue per year for private landowners in Maine.

C.8.c Other Potential Benefits

A state focus on the renewable sector as a government policy also enhances the industry knowledge base in the region. Maine's public and private research institutes have previously received R&D funding in this field and will continue to seek additional R&D funding from various sources. A state RPS policy may also incent the state's universities and colleges to conduct relevant research on the technical and economic aspects of renewables. This research is often consumed by many stakeholders, including private investors.

Incremental renewable energy generation will also produce environmental benefits, including improved air quality through a reduction in greenhouse gases and a reduction in water usage. For example, an additional 625 MW of on-shore wind at an assumed capacity factor of 35% produces annual generation of 1,916 GWh. Assuming emission rates[118] of 0.1 lbs/MWh for SO_2, 1.7 lbs/MWh for NO_X and 1,135 lbs/MWh for CO_2 for generic gas-fired generation, the annual reduction will be 96 tons for SO_2, 1,629 tons for NO_X and 1.1 million tons for CO_2. At prices of $0.8/ton for SO_2 (based on the current forwards), $20/ton NO_X, (based on the current forwards), and $12/ton for CO_2 (based on the floor of the proposed Kerry-Graham-Lieberman Climate Bill), respectively for allowances for these three pollutants, the annual monetary value of avoided emissions is about $13 million.[119]

Another potential benefit from additional renewable generation is fuel cost savings from reduced production by conventional generation, e.g. gas plants. Assuming a heat rate of 7.2 MMBtu/MWh for a gas-fired plant, 1,916 GWh of gas production would need nearly $14

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117 "Assessing the Economic Development Impacts of Wind Power." Northwest Economic Associates. February 12, 2003. Web. <http://www.nationalwind.org/assets/past_workgroups/Assessing_the_Econ_Development_Impacts_of_Wind_-_March_2003.pdf>

118 "Air Emissions," *United States Environmental Protection Agency*. December 28. 2007. Web. <http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html>

119 Although difficult to estimate in monetary terms, other environmental benefits may relate to emissions of air toxins (like mercury), haze, and water use. Most conventional generation requires removing water from a lake or river in the water cooling process. The EPA is developing new regulation on water intake as it is widely recognized that water pollution is a major source of environmental and ecological contamination. Renewable energy sources, except for biomass, do not require any water for cooling purposes.

million MMBtu of natural gas per annum. Assuming a delivered natural gas price of $5/MMBtu, this accounts for roughly $69 million of fuel savings annually.

Furthermore, renewable generation also provides fuel diversification benefits, an issue ISO-NE outlined as one of five strategic planning risks for the future in its Strategic Planning. In 2001, 15% (16,159 MW) of New England's capacity was gas-fired while as of 2010 over 46% (57,579 MW) was gas-fired. Gas-fired resources are likely to grow in dominance over time because most of the announced retired capacity will be replaced by gas-fired capacity and the increased wind penetration will require a complementary operating regime from quick start gas-fired capacity. Increased reliance on natural gas-fired capacity may complicate continued reliable operations of the New England power system during both cold winter conditions and other times of system stress because gas-fired units generally do not have firm contracts for either the commodity or transportation. Sustained policy emphasis on renewable generation, with financial support from RPS programs, will help motivate non-gas fired investment in generation, contributing to resource diversification.

C.8.d Summary of Costs and Benefits of Maine's RPS

As described in Items 4 and 5 above, an increase in Maine's RPS requirement will lead to an increase in electricity power costs to ratepayers which will result in a reduction in state GSP and job losses. On the other hand, as shown in this item, an increase in the RPS requirement in conjunction with the RPS in other New England states will also contribute to more renewable development. This additional renewable development in turn will create in-state investment which will contribute to an increase in Maine's GSP and additional employment as well as greater property tax revenues. There are also other benefits of the regions RPS requirements, including the potential for emissions reductions, fuel diversification, fuel cost savings and -- through the addition of a large amount of low cost renewable resources like wind -- lower electricity prices as wind displaces existing higher cost generation.[120] This benefit has particular relevance to Maine, where the increasing focus on wind and tides as fuels may allow Maine to increase its export of natural resources and thus help reduce the economic impact of Maine's energy imports. Figure 38 and Figure 39 summarize these costs from Item 5 and benefits from Item 8, respectively. This information should be viewed in the context of any underlying assumptions. In addition, the costs and benefits do not provide an apples-to-apples comparison and thus should not be interpreted as a cost/benefit analysis. It is important to note that there are different underlying timeframes assumed for the costs and the benefits. The costs reflect a near term timeframe (out to 2017 when Maine's RPS is expected to increase to 10% of retail sales) and are based on retail rates that include 2010 compliance costs. The benefits assume a longer timeframe as several years would be required to build 625 MW of new wind generation. It is also important to note that the economic benefits of renewable resource development in Maine is not an exclusive function of Maine's RPS, but of the collective impact of the RPS requirements throughout New England of which the Maine RPS is relatively small.

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120 Providing significant detail on these additional benefits was outside the scope of this Report.

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Figure 38. Costs (Associated with Maine's RPS) reflected on an Annual Basis

Status quo case: RPS at 3% of retail rate, REC price of $24/MWh and 12,000 GWh retail sales	
2010 retail compliance cost	$8.6 million
2010 retail compliance cost for just residential	$3.3 million
Retail rate impact	0.072 cent/KWh
Monthly bill impact (residential)	$0.37
Percentage of average retail rate of 12.6 cents/KWh	0.57%
2010 GSP	$51,643 million
2010 non-farm employments	577,756

Case 1: RPS at 10% of retail rate and REC price of $24/MWh	
Annual retail compliance cost Increase from 2010	$20 million
Annual retail compliance cost Increase for just residential	$7.6 million
Retail rate impact	0.24 cents/KWh
Monthly bill impact (residential)	$1.25
Percentage of average retail rate of 12.6 cents/KWh	1.90%
Decrease in GSP due to higher electricity rates (residential only)	$8.7 million
Decrease in jobs (residential only)	84

Case 2: RPS at 10% of retail rate and REC price of $33/MWh	
Annual retail compliance cost Increase from 2010	$31 million
Annual retail compliance cost Increase for just residential	$12 million
Retail rate impact	0.33 cents/KWh
Monthly bill impact (residential)	$1.72
Percentage of average retail rate of 12.6 cents/KWh	2.62%
Decrease in GSP due to higher electricity rates (residential only)	$13.4 million
Decrease in jobs (residential only)	129

Case 3: RPS at 10% of retail rate and REC price of $13.5/MWh	
Annual retail compliance cost increase from 2010	$7.6 million
Annual retail compliance cost increase for just residential	$2.9 million
Retail rate impact	0.135 cents/KWh
Monthly bill impact (residential)	$0.70
Percentage of average retail rate of 12.6 cents/KWh	1.07%
Decrease in GSP due to higher electricity rates (residential only)	$3.3 million
Decrease in jobs (residential only)	32

Figure 39. Benefits (Due to New England's RPSs) over a Multi-year Period[121]

Benefits to Maine (Assumes 625 MW wind built with a capital cost of $2,563/KW)	
Investment in Maine*	$560 million
Increase in local Jobs (temporary or permanent)	11,700
Increase in GSP	$1,140 million
Annual Tax Revenue	6.3 milllion
LMP Reduction**	$0.375/MWh
Annual Savings to Maine ratepayers from reduced electricity prices***	$4.5 million
Annual Emissions Reductions	$13 million

* Assumes 35% of investment stays in Maine

** Based on ISO-NE 2011 Economic Study Update (adjusted for 625 MW). Wayne Coste, Principal Engineer. September, 2011

*** Assumes retail sales of roughly 12,000 GWh

121 Because this benefit analysis is by definition based on cumulative investment over multiple years, LEI did not attempt to convert the multi-year benefits into annual rate impacts. Additional assumptions would need to be made regarding the specific timing of these investments and their commercial on-line operating dates to conduct this analysis properly.

D. Appendices

D.1 Appendix A: RPS Regulations in other New England States

In addition to Maine, four other states in New England have established mandatory renewable portfolio standards, including: Massachusetts, Connecticut, New Hampshire, and Rhode Island. (Vermont does not currently have a RPS). Electricity suppliers are required to meet a certain percentage of their retail sales by eligible renewable generation. In this Appendix, LEI provides a general comparative discussion of eligible resources as well as the specific details of each state's RPS requirements.

Comparative Eligible resources

Eligible resources are typically defined on the basis of technology (fuel type) and distinguished between new and existing resources given a selected cut-off date.

As shown in Figure 40, five New England states broadly categorize their RPS requirements into two general classes, namely new renewables and existing renewables. In addition, some states further demarcate the requirement into sub classes or additional sub-categories. For example, the Massachusetts RPS for Class II (existing renewables) is further segmented into Class II RE (existing renewables) and Class WE (waste resources). Similarly, the New Hampshire RPS is composed of four classes, including Class I and II for new renewables and Class III and IV for existing renewables. In contrast to other states, the Connecticut RPS includes a Class III requirement of cogeneration/combined heat and power ("CHP") and energy efficiency ("EE").

A specific date (i.e., commercial operation date ("COD") has been adopted to distinguish new and existing eligible renewable resources, with each state having its own cut-off. New Hampshire is the most strict with respect to new renewables (mandating that the new resources need to have come into service after January 1, 2006), while Massachusetts is the least restrictive (Massachusetts Class I RECs can include resources that came into service after December 31, 1997).

In terms of technology (fuel type), all five states in New England list solar (PV/thermal), wind, tidal, small hydro, biomass, and landfill gas as eligible technologies, although with different technical requirements for certain categories of renewables. For example, biomass facilities eligible for Massachusetts RPS Class I (new renewables) need to adopt low-emission, advanced biomass power conversion technologies. Hydroelectric facilities qualify in all five states, although the size specifications (limits) are different across states, ranging from 5 MW to 100 MW.

Certain types of renewable resources may qualify in one state but not in another. For example, energy efficiency projects only qualify in Connecticut and geothermal qualifies across all states in New England except Connecticut. In addition some New England states have attempted to encourage specific renewables through carve-outs for specific resources, such as a separate requirement for solar resources in Massachusetts.

Figure 40. Comparison of eligible resources for RECs across New England states with a mandatory RPS

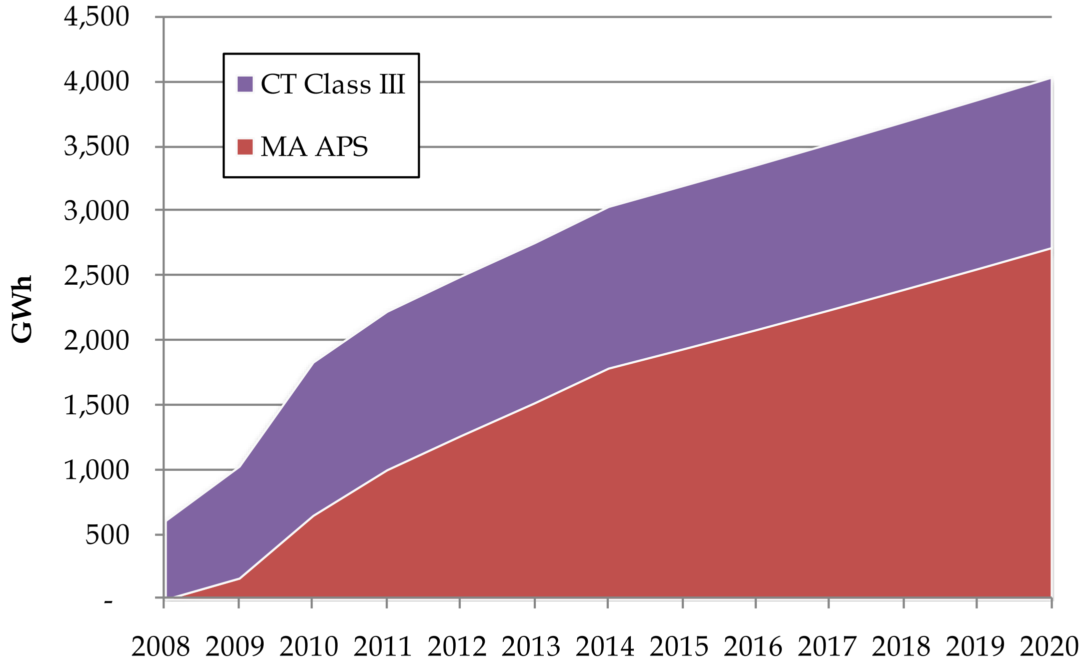
Fuel type	ME		CT			MA				NH				RI	
	Class I	**Class II**	**Class I**	**Class II**	**Class III**	**Class I**	**Class II RE**	**Class II WE**	**APS**	**Class I**	**Class II**	**Class III**	**Class IV**	**New RES**	**New/ Existing RES**
Solar thermal	<=100 MW	<=100 MW	✓			✓	✓				✓			✓	
Photovoltaic	<=100 MW	<=100 MW	✓			✓	✓				✓			✓	
Ocean thermal			✓			✓	✓			✓				✓	
Wave			✓			✓	✓			✓				✓	
Tidal	<=100 MW	<=100 MW	✓			✓	✓			✓				✓	
Marine or hydrokinetic						✓	✓								
Hydro	<=100 MW	<=100 MW	<5 MW	<5 MW		<25 MW	<5 MW			✓			<5 MW	<30 MW	
Wind	✓	<=100 MW	✓			✓	✓			✓				✓	
Biomass, biofuels	<=100 MW	<=100 MW	low emission rate	✓		low emission, advanced technology	✓			✓	< 25 MW			✓ (including cofiring with fossil fuels)	
Landfill gas	<=100 MW	<=100 MW	✓			✓	✓			✓		✓		✓	
Anaerobic digester						✓	✓			✓		✓		✓	
Fuel cells	<=100 MW	<=100 MW	✓			w/ renewable fuel	✓							w/ renewable resources	
Geothermal	<=100 MW	<=100 MW				✓	✓			✓				✓	
Municipal solid waste		<=100 MW		✓				✓							
Cogeneration, Combined heat and power ("CHP")		built through 1/1/1997			consumer sites, fuel efficiency >50%				✓						
Energy efficiency					✓										
Note	COD after 9/1/2005		COD after 7/1/2003			COD after 12/31/1997				COD after 1/1/2006	COD after 1/1/2006			COD after 12/31/1997	

Note: RE=Renewable Energy; WE=Waste Energy; APS=Alternative Portfolio Standard; RES=Renewable Energy Standard

Source: State Public Utilities/Service Commissions

In addition, as illustrated in Figure 41, Massachusetts and Connecticut have also established requirements for efficient thermal resources, including CHP and load side management (e.g., energy efficiency). Maine Class II also includes efficient cogen but there is no defined required percentage requirement.

Figure 41. RPS requirements of efficient thermal resources for Massachusetts and Connecticut



Note 1: RPS requirements of New England states from 2011 to 2020 (except Massachusetts APS) are based on projections from the ISO-NE RPS model. The Massachusetts APS requirement is calculated based on projections of Massachusetts' retail sales.

