A Review of Connecticut's Renewable Portfolio Standards

Prepared by

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For the

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Executive Summary

The Connecticut Energy Advisory Board (CEAB) has contracted with the Center for Energy, Economic and Environmental Policy (CEEEP) and the Rutgers Economic Advisory Service (R/ECON™) to conduct a review of Connecticut's Renewable Portfolio Standard (CT RPS), particularly in light of the State's policy goals. The assignment consisted of economic modeling of the impact of the CT RPS, conducting a stakeholder process with multiple opportunities for public comment, and a review of documents relevant to the CT RPS.

An RPS opens up the possibility for Connecticut to be creative in designing energy efficiency and renewable energy policies in conjunction with other statewide and regional policies to improve the State's economy, environment/public health, and energy security. This review, in part, hopes to spark such creative thinking that is then backed by rigorous, Connecticut-specific and detailed analysis that allows policymakers and stakeholders to evaluate different options and make explicit assessments of their impact on the State's energy goals.

The CEEEP Team found that the CT RPS might be better characterized as a Cleaner Energy Portfolio than an RPS, since both non-renewable resources and those that emit pollutants qualify. To avoid confusion, however, the CEEEP Team continues to use the term RPS.

Connecticut's energy policy aims at accomplishing multiple fundamental goals, although these goals are not clearly and precisely spelled out in the context of its RPS. In general, these goals relate to economic development, environment/public health improvement, and energy security. Connecticut needs to further define these goals and recognize that its RPS is one among several approaches that can be used to achieve its desired goals.

Connecticut should develop a formal and systematic multi-year RPS review process, perhaps as part of its integrated resource planning (IRP) process, so that proposed policy changes can be evaluated in concert with data collection and analysis. Such a process may help to reduce frequent and *ad hoc* changes to RPS policy. Studies are needed that quantify the technical and economic potential of cleaner energy technologies. Other studies must quantify the economic impact of RPS policies on Connecticut's economy and that of the region leveraging off the results presented in this report. In addition, the environmental implications of existing and proposed RPS policies, including changes in emissions over time and by location, pollution levels, in time and location, must be analyzed. Finally, greater effort is needed to define and quantify the energy security implications of the CT RPS.

There are several strategic decisions to make in the context of the CT RPS. One that stands out is whether there are alternative policies that can accomplish the goals of the RPS in a more cost-effective manner. The Connecticut RPS is aimed at achieving three broad and disparate categories of goals. Perhaps there are other policies that are directed at individual goals that, in combination, are more effective than using one approach, namely the RPS, to accomplish multiple goals.

Another strategic question is the extent to which developers or ratepayers should bear the risk of technology obsolescence. This question must be addressed to determine the appropriate portfolio of Renewable Energy Credits (RECs) and long-term financing, such as long-term contracts or feed-in tariffs, which Connecticut should employ to achieve its RPS goals.

Connecticut must also consider how its RPS interacts with other policies, at both the state, regional, and possibly national levels. For instance, there are some important connections between an RPS, wholesale electricity prices, regional transmission expansion policies, and regional air emission cap-and-trade policies. In some cases, interactions between these policies may result in counterintuitive results that policymakers may want to factor into their decision-making process. Currently, the Commissioner of the Department of Energy and Environmental Protection is considering a regional approach to the RPS, in coordination with New York and Massachusetts. This regional interaction was discussed by stakeholders both orally and in written comments to the CEAB, with varying opinions to the extent to which it should be done.

The economic impact of Connecticut's RPS deserves substantial attention. The quantitative results provided in this report are the first step in describing the qualitative interactions between the RPS and the State's economy. Before accounting for the environmental and energy security implications of the RPS, the RPS has a slight negative impact on Connecticut's economy. This is because it raises electricity rates (although by a relatively small amount), which has a slight drag on the economy, and most of the projects that qualify for the RPS are located outside of Connecticut. Overall, the economic analysis shows that the effect that the RPS has on increasing Connecticut's electricity prices is very small, between less than 1 percent and 3.5 percent of the typical residential electricity bill in 2020.