Source: State Public Utilities/Service Commissions; ISO-NE RPS worksheet <http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/eag/usr_sprdshts/2011_rps_worksheet.xlsx>

Comparative ACP Rates

Maine's ACP rate for Maine ME Class I was initially set at $57.12/MWh in 2007 based on market conditions at the time and then adjusted annually by the CPI. As shown in Figure 42, Maine's ACP is currently $62.1 per MWh. ACP rates of Massachusetts Class I, New Hampshire Class I, and Rhode Island New RES programs are the same as those of Maine Class I programs. Connecticut is the only state with static ACP rates in New England -- fixed at $55/MWh for Class I (new renewables) and $31/MWh for the Class II and III requirement.

In contrast to Maine, some states have an ACP rate for other classes of renewables (including existing). Massachusetts and New Hampshire have an ACP rate for solar PV that is much higher than their respective Class I rate in recognition of the higher capital costs of solar technology – the solar ACPs are roughly $600/MWh in Massachusetts and $160/MWh in New Hampshire. Although New Hampshire's rate is still below break-even for solar PV technology, the Massachusetts solar ACP rate is sufficiently high to not limit investment in this technology.

Figure 42. Comparison of ACP rates in New England

	Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
ME	Class I					$ 57.1	$ 58.6	$ 60.9	$ 60.9	$ 62.1
	Class II	N/A								
CT	Class I			$ 55.0	$ 55.0	$ 55.0	$ 55.0	$ 55.0	$ 55.0	$ 55.0
	Class II			$ 55.0	$ 55.0	$ 55.0	$ 55.0	$ 55.0	$ 55.0	$ 55.0
	Class III					$ 31.0	$ 31.0	$ 31.0	$ 31.0	$ 31.0
MA	Class I	$ 50.0	$ 51.4	$ 53.2	$ 55.1	$ 57.1	$ 58.6	$ 60.9	$ 60.9	$ 62.1
	Class I Solar Carve-Out								$ 600.0	$ 550.0
	Class II RE							$ 25.0	$ 25.0	$ 25.5
	Class II WE							$ 10.0	$ 10.0	$ 10.2
	APS							$ 20.0	$ 20.0	$ 20.4
NH	Class I						$ 58.6	$ 60.9	$ 60.9	$ 62.1
	Class II						$ 153.8	$ 160.0	$ 160.0	$ 163.2
	Class III						$ 28.7	$ 29.9	$ 29.9	$ 30.5
	Class IV						$ 28.7	$ 29.9	$ 29.9	$ 30.5
RI	New RES / Existing RES					$57.1	$ 58.6	$ 60.9	$ 60.9	$ 62.1

Note: The years highlighted in grey do not require compliance.

Source: State Public Utilities/Service Commissions

D.1.a Massachusetts

RPS requirements and eligible resources

The Massachusetts Class I (new renewables) requirement began in 2003 as a result of the electricity market structuring process. For Class I, retail electricity suppliers were required to meet 1% of retail sales with eligible renewable resources in 2003, increasing to 4% in 2009.[122] Afterwards, an annual increase of 1% is required until it reaches 15% in 2020 as shown in Figure 43. In addition, pursuant to the Green Communities Act of 2008, the original RPS was further expanded by Class II Renewable Energy ("RE"), Class II WE and APS.[123]

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122 Applicable retail sales are the total retail sales adjusted for exempt loads, which are electricity delivered under pre-2009 contracts. Source: Massachusetts RPS and APS 2009 Compliance Report.

123 Starting from 2009, the Massachusetts Class II RE (existing renewables) requirement is fixed at 3.6% and the Massachusetts Class WE requirement is fixed at 3.5% of the applicable retail sales. The APS started at 1% in 2009 and increases by 0.5% annually until reaching 3.5% in 2014. Afterwards, the APS requirement will increase by 0.25% annually.

Figure 43. RPS requirements (as a percentage of retail sales) in Massachusetts

Year	Class I	Class II RE	Class II WE	APS
2003	1.0%			
2004	1.5%			
2005	2.0%			
2006	2.5%			
2007	3.0%			
2008	3.5%			
2009	4.0%	3.6%	3.5%	1.00%
2010	5.0%	3.6%	3.5%	1.50%
2011	6.0%	3.6%	3.5%	2.00%
2012	7.0%	3.6%	3.5%	2.50%
2013	8.0%	3.6%	3.5%	3.00%
2014	9.0%	3.6%	3.5%	3.50%
2015	10.0%	3.6%	3.5%	3.75%
2016	11.0%	3.6%	3.5%	4.00%
2017	12.0%	3.6%	3.5%	4.25%
2018	13.0%	3.6%	3.5%	4.50%
2019	14.0%	3.6%	3.5%	4.75%
2020	15.0%	3.6%	3.5%	5.00%

Source: Massachusetts RPS & APS Annual Compliance Report for 2009

Eligible renewable resources for Massachusetts Class I (new renewables) include the following facilities, which began operation after 1997:[124]

- solar PV/thermal;
- wind energy;
- small hydropower up to 25 MW;
- fuel cells using eligible RPS Class I fuels;
- landfill methane and anaerobic digester gas;
- marine or hydrokinetic energy;
- geothermal energy; and
- eligible biomass fuel facilities, which adopt low-emission, advanced biomass power conversion technologies.

Massachusetts RPS Class II requirements have two sub classes: Class II renewable energy and Class II waste energy.[125] Qualified Massachusetts Class II renewable energy can be generated by the same fuel types and same technologies as Massachusetts Class I (new renewables) but with certain differences in other respects as shown in Figure 44. Eligible resources for Massachusetts Class II WE (waste resources) include approved generation facilities, which produce electricity or steam by burning solid waste.

124 Massachusetts RPS Class I regulation (225 CMR 14.00). Web. <http://www.mass.gov/Eoeea/docs/doer/rps_aps/225-CMR-14-00-122010-clean.pdf>

125 Massachusetts RPS Class II regulation (225 CMR 15.00). Web. <http://www.mass.gov/Eoeea/docs/doer/rps/225cmr1500-052909.pdf>

Furthermore, eligible resources for APS include CHP, flywheel storage, coal gasification, and efficient steam technologies, which tend to increase energy efficiency and reduce the demand for conventional fossil fuel-based power generation.[126]

Figure 44. Eligible resource difference between Massachusetts Class I (new renewables) and Class II (existing renewables) requirements

	MA Class I	MA Class II RE
Commercial online date ("COD")	post-1998	pre-1998
Size of eligible hydro resource	hydro <= 25 MW	hydro <= 5 MW
Criteria of biomass resource	low emission; advanced technology	low emission only
Annual requirement	increasing annually	fixed at 3.6%

Source: Massachusetts RPS and APS Annual Compliance Report for 2009

In addition, on January 1, 2010, the Massachusetts Department of Energy Resources ("MA DOER") further established the solar RPS Carve-Out, which explicitly specified the portion of Class I obligation to come from solar PV energy and aimed to support building 400 MW of solar PV within the state. Eligible projects have to satisfy the following conditions:

- located in the state of Massachusetts;
- capacity is less than 6 MW per parcel of land;
- commercial online date after 1/1/2008; and
- generation must be used on-site and be interconnected to the utility grid.[127]

Alternative Compliance Payment

The retail electricity suppliers can choose to either acquire RECs or pay the ACP for compliance. As shown in Figure 45, for the compliance year of 2011, the inflation adjusted ACP rate for RPS Class I (new renewables) is $62.13/MWh and the ACP for Class I (new renewables) solar carve-out program is $550/MWh, which is $50/MWh less than the one for compliance year 2010.[128] In addition, the Class II RE (existing renewables) ACP rate is $25.5/MWh, the Class WE ACP rate is $10.2/MWh and the APS rate is $20.4/MWh for compliance year 2011, which are similar to the ACP rates in the previous two years.

126 "Massachusetts RPS and APS Program Summaries." Government of Massachusetts. Web. <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/rps-and-aps-program-summaries.html>

127 "About the RPS Solar Carve-Out Program." Government of Massachusetts. Web. <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/solar/rps-solar-carve-out/about-the-rps-solar-carve-out-program.html>

128 "Alternative Compliance Payment Rates." Energy and Environmental Affairs, Government of Massachusetts. Web. <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/retail-electric-supplier-compliance/alternative-compliance-payment-rates.html>

Figure 45. MA RPS ACP rates, 2003-2011

Compliance year	CPI	Class I	Class I Solar	Class II RE	Class II WE	APS
2002	188.200	N/A				
2003	193.500	$50.00				
2004	200.200	$51.41				
2005	207.500	$53.19				
2006	215.000	$55.13				
2007	220.512	$57.12				
2008	229.306	$58.58				
2009	229.343	$60.92		$25.00	$10.00	$20.00
2010	233.868	$60.93	$600	$25.00	$10.00	$20.00
2011		$62.13	$550	$25.50	$10.20	$20.40

Source: Massachusetts alternative compliance payment rates (see footnote 128)

Banking mechanism

A retail electricity supplier may satisfy up to 30% of the Massachusetts Class I (new renewables) obligation and up to 10% of Massachusetts Class I (new renewables) solar obligation with excess RECs procured in the previous two years.[129]

Similarly, a retail electricity supplier may satisfy up to 30% of the Massachusetts Class II REC (existing renewables) and WE (waste resources) obligations with excess Class II RECs and WECs procured in the previous two years.[130]

A retail electricity supplier may satisfy up to 30% of the Massachusetts APS (efficient thermal resources) obligation with excess APS Alternative Generation Attributes procured in the previous two years.[131]

129 Massachusetts RPS Class I Regulation (225 CMR 14.00).

130 Massachusetts RPS Class II Regulation (225 CMR 15.00).

131 Massachusetts RPS APS Regulation (225 CMR 16.00).

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D.1.b Connecticut

RPS requirements and eligible resources

Connecticut's RPS requirement was enacted as part of the 1998 electricity utility restructuring law. Since then, Connecticut's RPS requirements have been amended several times in terms of eligible renewable resources and geographical locations. Currently, there are explicit RPS requirements for Class I (new renewables), II (existing renewables), and III (efficient thermal resources) resources as shown in Figure 46.

Figure 46. RPS requirements in Connecticut as a percentage of retail sales

Year	Class I	Class II	Class III	Total
2004	1.0%	3.0%		4.0%
2005	1.5%	3.0%		4.5%
2006	2.0%	3.0%		5.0%
2007	3.5%	3.0%	1.0%	7.5%
2008	5.0%	3.0%	2.0%	10.0%
2009	6.0%	3.0%	3.0%	12.0%
2010	7.0%	3.0%	4.0%	14.0%
2011	8.0%	3.0%	4.0%	15.0%
2012	9.0%	3.0%	4.0%	16.0%
2013	10.0%	3.0%	4.0%	17.0%
2014	11.0%	3.0%	4.0%	18.0%
2015	12.5%	3.0%	4.0%	19.5%
2016	14.0%	3.0%	4.0%	21.0%
2017	15.5%	3.0%	4.0%	22.5%
2018	17.0%	3.0%	4.0%	24.0%
2019	18.5%	3.0%	4.0%	25.5%
2020	20.0%	3.0%	4.0%	27.0%

Source: Connecticut RPS <http://www.ct.gov/dpuc/cwp/view.asp?a=3354&q=415186>

Class I (new renewables) eligible resources include "A) energy derived from solar power, wind power, a fuel cell, methane gas from landfills, ocean thermal power, wave or tidal power, low emission advanced renewable energy conversion technologies, a run-of-the-river hydropower facility provided such facility has a generating capacity of not more than five megawatts, does not cause an appreciable change in the river flow, and began operation after July 1, 2003, or a sustainable biomass facility with an average emission rate of equal to or less than .075 pounds of nitrogen oxides per million BTU of heat input for the previous calendar quarter, except that energy derived from a sustainable biomass facility with a capacity of less than five hundred kilowatts that began construction before July 1, 2003, may be considered a Class I renewable energy source, or (B) any electrical generation, including distributed generation, generated from a Class I renewable energy source."[132]

[132] General Statutes of Connecticut. Chapter 277 Department of Public Utility Control, Office of Consumer Counsel, Miscellaneous Provisions, §16-1(a)(26).

Class II (existing renewables) eligible resources include "energy derived from a trash-to-energy facility, a biomass facility that began operation before July 1, 1998, provided the average emission rate for such facility is equal to or less than .2 pounds of nitrogen oxides per million BTU of heat input for the previous calendar quarter, or a run-of-the-river hydropower facility provided such facility has a generating capacity of not more than five megawatts, does not cause an appreciable change in the river flow, and began operation prior to July 1, 2003."[133]

Class III (efficient thermal resources) eligible resources include "the electricity output from combined heat and power systems with an operating efficiency level of no less than fifty per cent that are part of customer-side distributed resources developed at commercial and industrial facilities in this state on or after January 1, 2006, a waste heat recovery system installed on or after April 1, 2007, that produces electrical or thermal energy by capturing pre-existing waste heat or pressure from industrial or commercial processes, or the electricity savings created in this state from conservation and load management programs begun on or after January 1, 2006."[134]

The Class I requirement starts with 1% of retail sales in 2004 and gradually increases to 20% in 2020. The Class II requirement begins with 3% of retail sales in 2004 and is maintained at that level. The Class III requirement starts with 1% of retail sales in 2007 and increases by 1% per year until reaching 4% in 2010 and remains at 4% thereafter.

Alternative Compliance Payment

Electric suppliers or distribution companies can choose to meet the RPS requirements by either acquiring RECs or paying the ACP. Connecticut's ACP rates for Class I and II REC obligations are fixed at $55/MWh. Connecticut's ACP rate for the Class III REC obligation is fixed at $31/MWh.[135]

Banking mechanism

For compliance purposes, electricity suppliers may satisfy their REC obligation in the previous year using RECs purchased in the first quarter of the existing year. In addition, electricity suppliers may satisfy up to 30% of each Class I, II, and III obligation with excess RECs purchased in the previous two years.[136]

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133 General Statutes of Connecticut. Chapter 277 Department of Public Utility Control, Office of Consumer Counsel, Miscellaneous Provisions, §16-1(a)(27).

134 General Statutes of Connecticut. Chapter 277 Department of Public Utility Control, Office of Consumer Counsel, Miscellaneous Provisions, §16-1(a)(44).

135 Connecticut RPS ACP rates. Connecticut Department of Energy & Environmental Protection Public Utilities Regulatory Authority. November 28, 2007. Web. <http://www.dpuc.state.ct.us/electric.nsf/60a3df2c610b4cd6852575b3005ce06c/1737dbf71756a9df852573a10073ec41?OpenDocument>

D.1.c New Hampshire

RPS requirements and eligible resources

Effective July 1, 2007,[137] NH RSA 362-F enacted the RPS, which requires that each electricity supplier needs to satisfy a certain percentage of its retail sales with eligible renewable resources. In August 2008, the New Hampshire Public Utilities Commission ("PUC") approved the final RPS rule (Chapter NH 2500). Currently, there are four renewable energy classes based on technology and vintage.

Class I (new) and II (new) requirements are established for new renewable energy resources, defined as qualifying renewable facilities in operation after January 1, 2006. Class I (new) renewable resources include wind energy, geothermal energy, hydrogen derived from biomass fuel or methane gas, ocean thermal/wave/current/tidal energy, certain methane gas, and certain biomass technologies. Class II (new) renewable resources include generation from solar technologies.

Figure 47. RPS requirements in New Hampshire as a % of retail sales

Year	Class I	Class II	Class III	ClassIV	Total
2008	0.0%	0.00%	3.5%	0.5%	4.0%
2009	0.5%	0.00%	4.5%	1.0%	6.0%
2010	1.0%	0.04%	5.5%	1.0%	7.5%
2011	2.0%	0.08%	6.5%	1.0%	9.6%
2012	3.0%	0.15%	6.5%	1.0%	10.7%
2013	4.0%	0.20%	6.5%	1.0%	11.7%
2014	5.0%	0.30%	6.5%	1.0%	12.8%
2015	6.0%	0.30%	6.5%	1.0%	13.8%
2016	7.0%	0.30%	6.5%	1.0%	14.8%
2017	8.0%	0.30%	6.5%	1.0%	15.8%
2018	9.0%	0.30%	6.5%	1.0%	16.8%
2019	10.0%	0.30%	6.5%	1.0%	17.8%
2020	11.0%	0.30%	6.5%	1.0%	18.8%
2021	12.0%	0.30%	6.5%	1.0%	19.8%
2022	13.0%	0.30%	6.5%	1.0%	20.8%
2023	14.0%	0.30%	6.5%	1.0%	21.8%
2024	15.0%	0.30%	6.5%	1.0%	22.8%
2025	16.0%	0.30%	6.5%	1.0%	23.8%

Source: New Hampshire RPS
<http://www.puc.nh.gov/Sustainable%20Energy/Renewable_Portfolio_Standard_Program.htm>

136 DPUC Promulgation of Regulations for Banking Renewable Energy Credits, Dkt No. 08-09-01. Web. <http://www.dpuc.state.ct.us/dockcurr.nsf/8e6fc37a54110e3e852576190052b64d/62ab8991cb6925a38525769a0057103a?OpenDocument>

137 New Hampshire Statutes: Chapter 362-F: Electric Renewable Portfolio Standard. Web. <http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-XXXIV-362-F.htm>

Class III and Class IV requirements are established for existing renewable energy resources. Class III (existing) renewable resources include existing eligible biomass technologies with a gross nameplate capacity of 25 MW or less and methane gas. Class IV (existing) renewable sources include existing hydroelectric facilities with a gross nameplate capacity of less than 5 MW and that meet certain specified technical requirements.[138]

The total RPS requirement in New Hampshire for these four Classes is 4% of retail sales in 2008 and increases gradually to 23.8% by 2025, as shown in Figure 47.

Alternative Compliance Payment

Pursuant to New Hampshire's RPS rules, the New Hampshire Public Utilities Company ("NH PUC") publishes ACP rates on September 1st of each year.[139] As shown in Figure 48, the ACP rate for New Hampshire Class I (new renewables) is around $60/MWh and the ACP rate for Class II (new solar) is around $160/MWh. The ACP rates for Class III and IV are around $30/MWh. The Class I ACP rate is the same as Massachusetts, Maine and Rhode Island. However, the ACP for solar technology of $163/MWh in 2011 is well below the ACP rate for solar in Massachusetts, which is $550/MWh.

Figure 48. New Hampshire inflation adjusted ACP rates

Class	2008	2009	2010	2011
Class I	$ 58.58	$ 60.92	$ 60.93	$ 62.13
Class II	$ 153.84	$ 159.98	$ 160.01	$ 163.16
Class III	$ 28.72	$ 29.87	$ 29.87	$ 30.46
Class IV	$ 28.72	$ 29.87	$ 29.87	$ 30.46

Source: New Hampshire RPS
<http://www.puc.nh.gov/Sustainable%20Energy/Renewable_Portfolio_Standard_Program.htm>

Banking mechanism

In New Hampshire, the electricity supplier may satisfy up to 30% of the RPS requirement in the compliance year using the excess RECs procured in the prior two years. In addition, the compliance entity can also apply the RECs obtained the first quarter of the existing year to satisfy up to 30% of the RPS obligation in the previous year.[140]

138 "Electric Renewable Portfolio Standard." New Hampshire Public Utilities Commission. Web. <http://www.puc.nh.gov/Sustainable%20Energy/Renewable_Portfolio_Standard_Program.htm>

139 New Hampshire. Renewable Energy Portfolio Standard (RPS) rules (PUC 2507.02).

140 New Hampshire Code of Administrative Rules: Chapter PUC 2500 Electric Renewable Portfolio Standard. Web. <http://www.puc.nh.gov/Regulatory/Rules/Puc2500.pdf>

D.1.d Rhode Island

RPS requirements and eligible resources

Pursuant to Rhode Island's RPS regulation effective on July 25, 2007,[141] its RPS requirement for new and existing resources combined starts with 3% of retail sales in 2007 and gradually increases to 16% in 2019, as shown in Figure 49.

Figure 49. RPS requirements in Rhode Island as a percentage of retail sales

Year	New resources	Existing resources	Total
2007	1.0%	2%	3.0%
2008	1.5%	2%	3.5%
2009	2.0%	2%	4.0%
2010	2.5%	2%	4.5%
2011	3.5%	2%	5.5%
2012	4.5%	2%	6.5%
2013	5.5%	2%	7.5%
2014	6.5%	2%	8.5%
2015	8.0%	2%	10.0%
2016	9.5%	2%	11.5%
2017	11.0%	2%	13.0%
2018	12.5%	2%	14.5%
2019	14.0%	2%	16.0%
2020 & thereafter	14.0%	2%	16.0%

Source: Rhode Island Rules and Regulations Governing the Implementation of a Renewable Energy Standard

Eligible renewable resources in Rhode Island include generation resources using:[142]

- direct solar radiation;
- wind;
- ocean movement or its latent heat;
- geothermal;
- small hydro (<=30 MW);
- clean biomass; and
- fuel cells.

The Rhode Island RPS program is under administration of two state entities, specifically, the Rhode Island Public Utilities Commission ("RI PUC") and the Rhode Island Economic

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141 RI Rules and Regulations Governing the Implementation of a Renewable Energy Standard. State of Rhode Island and Providence Plantations. Web. <http://www.ripuc.org/utilityinfo/RESRules(7-25-07).pdf>

142 Ibid.

Development Corporation ("RI EDC"). The RI PUC is responsible for regulation development and implementation of the RPS, whereas the RI EDC is in charge of administration of the renewable energy development fund.

Alternative Compliance Payment

As shown in Figure 50, the current inflation adjusted ACP in Rhode Island is $62.13/MWh, which is the same as in Maine.

Figure 50. Rhode Island inflation adjusted ACP rates

CY	2007	2008	2009	2010	2011
ACP	$ 57.12	$ 58.58	$ 60.92	$ 60.93	$ 62.13

Note: The ACP rates for both New and Existing RES compliances are the same.

Source: Rhode Island ACP rates <http://www.ripuc.org/utilityinfo/RES-ACPRate%281-18-11%29.pdf>

Banking mechanism

In addition, retail suppliers are allowed to satisfy up to 30% of the existing year's obligation using banked excess RECs from the previous two years.[143]

143 Ibid.

D.2 Appendix B: REC Price Drivers

REC prices are determined by the intersection of demand (i.e., effectively the RPS requirement) and supply (based on the quantity of qualified renewable resources and their willingness to sell RECs). To better understand RPS requirement changes and subsequently REC prices it is helpful to examine underlying demand and supply side drivers, discussed in more detail below.

Demand side drivers

- Load growth. If the economy grows, electric consumption will increase. Greater total retail sales will result in a higher effective MWh requirement for RECs. With a higher demand for RECs, it is reasonable to expect a higher REC price (over time), which implies more revenue flows to renewable projects. Conversely, lower load growth will result in lower REC prices.

- Level of RPS requirement. The RPS percentage requirement similarly affects the demand for RECs. For example, if Maine's RPS requirement for new renewable generation as a percentage of retail sales in 2017 is reduced from 10% to 4%, it would result in a lower demand for RECs given the same level of energy consumption (retail sales). A lower RPS requirement target will consequently imply a lower volume of RECs will be purchased for compliance and this may push REC prices down, holding all else equal. The converse is also true. If a higher RPS percentage requirement is enacted, it results in a higher RPS requirement and hence a higher REC price (capped by ACP levels). Higher REC prices will encourage renewable project development.

- RPS policy uncertainty. To the extent that there is sustained regulatory uncertainty regarding Maine's (as well as other New England states') RPS policies, risk-averse investors (and specifically lenders) may discount the value of RECs in the investment decision. This may limit new investment.[144]

Supply side drivers

- Capital investment costs. Renewable technologies over time typically experience a declining cost trend as a result of technology improvement. As a result, less capital

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144 RPS regulatory stability in the future has been emphasized by several respondents to the Maine PUC NOI, including HESS, Ocean Renewable Power Company ("ORPC"), and Conservation Law Foundation ("CLF"). RPS regulation uncertainty will not only negatively impact renewable project development but could also impact compliance entities' decision making on REC procurement. If RPS requirements have to be revised, respondents suggest that the legislative agency should consider grandfathering the existing contracts executed before any potential change of the requirements to mitigate the impacts of regulation changes on compliance entities (Responses to NOI, MPUC Dkt. No. 2011-271).

investment is required and the renewable project will become more economically viable.[145]

- Environmental regulations. Regulations that impose restrictions on conventional thermal generation can indirectly encourage more renewable project development. Several recently enacted or proposed EPA rules could force some conventional thermal units to retire in the near term or make capital refurbishments.[146] Retirements and/or capital investment would raise energy and capacity prices. As a result, renewable project developers may see an improvement in their economics.

- Large scale transmission ("TX") upgrades and infrastructure. Depending on location, transmission upgrades may either facilitate or challenge renewable project development within Maine. If the TX upgrades allow additional renewable energy outside of Maine to be made available throughout New England, this will likely lead to a decrease in energy prices, and depending on qualifications, a decrease in capacity and REC prices. Local renewable development would be challenged by such competition and the resulting potential lower market prices. On the other hand, if new TX is built to alleviate transmission congestion within New England and allow additional renewable energy from Maine to be transmitted to load centers in New England, this TX investment would complement renewable development within Maine.

- Production tax credit. The PTC provides a large component of economics for renewable projects that qualify. The PTC is scheduled to expire in December 31, 2013 (December 31, 2012 for wind) and if not renewed will materially impact renewable project development not only in Maine, but throughout the US.

- Biomass Policy. A higher biomass efficiency requirement may delay biomass related project development. If other states in New England adopt a higher biomass efficiency requirement similar to Massachusetts, more investment costs would be expected and biomass development may be delayed and/or reduced.

- Carve-out programs or Restrictions. Singling out specific types of renewable development will impact renewable development and RECs. For example, a higher biomass efficiency requirement, as adopted in Massachusetts, will likely raise capital costs for new biomass development and thereby constrain development.

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145 First Wind noted that "[t]he cost of wind turbines has declined significantly in recent years in relation to the capacity of the turbine and its expected output." Constellation also pointed out that solar panel costs have declined from $10,870/kW in 1998 to $7,160/kW in 2010. For tidal technology, ORPC estimates that over the next five to ten years, costs associated with tidal development will be reduced by approximately 70%. (Responses to NOI, MPUC Dkt. No. 2011-271).

146 The EPA proposed/issued several environmental rules in 2010 and 2011, including Cross-State Air Pollution Rule ("CSAPR"), Air Toxics Standards for Utilities ("MACT" – maximum achievable control technology), Coal Combustion Residuals ("CCR"), and Clean Water Act Section 316 b.

D.3 Appendix C: RPS Compliance in other New England States

In addition to Maine's RPS compliance discussed in Item 1 (Section C.1) of this Report, this Appendix summarizes RPS compliance information for Massachusetts, Connecticut, New Hampshire and Rhode Island for the period 2007-2009.[147] We have focused on the information, when available, for the latest compliance year.[148]

D.3.a Massachusetts

- ***ACPs were rarely used for the Massachusetts Class I (new renewable) RPS compliance during 2007-2009.***
- ***RECs purchased from neighboring areas of New England increased from 26% in 2007 to 44% in 2009.***
- ***Banking Massachusetts Class I (new renewable) RECs for future compliance increased during 2007-2009.***
- ***There was a shortage of Massachusetts Class II Renewable Energy (existing renewables) resources to achieve the requirement in 2009 and the shortage will likely persist in the short term according to the Massachusetts DOER.***
- ***Due to a large exemption of load from compliance, there was excess supply of Massachusetts Class II Waste Energy Certificates ("WECs") in 2009, but the market is expected to achieve a balance in supply-demand in the next five years.***
- ***Massachusetts APS (efficient thermal resources) compliance in 2009 was satisfied through a mix of AECs (73%) and ACPs; over 99% of AECs came from CHP plants.***

Massachusetts RPS Class I (new renewables) compliance, 2007-2009

Compliance: As shown in Figure 51, the RPS Class I (new renewables) supply has increased faster than requirements, thereby allowing obligations to be satisfied by a mix of banked RECs from the previous two years, RECs purchased in the compliance year and ACPs. In the past three years, over 99% of the Class I (new renewables) requirements were satisfied by purchased RECs and less than 1% of RPS Class I (new renewables) obligations were satisfied by ACPs. Furthermore, the ACPs used for compliance decreased to zero in 2009. In addition, as observed in the last three years, there has been an increasing trend in banking RECs forward by compliance entities, increasing from 81 GWh in 2007 to 386 GWh in 2009. Both the increasing trend in banking RECs and the decreasing trend in ACPs can be explained by low REC prices in the 2009 trading year. As shown in the annual compliance report, all except one of the 28 suppliers have banked excess RECs in 2009 for compliance years 2010 and 2011 due to low REC

[147] 2010 data was not available but will be added once available.

[148] The Rhode Island Compliance Report is not available for 2007, the New Hampshire Compliance report is not applicable for 2007 and is not available for 2008 and the Connecticut RPS compliance report for 2009 is not available at the time of analysis. The Connecticut RPS compliance report for 2009 is expected to be available in January 2012.

prices during 2009.[149] No Class I compliance cost information was available in the Massachusetts compliance reports for 2007, 2008 or 2009.

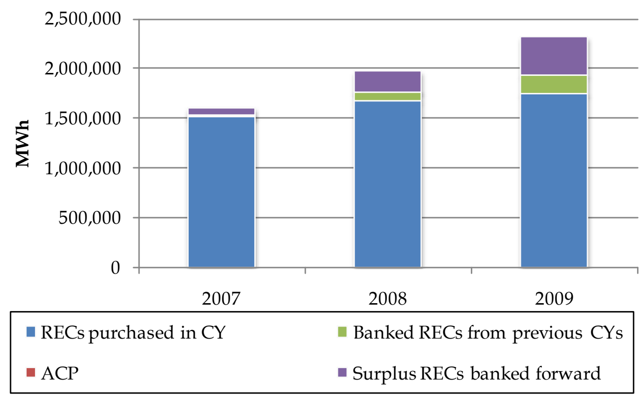
Overview of Green Communities Act 2008

1) Creates unconstrained market for energy efficiency to compete with supply – utilities to invest in all cost-effective energy efficiency
2) Partners state with towns/municipalities to implement energy efficiency and renewables
3) Expands renewable energy goals through increase in RPS minimum standard and additional RPS classes
4) Enhances market opportunities for renewables through municipal ownership, net metering, and utility PV ownership

Source: MA DOER, "2008 Green Communities Act", September 4, 2008

Sources: Historically, Massachusetts Class I (new renewables) RECs came from both in-state and out-of-state resources, including from other New England states, New York, Quebec, and the Maritimes (Northern Maine Independent System Administrator (NMISA) and Prince Edward Island). As shown in Figure 52, RECs sourced from within Massachusetts have increased at an annual rate of 1.4% but this growth rate has been well below the average growth rate of total REC obligations, which is around 15%. As a result, the share of resources used for Massachusetts Class I (new renewables) compliance has decreased from 13% in 2007 to 9% in 2009. Meanwhile, the share of resources from regions outside ISO-NE's footprint has increased from 26% in 2007 to 44% in 2009. The amount of RECs sourced from Maine was above 500 GWh of the Massachusetts Class I obligation, despite a three year decline in RECs sourced from New England.

Figure 51. Massachusetts RPS Class I (new renewables) compliance in 2007-2009

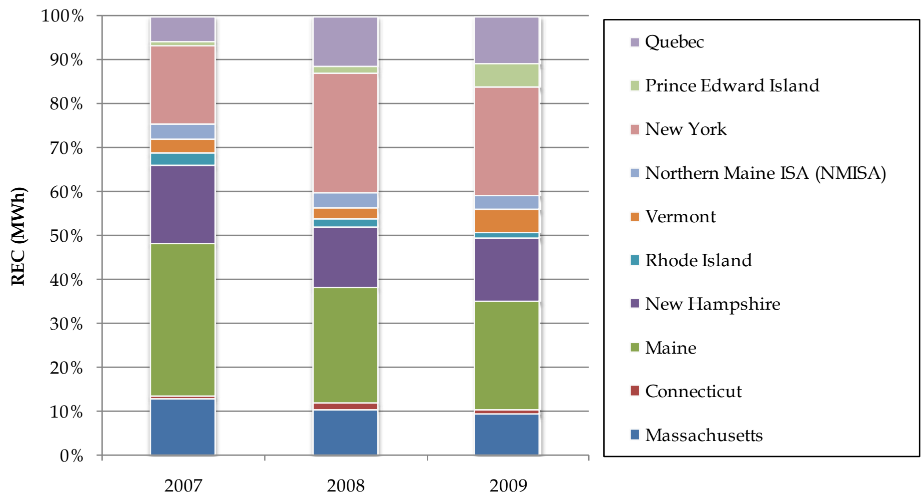


MWh	2007	2008	2009
Class I REC obligation	1,529,343	1,761,257	1,932,089
RECs purchased in CY	1,511,576	1,679,458	1,742,254
RECs banked in previous Cys	6,863	80,605	189,835
ACP	10,920	1,208	0
RECs banked forward	80,743	210,580	386,059

Source: Massachusetts Renewable and Alternative Energy Portfolio Standards (RPS & APS) Annual Compliance Report for 2009

149 Massachusetts RPS and APS Annual Compliance Report for 2009. Page 8.

Figure 52. 2007-2009 Location distribution of RECs purchased for Massachusetts Class I (new renewables) compliance (MWh)



Source: Massachusetts Renewable and Alternative Energy Portfolio Standards (RPS & APS) Annual Compliance Report for 2009

As shown in Figure 53, biomass and landfill gas together accounted for over 50% of the total RECs purchased for Massachusetts Class I (new renewables) RPS compliance from 2007 to 2009. All biomass RECs were produced in Maine and New Hampshire. REC reduction from biomass over this period is due to the shutdown of two biomass plants in Maine. Furthermore, RECs sourced from wind mainly came from New York, Quebec, and the Maritimes and increased from 19% in 2007 to 37% in 2009. Hydroelectric resources became a qualified resource for Massachusetts Class I (new renewables) in 2009.[150] Although hydroelectric facilities only account for 2%of RECs in 2009, RECs sourced from hydroelectric generators due to expected capacity and efficiency upgrades are expected to increase in the near future.[151] Given the Massachusetts Class I (new renewables) RPS solar carve-out implemented in January 2010, solar RECs are also expected to increase in the near future.

Pursuant to the Massachusetts Green Communities Act,[152] retail suppliers are encouraged to enter long-term (10-15 years) contracts with renewable energy developers to facilitate project

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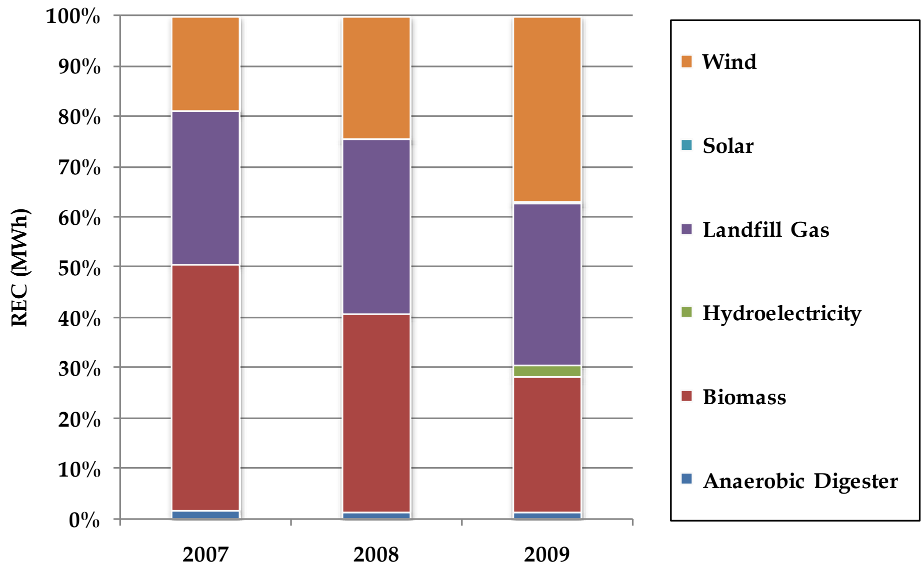
150 Massachusetts RPS and APS Compliance Report 2009. Page 6.

151 Hydro RECs are generated mostly from most post-1998 production increases at some old plants due to capacity and efficiency upgrades.

152 Massachusetts Green Communities Act, S.B. 2768. Web. <http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169>

financing, which may included RECs as part of the contract (for example, the PPA between National Grid and Cape Wind[153]).

Figure 53. Fuel mix of RECs purchased for Massachusetts Class I (new renewables) compliance (MWh) (2007-2009)



Source: Massachusetts Renewable and Alternative Energy Portfolio Standards (RPS & APS) Annual Compliance Report for 2009

The opportunity for long term contracts to supplant REC purchases may effectively reduce the demand in the REC market, and may depress REC market prices, such that the "market" signal for new renewable investment is muted. The relationship between contracting opportunities and REC (spot) markets requires careful consideration in light of such potential dynamics.

Massachusetts RPS Class II compliance in 2009

Costs of compliance: In 2009, the total Massachusetts Class II RE obligation was 589,801 MWh. Only three suppliers were able to meet the requirement by Class II RECs, whereas the other 25 suppliers had a total shortfall of 554,911 RECs. As shown in Figure 54, 94% of Massachusetts Class II obligations were satisfied through ACP at $20/MWh, totalling $13,872,775. The major reason for the compliance failure is the lack of Class II qualified resources. 2009 was the first year of Class II RE compliance, and only seven facilities with a total capacity of 13 MW were certified. Due to insufficient eligible resources for the Class II REC (existing renewables) requirement, the share of ACP compliance is expected to stay at a similar level in the near future.

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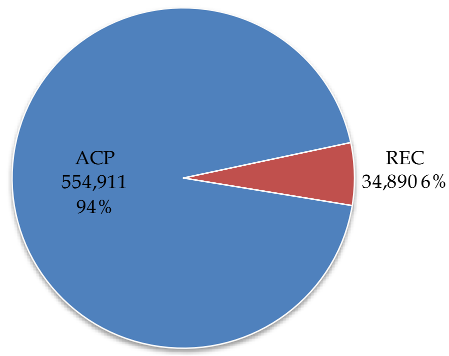
153 Massachusetts DPU, Dkt. No. 10-54. <http://www.env.state.ma.us/dpu/docs/electric/10-54/112210dpufnord.pdf>

Figure 54. Massachusetts Class II Renewable Energy compliance in 2009



Source: Massachusetts Renewable and Alternative Energy Portfolio Standards (RPS & APS) Annual Compliance Report for 2009

Massachusetts Class II also has a separate requirement for waste energy, which is fixed at 3.5% of total electricity retail sales per year. The Massachusetts Class II WEC obligation was 574,384 MWh in 2009. WECs totalled 1,064,833, well above the obligation for 2009, and 330,288 WECs were banked towards Class II WECs for the next two years. The surplus in 2009 was due to the large exemption mandated in the Green Communities Act and is expected to disappear over the next few years. Despite the oversupply, four suppliers paid ACP at a rate of $10/MWh for 728 WECs.

APS compliance in 2009[154]

Costs of compliance: APS is a new obligation mandated under the Green Communities Act. It differs from RPS because it is a requirement to support certain "alternative" energy resources instead of renewable energy, such as CHP and flywheel storage. The APS alternative energy certificates ("AEC") obligation net of exempt load was 163,844 MWh in 2009, of which 73% was satisfied by AECs and the rest was satisfied by ACPs at a rate of $20/MWh with a total payment of $890,380. Nine of twenty-eight suppliers did not purchase any AECs. Among the purchased AECs, over 99% came from CHP plants and the rest were from flywheel storage units.

154 LEI contacted the Massachusetts DOER regarding the release date of the 2010 Annual Compliance Report. At the time of writing this Report, there has not been a response to our inquiry.

D.3.b Connecticut

- ***Connecticut has limited in-state eligible renewable resources. Therefore over 90% of Class I requirements have historically come from neighboring states. Over 70% of Connecticut Class I RECs were sourced from biomass resources in 2008.***
- ***For Connecticut Class II compliance, due to new eligibility guidelines (i.e., biomass and hydroelectric), the share of trash-to-energy resources decreased from close to 80% in 2007 to 29% in 2008.***
- ***ACP payments accounted for less than 1% of the compliance strategy in 2008.***

Connecticut Class I (new renewables) compliance

Costs of compliance: In Connecticut, there are three RPS classes: new renewable resources (Class I), existing renewable resources (Class II), and alternative energy resources (Class III). The Connecticut Class III (efficient thermal resources) requirement started in 2007. As shown in Figure 55, for 2007 and 2008, Class I and III requirements have typically been met without banking many RECs given the relatively high average REC price of $50.6/MWh for compliance year 2007 and $38.6/MWh for compliance year 2008. Class II RECs procured in 2006 and 2007 significantly exceeded the requirement in 2006 and 2007 due to over-procurement activities of several load serving entities.[155, 156]

Figure 55. Connecticut RPS compliance, 2005-2008

Year	Total Load (MWh)	Class I RECs		CLASS II RECs		CLASS III RECs		Total RECs	
		Required	Actual	Required	Actual	Required	Actual	Required	Actual
2005	31,700,000	480,000	510,000	950,000	940,000	-	-	1,430,000	1,450,000
2006	30,400,000	610,000	550,000	910,000	1,490,000	-	-	1,520,000	2,040,000
2007	31,120,000	1,090,000	1,090,000	930,000	1,410,000	310,000	320,000	2,330,000	2,820,000
2008	30,310,000	1,520,000	1,530,000	910,000	920,000	610,000	610,000	3,030,000	3,060,000

Source: Annual Review of Connecticut RPS Compliance in 2008, Dkt. No. 09-10-09

Although the total purchased RECs were more than required on an aggregate, state-wide basis, a few retail suppliers still needed to satisfy their obligations through the ACP: four companies for Connecticut Class I (new renewables), five companies for Connecticut Class II (existing renewables), and five companies for Connecticut Class III (efficient thermal resources). The total ACP payments made in 2008 amounted to $113,730, which was 67% lower than in 2007, reflecting a decreased reliance on ACP.[157] Figure 56 presents the detailed ACP costs by

155 Annual Review of Connecticut RPS Compliance in 2008, Dkt. No. 09-10-09.

156 "Banking" was not permitted until 2009. Please refer to the Department amended "Conn. Agencies Regs. §16-245a-1" for details (Ibid. Page 9).

157 ACP rates for Class I, II and III were $55/MWh, $55/MWh and $31/MWh respectively.

company and by RPS class.[158] Although no information was available to determine the deficiency reasons, the Connecticut Department of Public Utility Control ("DPUC") believed that the deficiency was due to miscalculation of requirements given load adjustments.[159]

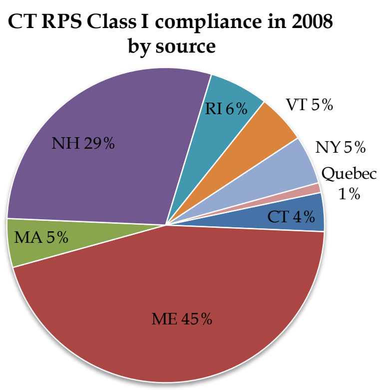
Figure 56. ACP costs for Connecticut RPS compliance in 2008

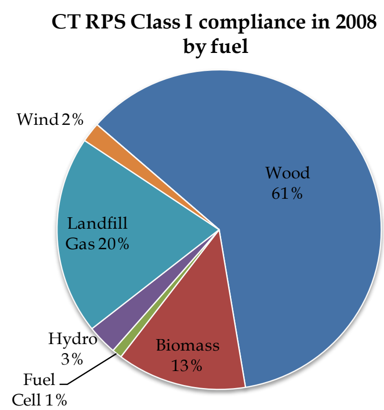
Company	Class I		Class II		Class III	
	Deficiency	ACP	Deficiency	ACP	Deficiency	ACP
Clearview Electric						
Dominion					59	$ 1,817
Glacial Energy Inc.			122	$ 6,714		
Integrys	449	$ 24,701	271	$ 14,930	181	$ 5,600
Mxenergy, Electric, Inc.	251	$ 13,781	151	$ 8,291	101	$ 3,126
Public Power & Utility	276	$ 15,175	166	$ 9,105		
TransCanada Power Marketing	120	$ 6,583	42	$ 2,300	52	$ 1,608
Total	**1096**	**$ 60,240**	**752**	**$ 41,340**	**393**	**$ 12,151**
ACP rates ($/MWh)		**$ 55**		**$ 55**		**$ 31**

Source: Annual Review of Connecticut RPS Compliance in 2008, Dkt. No. 09-10-09

Sources: Fifteen out of nineteen companies satisfied Connecticut Class I (new renewables) requirement in 2008 through RECs and the remaining four companies satisfied the compliance deficiency through ACP. As shown in Figure 57, Connecticut Class I (new renewables) RECs purchased within Connecticut increased from 2.5% in 2007 to 4% in 2008 as a result of the price decline for Connecticut Class I (new renewables) RECs. In 2008, 74% of Class I RECs were produced from biomass and 20% of Class I RECs were produced from landfill gas facilities.

Figure 57. Location distribution and fuel mix of resources for Connecticut Class I (new renewables) compliance in 2008





Source: Annual Review of Connecticut RPS Compliance in 2008, Dkt. No. 09-10-09

158 LEI requested the most recent annual compliance report from Connecticut staff. According to our discussion with Connecticut DPUC staff, the 2009 RPS compliance report will be available after this Study is submitted.

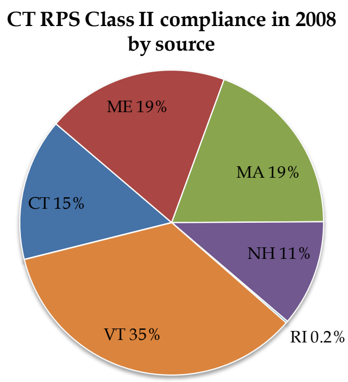
159 Annual Review of Connecticut RPS Compliance in 2008, Dkt. No. 09-10-09. Page 19.

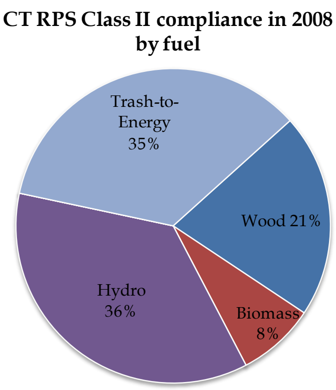
Connecticut Class II (existing renewables) compliance

Sources: Fourteen out of nineteen companies satisfied the Connecticut Class II (existing renewables) requirement in 2008 through RECs and the remaining five companies satisfied the compliance deficiency through ACP. Although a significant number of Class II (existing renewables) RECs were purchased within Connecticut, the percentage decreased from 2007 to 2008. Since very few applicants have applied for Class II certification in the past couple of years, no significant increase in the Class II (existing renewables) RECs supply is expected in the foreseeable future.

As shown in Figure 58, the fuel mix of resources for Connecticut Class II (existing renewables) requirement includes 35% of trash-to-energy, 29% of biomass (including wood), and 36% of hydroelectric. The fuel mix has changed due to more renewable source certifications since 2007 from non trash-to-energy facilities which had accounted for close to 80% of Class II supply in 2007.

Figure 58. Location distribution and fuel mix of resources for Connecticut Class II (existing renewables) compliance in 2008





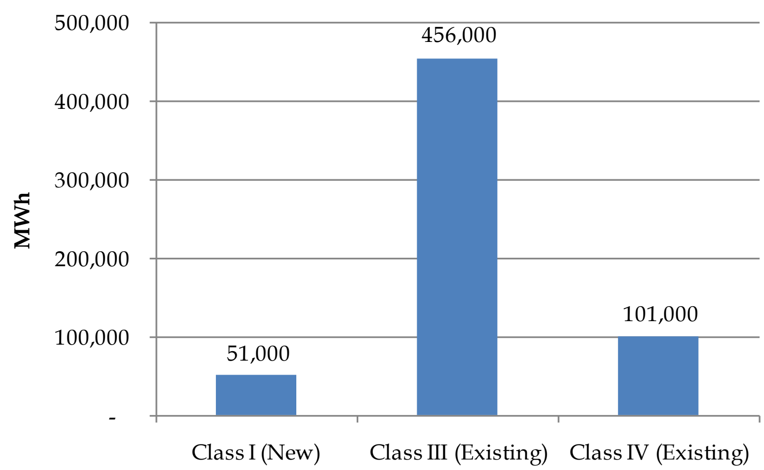
Source: Annual Review of Connecticut RPS Compliance in 2008, Dkt. No. 09-10-09

D.3.c New Hampshire

- ***The majority of eligible resources for New Hampshire Class I (new renewables) and Class II (new renewables) historically have been located outside of the state of new Hampshire.***
- ***There is excess supply of Class I (new renewables) RECs currently in New Hampshire, which has driven Class I REC prices below Class III (existing renewables) and Class IV (existing renewables) RECs.***
- ***There is also a shortage of Class IV (existing renewables) eligible resources, thereby requiring substantial ACP payments for this class.***
- ***The New Hampshire PUC is currently evaluating its RPS.***

Costs of compliance: New Hampshire's RPS regulation is relatively new; therefore, the first compliance year for New Hampshire's Class I (new renewables) requirement was 2009 and the first compliance year for New Hampshire's Class II (new renewables) requirement was 2010. For the compliance year of 2009, retail suppliers were only required to procure RECs to satisfy Class I (new renewables), Class III (existing renewables), and Class IV (existing renewables) requirements. The Class III RPS requirement accounted for 75% of the total RPS requirement of 608,000 MWh (see Figure 59).

Figure 59. New Hampshire's RPS Class III requirements in 2009



Note: New Hampshire's RPS Class II (new renewables) was not required for compliance in 2009.

Source: New Hampshire's Annual RPS Compliance Report for 2009

As shown in Figure 60, there was no ACP used for the compliance of New Hampshire's Class I (new renewables) RPS requirement in 2009. The ACP costs for New Hampshire's Class III (existing renewables) and Class IV (existing renewables) compliance totalled $78,468 (i.e., <1% of the REC obligation) and $1.26 million (i.e., 42% of the REC obligation), respectively. As noted

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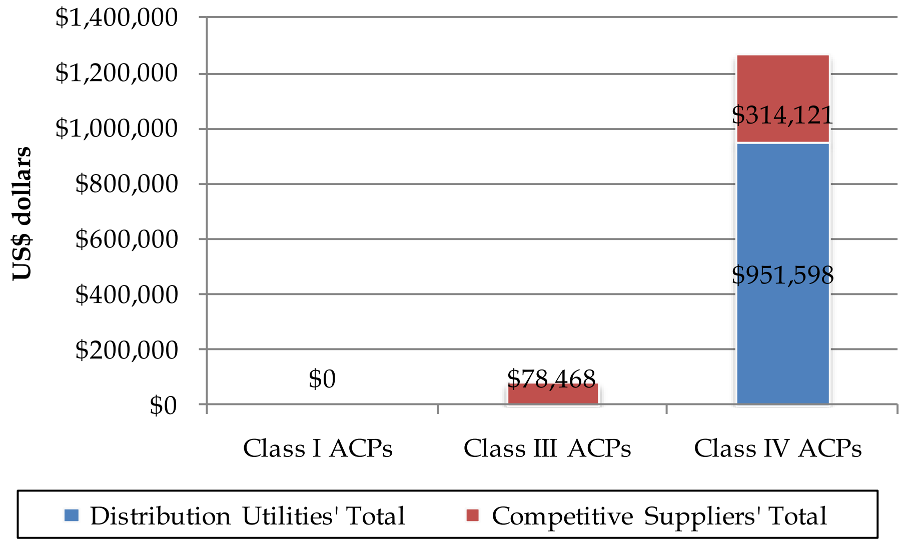
by New Hampshire's PUC, there is currently a shortage of renewable resources to satisfy New Hampshire's RPS Class IV (existing renewables) requirement.[160]

Figure 60. ACPs for New Hampshire's RPS compliance in 2009



Source: New Hampshire Annual RPS Compliance Report for 2009

Sources: As of early 2011, 63% of eligible Class I (new renewables) resources and 95% of eligible Class II (new renewables) resources were located outside of the state of New Hampshire, as shown in Figure 61.[161] In terms of fuel mix, wind accounted for 142 MW, or 44% of the total eligible capacity for New Hampshire's Class I (new renewables) RECs, followed by 27% for landfill gas and 20% for biomass, as shown in Figure 62. New Hampshire's Class III (existing renewables) eligible resources are almost evenly split between biomass and landfill gas, while Class IV (existing renewables) eligible resources are all hydroelectric power.

Figure 61. Location of eligible renewable resources for New Hampshire's RPS as of early 2011 (MW)

Fuel	Class I	Class II	Class III	Class IV
NH	121	0.41	69	1
other states in New England	30	7.15	37	17
New York	175		28	
Total	**326**	**7.56**	**133**	**18**

Source: 2011 RPS Review: Public stakeholder kick-off meeting, New Hampshire PUC, February 14, 2011

160 2011 RPS Review: Public stakeholder kick-off meeting, New Hampshire's PUC, February 14, 2011.

161 Ibid.

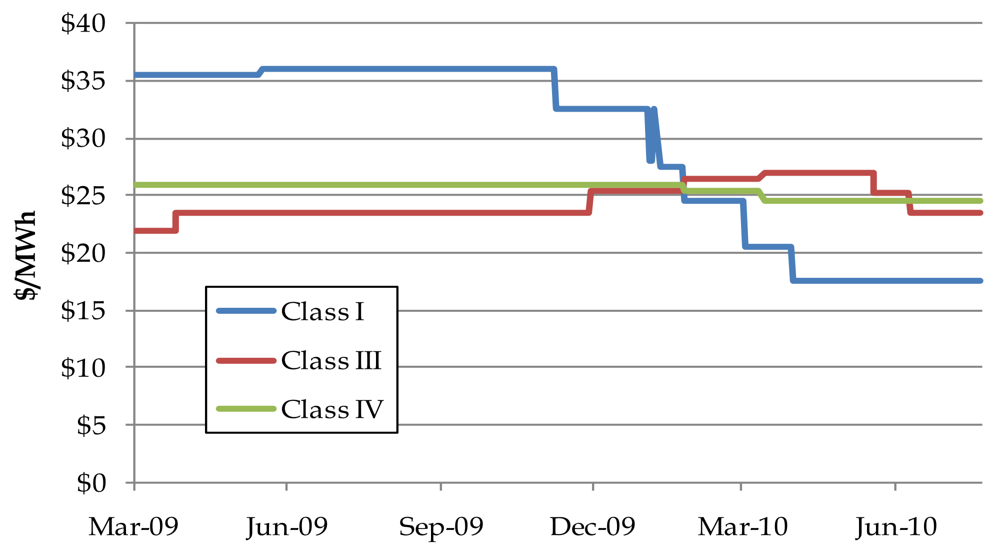
Figure 62. Fuel mix of eligible renewable resources for New Hampshire's RPS as of early 2011 (MW)

Fuel	Class I	Class II	Class III	Class IV
Biomass	66		57	
Hydro	30			18
LFG Methane	88		76	
Wind	142			
Solar		7.56		
Total	326	7.56	133	18

Source: Ibid.

As shown in Figure 63, there has been an excess supply of New Hampshire Class I (new renewables) RECs for compliance year 2009, which collapsed the Class I (new renewables) REC market price. The 2010 compliance year market price of New Hampshire's Class I (new resources) RECs is even lower than Class III (existing renewables)[162] and Class IV (existing renewables)[163] RECs. However, the overall trend in REC prices is consistent with trends as observed for other states' Class I (new renewables) RECs during the same time period.

Figure 63. Historical REC market prices for New Hampshire's RPS ($/MWh) for Compliance Year 2009



Source: Bloomberg

162 Class III (existing) renewable resources include existing eligible biomass technologies with a gross nameplate capacity of 25 MW or less and methane gas.

163 Class IV (existing) renewable sources include existing hydroelectric with a gross nameplate capacity of less than 5 MWs meeting certain technical requirements.

D.3.d Rhode Island

- ***In the first compliance year of 2007, ACP payments accounted for over 30% of the compliance requirements; whereas only 1 MWh was satisfied via ACP for compliance year 2009.***
- ***Eligible resources for compliance years 2007 to 2009 for both new and existing RES compliance have been sourced primarily from outside the state.***
- ***For compliance years 2007 to 2009 for new RES compliance, RECs from biomass and landfill gas facilities accounted for close to 90% of the total requirement.***
- ***For existing RES compliance, all of the RECs have come from hydroelectric facilities in Massachusetts, New Hampshire, Vermont, and Rhode Island.***

Rhode Island's New RES (new renewables) compliance during 2007-2009

Costs of compliance: 2009 was the third compliance year for Rhode Island's RES. The RES requirement in 2009 was 2% from new renewable energy resources and an additional 2% from either existing or new renewable energy resources. As shown in Figure 64, the obligations of new and existing RES in 2009 were 158,212 MWh each (in total 316,424 MWh). In addition, 16,290 RECs were banked for future new RES compliance. The total cost of RES compliance in 2009 was about $5.5 million, which would translate into a monthly impact of $0.465 or an annual impact of $5.58 for a typical residential customer on his/her electricity bill.

In the first compliance year of 2007, the ACP payments accounted for 30% of their collective new RES compliance requirement. According to Rhode Island's Public Utilities Commission, this was due to the lack of experience of RES regulation implementation.[164] This decreased significantly to only 1.6% of the requirement in 2008 and to roughly 0.0006%, or the equivalent of 1 MWh in 2009.

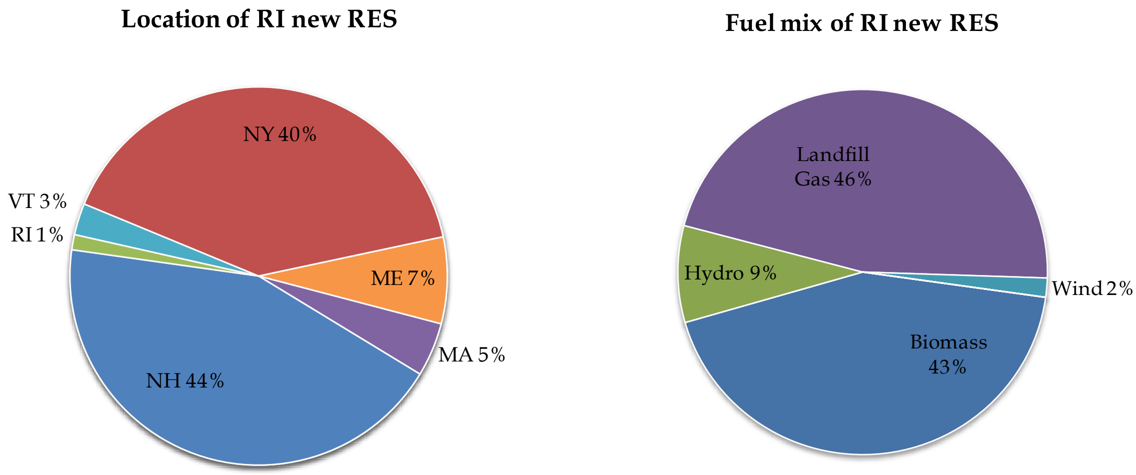
Figure 64. Rhode Island RES compliance in 2009

	New RES	Existing RES
RES obligation	**158,212**	**158,212**
RECs	158,211	158,211
ACP	1	1
ACP rates	$60.92	$60.92
Banked for future	16,290	N/A

Source: Annual RES Compliance Report for Compliance Year 2009

164 As noted in the Annual Rhode Island RES Compliance Report in 2009, a high percentage of ACP for compliance in the first year was also observed in other similar RPS programs across the region.

Figure 65. Location distribution and fuel mix for Rhode Island's new RES compliance in 2009

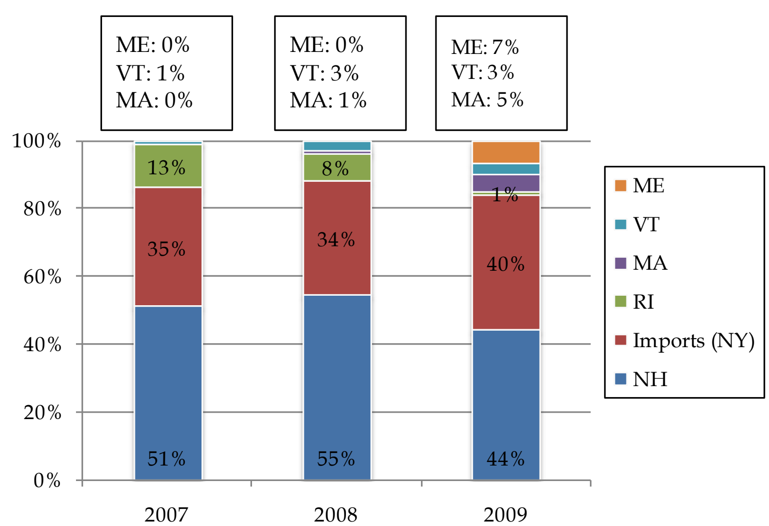


Source: Rhode Island's Annual RES Compliance Report for Compliance Year 2009

Sources: As shown in Figure 65, Rhode Island's New RES RECs were sourced mainly from generation in New York and New Hampshire. In addition, biomass/landfill gas accounted for close to 90% of renewable resources for new RES RECs. Furthermore, it is interesting to observe the differentiation in resources geographically; eligible resources in Massachusetts, Rhode Island, and Vermont are all hydroelectric facilities, whereas eligible resources from Maine, New York, and New Hampshire are mainly biomass and landfill gas facilities.

As shown in Figure 66, New Hampshire and imports from New York have been the major REC sources to satisfy Rhode Island's New RES requirement. Moreover, the share of RECs produced within Rhode Island decreased from 13% in 2007 to 1% in 2009.

Figure 66. Location distribution for Rhode Island's new RES compliance during compliance years 2007- 2009



Source: Rhode Island's Annual RES Compliance Report for Compliance Year 2009

Figure 67. Fuel mix for Rhode Island's new RES compliance during compliance years 2007-2009

Note: 3,000 RECs came from wind in 2009, compared to 389 RECs in 2008 and no RECs in 2007.

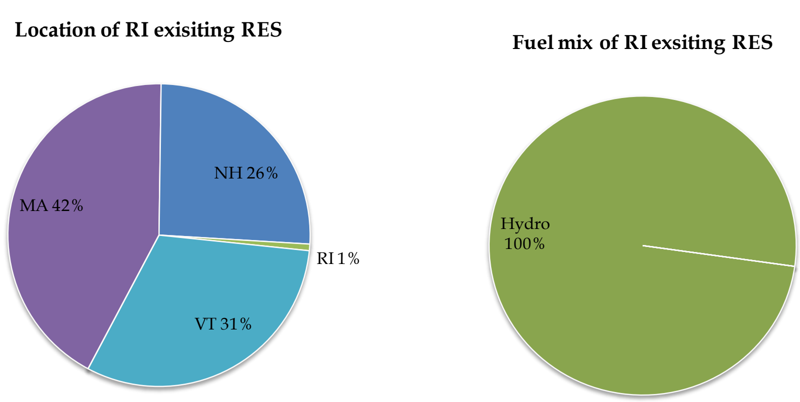
Source: Rhode Island's Annual RES Compliance Report for Compliance Year 2009

In terms of technology, as shown in Figure 67, biomass and landfill gas accounted for about 90% of RECs used to satisfy Rhode Island's New RES for compliance years 2007 through 2009.

Rhode Island's Existing RES (existing renewables) compliance during 2007-2009

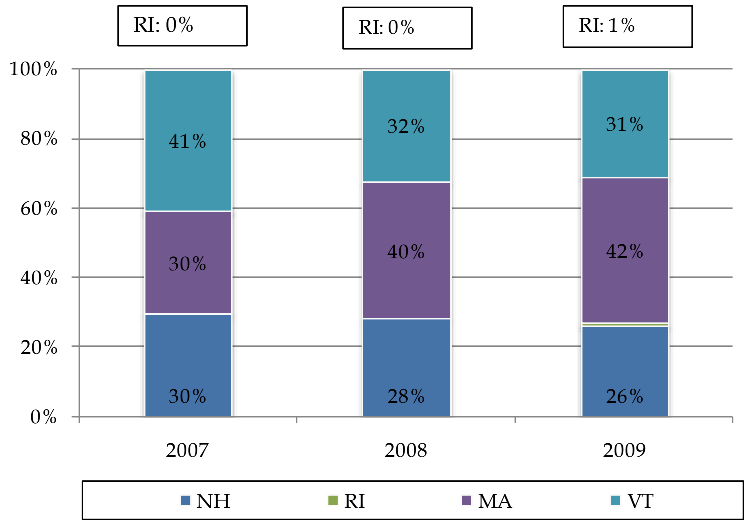
Sources: Hydro has been the only fuel used for Rhode Island's existing RES obligations, as shown in Figure 68. As shown in Figure 69, from 2007 to 2009, the share of Rhode Island's existing RES RECs from Massachusetts increased from 30% to 40%, while shares of such RECs from Vermont decreased from 40% to 30% over this period.

Figure 68. Rhode Island's existing RES compliance in 2009



Source: Rhode Island's Annual RES Compliance Report for Compliance Year 2009

Figure 69. Location distribution for Rhode Island's existing RES compliance during 2007-2009



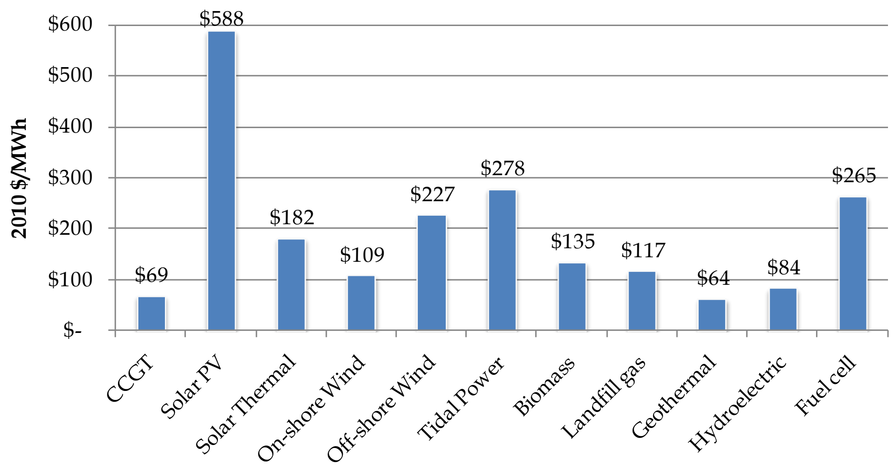
Note: 1,964 RECs came from Rhode Island in 2009, compared to zero RECs in 2008 and 156 RECs in 2007.

Source: Rhode Island's Annual RES Compliance Report for Compliance Year 2009

D.4 Appendix D: Assessing the Optimal REC Price for Promoting New Investment Based on the Break-Even Shortfalls between all-in levelized costs and revenues for various renewable technologies

Figure 70 shows the hypothetical all-in levelized costs for each generic type of renewable generating technology.[165] The hypothetical all-in levelized costs are $64/MWh for geothermal and $84/MWh for hydroelectric projects.[166] On-shore wind, landfill gas, and biomass are the next most competitive renewable resources with all-in levelized costs in a range of $109/MWh to $135/MWh. Solar PV is the most expensive eligible renewable resource with an all-in levelized cost of $588/MWh.

Figure 70. Hypothetical all-in levelized costs of eligible renewable resources for Maine's RPS Class I Requirements (2010 $/MWh)



In 2010, renewable generation facilities were generally eligible to earn four categories of revenue within the footprint of ISO New England: 1) energy sales revenues; 2) capacity payments; 3) federal PTCs, and 4) RECs. In 2010, the ISO-NE Internal Hub ("IH") day-ahead

165 Major assumptions used in the NETP model are primarily based on EIA Annual Energy Outlook ("AEO") 2011 assumptions and generic capital costs in New England published by ISO-NE. Respondents to the MPUC NOI generally confirmed these capital cost and operating cost estimates as reasonable and representative of actual conditions in New England. Changes in parameters, such as higher capital costs, a shorter financing timeframe, higher fixed operating costs, a higher interest rate, a higher equity rate of return, or lower leverage would result in higher all-in levelized costs.

166 For reference, Figure 70 above also shows that the all-in levelized cost of gas-fired CCGTs is $69/MWh, assuming a 60% load factor and gas price of $5.3/MMBtu and a carbon cost of $2/ton. Although the capital costs of hydroelectric and geothermal projects are much higher than a gas-fired CCGT, savings in fuel costs make both resources competitive with gas-fired CCGTs on a levelized cost basis.

LMP averaged $48.9/MWh.[167] The capacity payment rate was set at $4.5/KW-month, or about $6.2/MWh, assuming a capacity factor of 100% and prior to capacity derates for intermittent resources.[168] Furthermore, current PTC rates are $21/MWh (notably, these subsidies if not extended by Congress will expire by December 31, 2013 (December 31, 2012 for wind).[169] Based on the all-in levelized costs and revenue sources discussed above, the breakeven shortfall can be derived for different renewable resources.

Given the predominant sourcing of RECs from biomass, wind and landfill gas in New England, LEI focused on the "breakeven" shortfalls of these three renewable technologies.[170] Geothermal and hydroelectric projects are the most economic fuel resources for renewable project development in Maine; however, there is not a substantial natural endowment for new investment in these renewables. Notably, all the "breakeven" shortfall levels are substantially above vintage 2010 REC prices. This observation suggests that current RPS policies and associated REC prices in Maine and other New England states are not at sufficient levels to motivate new investment. This is consistent with the general over-supply of RPS-eligible renewables in New England, as discussed in Section B.

Based on LEI's analysis of various renewable technologies, historical Maine Class I (new renewables) REC prices would not fully fund the gap between all-in levelized costs and expected revenues (so there would continue to be a "break-even" shortfall)[171]. As illustrated in Figure 71 below, the maroon-colored bars show the breakeven shortfalls by technology type. For example, an on shore wind plant in Maine would have a breakeven shortfall of $33/MWh,

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167 Since wind capacity produces more generation during off-peak hours, off-peak prices may be more appropriate to approximate the energy revenue for wind capacity. For simplicity of comparison across different renewable technologies, the average around-the-clock energy price at the Internal Hub in New England has been employed in LEI's analysis.

168 For renewable resources, these capacity payments may need to be derated due to their intermittent operation and contribution to resource adequacy at peak hours. For example, wind generators and run-of-river hydro only receive a portion of their nameplate generating capacity certified for capacity payments.

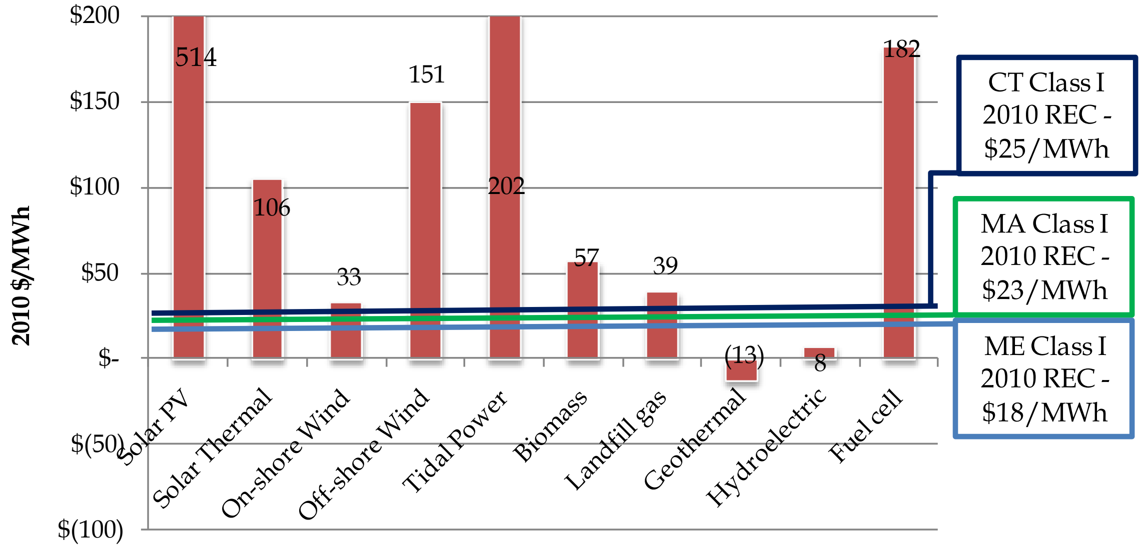
169 The Federal PTC is a tax credit for electricity generated by qualified, new renewable energy resources during the taxable year. Currently, the Federal PTC is applicable to various renewable energy resources, including wind, biomass, geothermal energy, landfill gas, municipal solid waste, and hydroelectric energy. In addition, the American Recovery and Reinvestment Act of 2009 (H.R.1) also allows taxpayers eligible for the PTC to receive either the federal business energy investment tax credit ("ITC") or a grant from the U.S. Treasury Department instead of the PTC for new installations. Since the PTC, ITC and the ARRA grants accrue with commercial operations, they are usually treated as additional 'subsidy-based' revenue streams. LEI explicitly examined cases where the PTC remains in place as well as where is not extended in calculations of the shortfall between all-in levelized costs and revenues.

170 According to the Maine RPS Class I compliance information for 2010, biomass accounted for nearly 80% of procured RECs and wind accounted for over 20% of procured RECs for Maine's RPS compliance. Landfill gas and hydro accounted for the remaining less than 1%. Source: MPUC staff. There are limited opportunities for new hydroelectric resources in New England; therefore, hydroelectric resources were not analyzed in such detail with respect to Class I RECs and RPS.

171 Class I REC prices are based on surveyed bilateral REC trades and may differ from reported compliance costs.

taking into account energy and capacity revenues and the PTC. Maine Class I RECs at $18/MWh (the average price for 2010 vintage RECs) then are providing about 55% equity recovery for new on-shore wind generators, and less than 25% equity recovery for new biomass plants.

Figure 71. Comparison of "break-even" shortfalls for new renewables and vintage 2010 REC prices ($/MWh)



Note: The maximum of the Y-axis is fixed at $200/MWh to show the relationship between breakeven shortfalls and Class I (new renewables) REC prices of Connecticut, Massachusetts, and Maine for 2010, which are calculated as an average based on historical data.

Source: Bloomberg, accessed September 2011.

Notably, the higher Class I REC prices in other states, like Massachusetts and Connecticut, are not sufficient to fully fund a new renewable generation project. Resulting REC revenues in Connecticut and Massachusetts cover 76% and 70% respectively of the breakeven shortfall for a typical on-shore wind project.[172] However, it is important to keep in mind that a renewable generator can only earn RECs once it is operational and producing electricity under the current RPS design across all New England states. Therefore, once a renewable generator is operational, there may be no option but to sell RECs at such prices and therefore sacrifice some of the equity return (at least for some time).

It is also notable that the "breakeven" shortfall for solar PV is $514/MWh, which is much higher than other renewable technologies. Given the current REC costs and ACP rate of about $60/MWh for Maine's Class I RPS program, solar PV development is constrained by the opportunity to purchase RECs from other types of renewable resources and the ability to pay

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172 New Hampshire Class I REC prices for compliance year 2010 averaged around $25/MWh and cannot fully recover the breakeven shortfalls either. However, Rhode Island Class I REC prices for compliance year 2010 were not available from Bloomberg at the time of analysis.

ACP. Under such conditions, it is unlikely that solar PV projects will be developed solely for Maine RPS compliance.[173]

D.4.a Impacts of low energy market prices & expiration of PTC on the viability of renewable facilities

As discussed above, the levels of breakeven shortfalls are highly dependent upon market revenue streams. However, market conditions fluctuate constantly and there are critical uncertainties regarding future gas markets, the potential for carbon pricing, REC markets and renewable and transmission policies. Therefore, it is helpful to illustrate how changes in market conditions, coupled with 2010 REC prices, will impact the viability of renewable generating facilities. To illustrate potential impacts, we have crafted a "what if" analysis to determine the impact of low market prices and the expiration of the PTC on the viability of renewable facilities.

If energy prices reach the recent record low of $41.5/MWh in 2009 at ISO-NE Internal Hub and the PTC is not extended, the breakeven shortfall will be $60.9/MWh for a new on-shore wind plant, or $28/MWh higher than the baseline breakeven shortfalls, as shown in Figure 72.

Case with low energy market prices & expiration of the PTC:

Breakeven shortfall = All-in levelized costs – Energy revenue – Capacity payment – PTC
= $109/MWh - $ ~~48.9~~ 41.5/MWh - $6.2/MWh - $ ~~21~~ 0/MWh
= $60.9/MWh > Baseline breakeven shortfall of $32.9/MWh

Under these conditions, the breakeven shortfalls of on-shore wind, landfill gas, and biomass are in a range of $61/MWh to $85/MWh. In other words, a REC price of $61/MWh would be needed for a new wind generator to breakeven. If this implied break-even is benchmarked against current ACP levels of around $60/MWh, it is evident that new wind, biomass, and landfill gas projects could not be developed as the ACP would constrain the REC prices from ever achieving full remuneration levels. Although investment decisions are not done relying on just one year's market outcomes, this comparative analysis does raise the question of whether ACP levels, which serve as ceiling prices of RECs, are currently sufficient in promoting the level of renewable project development contemplated by the RPS.[174]

In general, higher REC prices will signal a higher demand for more renewables. To achieve higher REC prices, policymakers could simply increase the RPS requirement. Policymakers can also impose stricter requirements on eligible renewables for RECs (e.g., Massachusetts imposes stricter efficiency requirements on biomass facilities) to effectively reduce the REC supply. However, such a policy may create winners and losers among the generators and therefore the

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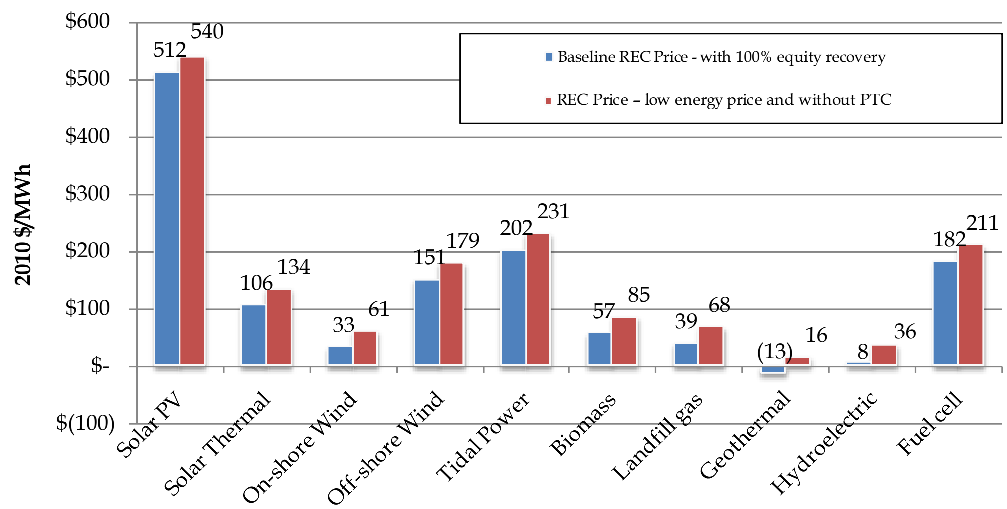
173 In response to the NOI, Constellation also commented that a solar-specific requirement as a separate RPS class in Maine (as is the case in Massachusetts) will create the most attractive investment environment. Currently, Constellation is an active solar PV developer in Massachusetts (Responses to NOI, MPUC Dkt. No. 2011-271).

174 If Maine's ACP funds were used to fund long-term contracts for renewable resource, the RPS could result in some new development.

complete costs and benefits need to be carefully weighed. In addition, state level subsidies (similar to investment grants or the PTC) would also be helpful to bridge the gap between REC prices and required breakeven shortfalls for renewable investment. An increase in the ACP rate could also indirectly signal governmental support for higher REC prices, but would only have a direct impact on REC prices if supplies were tight.

Figure 72. Breakeven shortfalls of Maine's RPS Class I (new renewables) (2010 $/MWh)



D.5 Appendix E: Key Assumptions used in the NETP Model

Figure 73 outlines the major assumptions used in the NETP model for New England. Technology-specific all-in levelized costs are estimated in LEI's NETP model by summing the following cost parameters:

- **cost of capital**: consisting of the (1) cost of debt; and (2) cost of equity, levelized over the expected operating regime;
- **fuel cost** (if applicable);
- **variable O&M costs**;
- **fixed O&M costs**, generally estimated as $/KW–year and then adjusted in $/MWh terms using the technology's expected operating regime; and
- **interest expense during construction:** accrued interest expenses based on an all-in capital cost during the construction term, levelized over the debt term, and adjusted in $ per MWh terms using the technology's expected operating regime.

Figure 73. Major assumptions used in the NETP model for New England (2010 dollars)

analysis year	CCGT	Solar PV	Solar Thermal	Onshore wind	Offshore wind	Tidal power
nominal capital cost, $/kW	$ 1,029	$ 6,050	$ 4,932	$ 2,563	$ 6,443	$ 4,500
leverage (debt)	60%	60%	60%	60%	60%	60%
debt interest rate	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
after-tax required equity return	15%	15%	15%	15%	15%	15%
corporate income tax rate	40%	40%	40%	40%	40%	40%
debt financing term, years	18	18	18	18	18	18
equity contribution capital recovery term, years	20	20	20	20	20	20
construction time, months	36	24	36	24	48	36
average annual load factor	60%	15%	45%	36%	47%	30%
nominal variable O&M, $/MWh	$ 3.6	$ -	$ -	$ -	$ -	$ 26.0
nominal fixed O&M, $/kW-year	$ 15.1	$ 31.2	$ 93.3	$ 29.5	$ 92.5	$ 93.6

analysis year	CCGT	Biomass	Landfill gas	Geothermal	Small hydro	Fuel cell
nominal capital cost, $/kW	$ 1,029	$ 3,962	$ 2,655	$ 2,411	$ 2,494	$ 5,963
leverage (debt)	60%	60%	60%	60%	60%	60%
debt interest rate	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
after-tax required equity return	15%	15%	15%	15%	15%	15%
corporate income tax rate	40%	40%	40%	40%	40%	40%
debt financing term, years	18	18	18	18	18	18
equity contribution capital recovery term, years	20	20	20	20	20	20
construction time, months	36	36	36	48	48	36
average annual load factor	60%	80%	80%	90%	48%	50%
nominal variable O&M, $/MWh	$ 3.6	$ 7.4	$ 8.4	$ 9.7	$ 2.5	$ 11.9
nominal fixed O&M, $/kW-year	$ 15.1	$ 105.6	$ 376.7	$ 109.4	$ 13.8	$ 352.7

Note: Natural gas CCGT is not an eligible renewable resource and is included in the above table merely for reference. Most assumptions of capital costs and O&M costs are directly from EIA AEO 2011 or EIA updated capital costs (if applicable). (Some renewable technology costs, such as solar pv are expected to continue to see cost declines.) As an exception, the capital cost of hydroelectric generation is estimated based on an average from multiple sources and reflects the capital cost of small hydroelectric projects. In addition, the capital cost of tidal power reflects an average estimate based on LEI intelligence. Other parameters, such as leverage, debt interest rate, debt financing terms and annual load factors, etc., are based on LEI's industry intelligence. For simplification, the financing costs are presented as invariant to technology; in reality financing costs will differ, as well as return on equity ("ROE"), given different perceived risks of development and operations.

D.6 Appendix F: Cost Impacts of RPS Requirements on Maine Customers

In a stylized step-by-step analysis of the effect of an increased RPS requirement as well as a potential increase in Maine Class I REC prices, the retail rate impacts are illustrated. The analysis is done from the ratepayers' perspective. A generic single year is used, but the step-by-step analysis extends over multiple time dimensions. Note that this analysis is primarily for illustrative purposes.

Figure 74. Status Quo cost impact of the RPS requirement (based on 2010 inputs)

	Baseline	Note
Assumptions		
Total retail sales (MWh)	12,000,000	A
ME Class I requirement	3%	B
Class I REC price ($/MWh)	$24.00	C
Retail rate (cents/KWh)	12.60	D
RPS compliance cost		
REC obligation (MWh)	360,000	E=A*B
Compliance cost ($)	$8,640,000	F=C*E
Cost impact on retail rates		
Retail rate surcharge (cent/KWh)	0.072	G=F/A*100/1,000
REC Compliance as % Retail Rate	0.57%	H=G/D

Note: The retail rate of 12.6 cents per KWh is the load-weighted competitive electricity supplier retail rate to Maine customers in 2010.

D.6.a Status Quo

The starting point is 2010 costs. This is referred to as the "status quo" and notionally reflects Maine's RPS policy and conditions in 2010 (for example, vintage 2010 REC prices and 2010 retail load).[175] More specifically, the Status Quo assumes total retail sales of 12,000,000 MWh in Maine, which is comparable to the aggregate retail sales in 2010 and a the 2010 compliance year REC price of $24/MWh comparable to the Maine Class I REC purchase price for 2010.[176] Given the

175 As of September 2011, over 50% of Maine load was served under SOS rates, which are fixed in advance. Most competitive electricity providers and standard offer suppliers have to commit to offers to sell (at fixed price) before they have fully procured their RECs (given that demand is not known and the market value of RECs is established towards the compliance deadline, so after the fact; and ACP payments are not required until July of the following year after the compliance year). Thus electricity providers bear some uncertainty about the compliance costs and specifically the strategy that they implement to secure compliance. Most competitive electricity providers have to buy RECs to comply with the RPS (as they do not have their own renewable generation). If their load obligation is higher, they need more RECs, and vice versa. This suggests that in a competitive market, RECs can still be considered a variable cost of operation and competitive electricity providers effectively can pass through the cost of RECs to end-users, although the timing may not be perfect. In LEI's analysis, full pass-through of the cost of RECs to end users was assumed.

176 The unit cost impact of the RPS on retail rates does not depend on the level of total retail sales, but only on the level of RPS requirements and REC prices, since the volume of electricity sales (KWh) is already represented in the denominator of unit costs.

RPS requirement of 3% in 2010, the compliance cost for Maine's RPS Class I will be $8.6 million, which is equivalent to 0.07 cents/KWh, or 0.57% of the average retail rate of 12.6 cents/KWh, as shown in Figure 74.

D.6.b Higher RPS requirement scenario

An increase of RPS requirements will directly impact the RPS compliance costs and therefore the cost of electricity service to Maine customers. In this sub section, LEI examined the impact of a 10% RPS requirement on Maine customers.

Holding all else equal, if the RPS requirement increases from 3% to 10%, as shown in Figure 75, the total RPS obligation will increase to 1,200 GWh. Assuming no price change, the compliance cost will increase to $28.8 million, which is equal to 0.24 cents/KWh, or 1.9% of the average retail rate of 12.6 cents/KWh).

Figure 75. Maine consumer' cost impact of higher RPS requirement

	Higher RPS requirement scenario	Note
Assumptions		
Total retail sales (MWh)	12,000,000	A
ME Class I requirement	10%	B
Class I REC price ($/MWh)	$24.00	C
RPS compliance cost		
REC obligation (MWh)	1,200,000	D=A*B
Compliance cost ($)	$28,800,000	E=C*D
Cost impact on retail rates		
Retail rate surcharge (cent/KWh)	0.240	F=E/A*100/1,000
REC Compliance as % 2010 Retail Rate	1.90%	G=F/12.6

Note: The retail rate of 12.6 cents per KWh is the load-weighted competitive electricity supplier retail rate to Maine customers in 2010.

D.6.c Higher RPS requirement and higher REC price scenario

LEI further examined the combined impact of a higher RPS requirement (increase from 3% to 10%) and a higher REC price (increase from $24/MWh to $33/MWh) outlined in Figure 76 on Maine customers. Holding all else equal, if the RPS requirement increases from 3% to 10% and the REC price increase from $24/MWh to $33/MWh, as shown in Figure 76, the total RPS obligation is 1,200 GWh. With higher REC prices, the compliance cost will increase to $39.6 million, which is equal to 0.33 cents/KWh, or 2.62% of the average retail rate of 12.6 cents/KWh).

Figure 76. Maine consumer' cost impact of higher RPS requirement and a higher REC price

	Higher RPS requirement AND higher REC price scenario	Note
Assumptions		
Total retail sales (MWh)	12,000,000	A
ME Class I requirement	10%	B
Class I REC price ($/MWh)	$33.00	C
RPS compliance cost		
REC obligation (MWh)	1,200,000	D=A*B
Compliance cost ($)	$39,600,000	E=C*D
Cost impact on retail rates		
Retail rate surcharge (cent/KWh)	0.330	F=E/A*100/1,000
REC Compliance as % 2010 Retail Rate	2.62%	G=F/12.6

Note: The retail rate of 12.6 cents per KWh is the load-weighted competitive electricity supplier retail rate to Maine customers in 2010.

D.6.d Higher RPS requirement and lower REC price scenario

LEI further examined the combined impact of a higher RPS requirement (increase from 3% to 10%) and a lower REC price (assuming $13.50/MWh) outlined in Figure 77 on Maine customers. Holding all else equal, if the RPS requirement increases from 3% to 10% and the REC price is at $13.50/MWh, as shown in Figure 77, the total RPS obligation is 1,200 GWh. With lower REC prices, the compliance cost will increase to $16.2 million, which is equal to 0.135 cents/KWh, or 1.07% of the average retail rate of 12.6 cents/KWh).

Figure 77. Maine consumer' cost impact of higher RPS requirement and lower REC price

	Higher RPS requirement AND lower REC price	Note
Assumptions		
Total retail sales (MWh)	12,000,000	A
ME Class I requirement	10%	B
Class I REC price ($/MWh)	$13.50	C
RPS compliance cost		
REC obligation (MWh)	1,200,000	D=A*B
Compliance cost ($)	$16,200,000	E=C*D
Cost impact on retail rates		
Retail rate surcharge (cent/KWh)	0.135	F=E/A*100/1,000
REC Compliance as % 2010 Retail Rate	1.07%	G=F/12.6

Note: The retail rate of 12.6 cents per KWh is the load-weighted competitive electricity supplier retail rate to Maine customers in 2010.

D.7 Appendix G: Case Studies for Investigating ACP Mechanisms

D.7.a Case study 1 – ACP rates in another New England state with inflation escalation (Massachusetts)

The Massachusetts RPS Class I (new renewables) program was implemented in 2003, which was the first RPS program implemented for new renewables among New England states. Pursuant to the Massachusetts Electric Utility Restructuring Act of 1997,[177] the Massachusetts DOER was directed to conduct a stakeholder process for the initial proposed regulation on the RPS implementation. Based on balancing (a) consideration of limiting cost impacts on Massachusetts customers against (b) providing sufficient financial incentives for renewable project developers, the ACP rate for Massachusetts Class I was set at $50/MWh for the compliance year 2003. For each compliance year after 2003, the ACP rate is set to be adjusted by the CPI to keep pace with inflation.[178]

Based on similar logic, the ACP rates for Massachusetts Class II Renewable Energy (existing renewables), Class II Waste Energy (existing renewables), and APS were set at $25/MWh, $20/MWh and $10/MWh for the initial compliance year of 2009. For each compliance year thereafter, the ACP rate is also adjusted by the CPI.[179, 180]

For the Massachusetts Class I solar carve-out program, the initial ACP was set at $600/MWh in recognition of the high capital cost of the solar PV technology. In addition, to account for technical improvements and the anticipated decrease in capital costs in the future, the Massachusetts DOER can reduce the ACP by no more than 10% in a compliance year.[181] In 2011, the ACP rate for the solar carve-out program was lowered to $550/MWh.[182]

Pursuant the Massachusetts RPS regulation, the received ACPs for compliance will be deposited to different accounts for promotion of different renewable resources. For example, the ACPs of Massachusetts Class I will be deposited into a separate account of the Massachusetts Clean Energy Technology Center ("MassCEC"), established by M.G.L ch. 23J. Under supervision of Massachusetts DOER, the MassCEC will use the ACP funds to further commercial development

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177 Massachusetts Electric Utility Restructuring Act of 1997, Part I, Title II, Chapter 25 A, Section 11F (f). Web. <http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter25a/Section11f>

178 Communication with Massachusetts DOER staff on November 16, 2011.

179 Massachusetts 225 CMR 15.00. Web. <http://www.mass.gov/eea/docs/doer/rps/225cmr1500-052909.pdf>

180 Massachusetts 225 CMR 16.00. Web. <http://www.mass.gov/eea/docs/doer/rps/225cmr1600-052909.pdf>

181 Massachusetts 225 CMR 14.00. Web. <http://www.mass.gov/eea/docs/doer/renewables/solar/225-cmr-14-00-082010.pdf>

182 "Alternative Compliance Payment Rates." Commonwealth of Massachusetts. 2011. Web. <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/retail-electric-supplier-compliance/alternative-compliance-payment-rates.html>

of RPS Class I and Solar Carve-Out renewable generation units.[183] Similarly but differently, the ACPs of Massachusetts' APS will also be deposited into another account of the MassCEC, which will be used to further the commercial development of Alternative Generation.[184]

D.7.b Case study 2 – ACP rates in another New England states without escalation (Connecticut)

Among New England states, Connecticut is the only state with a flat ACP rate. Specifically, the ACP rates were fixed at $55/MWh for both Connecticut Class I (new renewables) and Connecticut Class II (existing renewables). In addition, the ACP rate was fixed at $31/MWh for Connecticut Class III (alternative energy).[185]

The ACPs received for Connecticut Class I are deposited in the Renewable Energy Investment Fund ("REIF") to further support development of Class I renewable technologies. Similarly, pursuant to Connecticut Public Act 05-01, Section 16, 75% of received ACPs for compliance of Connecticut Class III are deposited in the Conservation and Load Management fund and 25% of those are deposited in REIF to support development of alternative energy resources.

D.7.c Case study 3 – FIT in Germany

Although ACP rates and FIT are different, they have one important similarity – they are both regulatory-set rates, and both are meant to encourage new renewable development, although the features of the REC market for RPS compliance (where ACPs are used) are different from the characteristics of a FIT program (where there is no market, but certain qualifying criteria are used for participation). (Figure 78 provides a summary comparison of ACP rates to a FIT structure.) Therefore, to some extent, it is useful to refer to the experiences of other jurisdictions in setting FIT tariff levels, as it can be instructive for setting ACP rate levels.

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183 Massachusetts 225 CMR 14.00. Web. <http://www.mass.gov/eea/docs/doer/renewables/solar/225-cmr-14-00-082010.pdf>

184 Massachusetts 225 CMR 16.00. Web. <http://www.mass.gov/eea/docs/doer/rps/225cmr1600-052909.pdf>

185 Connecticut RPS ACP rates. Connecticut Department of Energy & Environmental Protection Public Utilities Regulatory Authority. November 28, 2007. Web. <http://www.dpuc.state.ct.us/electric.nsf/60a3df2c610b4cd6852575b3005ce06c/1737dbf71756a9df852573a10073ec41?OpenDocument>
Notably, the Class II ACP was set based on the aggregate cost of procuring the alternative energy under Conservation & Load Management ("C&LM") programs (Connecticut DPUC proceeding to develop a new distributed resource portfolio standard (Class III), Connecticut DPUC Dkt. No. 05-07-19).

Figure 78. Comparison of ACP rates vs. FIT

	FIT	ACP rate
Definition	Fixed contracting price based on the all-in levelized cost for a specific category of renewable technology	Ceiling price of RECs, which are created to bridge the gap between all-in levelized costs and available market revenue flows
Purpose	Promote renewable energy development while limiting the costs to customers	
Establishment	via legislature	
Unit	cents per KWh/dollar per MWh	

The FIT program was introduced in Germany in 1990 and took effect on January 1, 1991.[186] FIT tariff levels were calculated based on the generation cost plus a profit margin (comparable to all-in levelized costs), but were not indexed to inflation. In addition, an annual, resource-specific tariff reduction (called "degression") was incorporated, as detailed in Figure 79, in order to reflect technological improvements. In addition to the degression rates shown in the table, discretionary adjustments of FIT tariff levels have also taken place, to avoid inefficient outcomes. For example, in May 2010, observing the sharp increase in solar PV installations due to falling prices of solar modules under an environment of poor economic climate and high incentive payments, Germany chose to cut FIT rates from by 8% to13% for solar energy. This was accomplished through Legislative change (an amendment to the Erneuerbare Energien Gesetz, or "EEG").

The FIT has been effective in promoting renewable energy in Germany. For example, Germany's indicative renewable generation target of 12.5% by 2010 was reached in 2007. As of the end of 2009, Germany had more than 25,000 MW of wind and close to 10,000 MW of solar PV capacity installed.

Germany's experience with FIT suggests that setting rates initially was not sufficient, as the legislature was forced to amend the law and make further reductions. However, it is important to keep in mind that the ACP rate, in contrast to the FIT, is not likely to affect consumer costs as directly and substantially. Therefore, the monitoring and adjustment needed for an efficient (and reasonably priced) FIT rate regime may not be as necessary for an ACP mechanism.

186 Since then, changes have been made to the FIT with the Renewable Energy Sources Act (Erneuerbare Energien Gesetz, or "EEG") in 2000 and amendments to the EEG in 2004 and 2009. The 2008 EEG entered into force on January 1, 2009.

Figure 79. FIT rates in Germany as in 2009 EEG and 2010

Technology		Installed capacity	2009 EEG (€ cent/kWh)	2010 (€ cent/kWh)	Degression rate
Solar	Roof-mounted	≤30 kW	43.01	28.74 *	9% from 2011
		30-100 kW	40.91	27.33 *	
		> 100 kW	39.58	25.86 *	
		< 1,000 kW	33.00	21.56 *	
	Freestanding	All	31.94	21.11 *	9% from 2011
Wind	Offshore	Initial Tariff	13.00	13.00	5.0% (from 2015)
		Basic Tariff	3.50	3.50	
	Onshore	Initial Tariff (first 5 years)	9.20	9.11	1.0%
		Basic Tariff	5.02	4.97	
Geothermal		≤10 MW	16.00	15.84	1.0%
		>10 MW	10.50	10.40	
Hydro	New (up to 5 MW)	≤500 kW	12.67	12.67	
		0.5 - 2 MW	8.65	8.65	
		2-5 MW	7.65	7.65	
	Modernised (up to 5 MW)	≤500 kW	11.67	11.67	
		0.5 - 5 MW	8.65	8.65	
	Renewal of facilities of over 5MW (increments represent the net increase in capacity)	≤500 kW	7.29	7.22	1.0%
		≤10 MW	6.32	6.26	
		≤20 MW	5.80	5.74	
		≤50 MW	4.34	4.30	
		>50 MW	3.50	3.47	
Biomass		≤ 150 kW	11.67	11.55	1%
		150 kW - 500 kW	9.18	9.09	
		500 kW - 5 MW	8.25	8.17	
		5 - 20 MW	7.79	7.71	
Sewage gas		≤ 500 kW	7.11	7.00	1.5%
		0.5 - 5 MW	6.16	6.07	
Landfill gas		≤ 500 kW	9.00	8.87	1.5%
		0.5 - 5 MW	6.16	6.07	
Mine gas		≤ 1 MW	7.16	7.05	1.5%
		1 MW - 5 MW	5.16	5.08	
		> 5 MW	4.16	4.10	

Note: The FIT for solar in 2010 was effective as of January 1, 2011.

Sources: BMU, NREL, European Energy Blog

D.8 Appendix H: Factors affecting the ACP rate

The ACP rate is a regulatory mechanism in a regulatory market, namely the REC market. It is set through legislation or regulation. Therefore, best practices for setting the ACP rate are grounded in general regulatory ratemaking principles. The ACP rate should be set at a level to be:

- ***efficient***, so that the ACP is not too low as to preclude new investment in renewables but also not too high as to be irrelevant; and, so that ultimately, renewable energy projects are promoted;
- ***fair***, so that the ACP rate provides the right incentives to retail suppliers to procure RECs and that the costs of RPS compliance are managed prudently, so as not to be overly burdensome on customers;
- ***stable and predictable***, so that market players, including both CEPs and renewable developers, can make long term business decisions with some certainty; and
- ***practical and easy to implement***, so that the regulatory costs of compliance are minimized.

Notably, there are trade-offs among these principles. For example, the "efficiency" criteria may lead to implementations that are more complex and therefore move the ACP rate design away from the last principle, which promotes "practical and easy-to-implement" rates. In addition, the primary function of ACP is to cap ratepayer exposure to high REC prices. So an important consideration for policymakers is limiting the total amount of costs incurred (or subsidy provided) by ratepayers.

Since the ACP is effectively the price ceiling for RECs, there are a number of factors that should be taken into account when setting ACP rates in order to ensure an efficient REC market. The key factors include: (i) capital cost of renewable technology; (ii) prevailing market conditions; (iii) availability of federal subsidies; (iv) technical improvement; (v) price inflation; (vi) transaction costs of REC procurement; and (vii) ACP rates in neighbouring states within the same regional market. For example, in order to prevent inefficiencies, the ACP should be consistent with other states in the same regional REC market. The first four factors directly relate to the REC price, which in an equilibrium state would make up for the shortfall between the all-in costs of new renewables and available market revenues, as discussed in the analysis of Study Item 3 in Section C.3.

Capital costs of renewable technology will drive the level of all-in levelized costs and therefore the required revenue necessary to incentivize the renewable investment and make it commercially viable. Holding all else equal, a higher capital cost of renewable technology will imply a larger gap between the all-in levelized costs and available market revenues. For example, the Massachusetts RPS solar program set its ACP rate at around $600/MWh in recognition of the higher capital costs of solar technology.

Prevailing market conditions will drive market revenues for all generation, including renewable projects. The primary sources of market revenues for renewables in New England are the energy and capacity markets. In 2010, New England markets had experienced very low energy prices due to low gas prices, with the Internal Hub energy price at $48.9/MWh and the capacity price at $4.5/KW-month or equivalent to $1.8/MWh assuming a 30% derating factor, which would be typical for a wind generator. For a wind generator, the all-in levelized costs were $109/MWh and therefore the gap was $58/MWh ($109/MWh - ($48.9/MWh+$1.8/MWh), which is in-line with the ACP rate of $62/MWh. This suggests that the ACP is not currently a barrier, at least in the case of wind, as it would not limit the REC price if the supply-demand balance had indicated a need for new investment. Generally, movements in market conditions and resulting impacts on RECs should be comfortably accommodated before hitting the ACP threshold, taking into account policy aims to limit the associated costs to ratepayers. On the other hand, if there are structural changes in the energy and capacity markets that constrain the market revenues for new renewables, the ACP, as the effective maximum REC price, may need to be adjusted upwards so that it does not artificially limit REC market activity. Any possible upward adjustment in the ACP level would need to take into account its impact on ratepayer cost.

Availability of federal subsidies - such as PTCs or investment grants and load guarantees - also represent an additional income source to renewable developers. As noted by Ocean Renewable Power Company ("ORPC"), the ITC/ARRA Grant for all units of the Maine Tidal Energy Project ("METEP") accounts for 30% of the installed capital cost of the project.[187] Currently, PTCs will expire by December 31, 2012 (December 31, 2013 for wind), if Congress does not otherwise agree to an extension. The expiration of the PTC will expand the gap between the all-in cost and available market revenues and income, and therefore put upward pressure on REC prices. To the extent that the ACP rate levels considered the availability of these subsidies as income, the ACP rate may need to be re-set so that it does not artificially suppress REC prices.

Technical improvement has demonstrably decreased the capital cost of renewable energy projects in the recent past, and could be expected to further reduce capital costs in future. As noted in responses to MPUC's NOI (i.e., ORPC and First Wind), holding all else equal, a lower capital cost will imply a lower gap between the all-in cost and available market revenues; therefore pushing REC prices down. To the extent that the ACP rate becomes irrelevant as it is no longer reflective of the maximum price for RECs, it may be reasonable to adjust it downward to reflect those technological gains. A similar adjustment mechanism due to technical improvement of the FIT has been implemented in Germany and Spain. The decrease rate of the FIT is also referred to the "degression rate", and it may be different across renewable technologies.

Inflation trends measure the price change for the same goods and services. Holding all else equal, the ACP rate should be escalated by the price of inflation to accommodate potential changes in REC prices due to price inflation. Currently, the CPI has been the index of choice to adjust the ACP rate on an annual basis.

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187 Responses to NOI, State of Maine. Maine Public Utilities Commission. Maine Public Utilities Commission inquiry into Maine's new renewable resource portfolio requirement. 2011. Docket No. 2011-271.

Transaction costs of REC procurement would impact whether competitive energy providers would procure RECs or employ the ACP mechanism for their RPS obligations. Since the REC procurement will involve solicitation and contract negotiation with REC suppliers, there would be economies of scale with respect to transaction costs that become apparent only for a certain volume of RECs. Therefore, the ACP mechanism may be a safety valve for promoting small retail competitive suppliers, who may have no other cost-effective means for meeting their RPS compliance. Therefore, the transaction costs of REC procurement should be also considered in setting the ACP rate.

Congruency with ACP rates in neighbouring states within the same regional market is also relevant for setting the ACP rate. Since one renewable source may qualify to sell RECs in multiple states in New England, adopting an ACP rate in Maine that is significantly different from other New England states may create distortions in Maine's REC market. Therefore, it is important to consider congruency with neighbouring states, where REC supplies compete for buyers.