Energy efficiency and distributed generation that is located within Connecticut provide state economic benefits that offset, in part, the increase in electricity rates as well as act to reduce electricity bills of participating ratepayers and in some instances (Demand Reduction Induced Price Effect or DRIPE) for all ratepayers. The economic implications of the RPS on the environment and energy security could not be quantitatively assessed because the necessary data and studies that quantify those implications are not yet available. Of course, all economic projections depend on assumptions that may turn out to be incorrect due to a rapidly changing landscape and methodological limitations. The qualitative findings from this effort, however, are that policies that result in lower RPS costs and retain more of the funding in-state as the ones that are economically desirable.

Based upon the review of the CT RPS and discussions with the CEAB RPS Subcommittee, this report has the following five recommendations:

Recommendation A: Connecticut should clearly define its goals of economic development, environment/public health, and energy security, determine the relative priorities of each of them, and establish a process by which it can evaluate the extent to which current or future policies achieve those goals and evaluate associated tradeoffs.

Recommendation B: Connecticut needs to study other approaches besides its RPS to determine whether those approaches can better achieve its goals, and then compare these alternative approaches explicitly to its RPS taking into account that new approaches may introduce some uncertainty into the renewawble industry.

Recommendation C: Connecticut should have a formal ongoing CT RPS review and evaluation cycle that will provide a review timeline, analysis, and proposed changes to the CT RPS for consideration. This would arm policymakers and stakeholders with updated information and analysis needed to evaluate changes to its RPS and related policies.

Recommendation D: The necessary foundational studies need to be conducted on a routine basis that assess the technical and economic potential of RPS eligible resources, the economic impact on Connecticut's economy of the current CT RPS and proposed changes, their associated environment/public health impacts (including not only changes in emissions, but also on pollution levels), and their impact on energy security, so that policymakers may make informed decisions regarding the tradeoffs between goals.

Recommendation E: Connecticut should undertake detailed and systematic analyses of the interactions between its RPS, policies that cap air emissions such as the Regional Greenhouse Gas Initiative (RGGI), and regional wholesale electricity and transmission expansion policies to understand the interactions between these various policies.

I. Introduction, Policy Context, Goals and Strategies

In April 2010, in its statutorily mandated *2010 Comprehensive Plan for the Procurement of Energy Resources (CEAB, 2010)*, the Connecticut Energy Advisory Board (CEAB) recommended a comprehensive review of the State's Renewable Portfolio Standards and related renewable energy policies. The purpose of this review, which included a process for public and stakeholder input, is to determine whether the RPS Policies are consistent with current state goals.

The existing CT RPS calls for significant increases in new cleaner energy sources over the next decade. The CEAB and the Electric Distribution Companies (EDCs) each conducted significant analyses of the resources that would be needed to comply with these requirements. Through this process, they identified a number of challenges and issues regarding the impact of current RPS Policies on consumers and, more generally, the economic viability of the CT RPS in today's economy. Thus, it is important to review the goals of the CT RPS, in terms of the outlook for their success, their impact on electric ratepayers, the environmental and security performance of the electric system, the market for renewable energy, and other societal costs and benefits.

Connecticut was one of the earliest states to establish a statewide RPS, with its first requirement year being 2000. The CT RPS also has the distinction of undergoing more revisions than any other RPS policy.[1] The CT RPS requires each electric supplier and each electric distribution company wholesale supplier to obtain at least 23% of its retail load by using renewable energy by January 1, 2020. The RPS also requires each electric supplier and each electric distribution company wholesale supplier to obtain at least 4% of its retail load by using combined heat and power (CHP) systems and energy efficiency by 2010.

Separate portfolio standards are required for energy resources classified as "Class I," "Class II," or "Class III." Class I resources include energy derived from solar power, wind power, fuel cells (using renewable or non-renewable fuels), methane gas from landfills, ocean thermal power, wave or tidal power, low-emission advanced renewable energy conversion technologies, certain newer run-of-the-river hydropower facilities not exceeding five megawatts (MW) in capacity, and sustainable biomass facilities. Emissions limits apply to electricity generated by sustainable biomass facilities. Electricity produced by end-user distributed generation (DG) systems using Class I resources also qualifies. Class II resources include waste-to-energy facilities, certain biomass facilities not included in Class I, and certain older run-of-the-river hydropower facilities.

Class III resources include: customer-sited CHP systems, with a minimum operating efficiency of 50%, installed at commercial or industrial facilities in Connecticut on or after January 1, 2006; electricity savings from conservation and load management programs that started on or after January 1, 2006; and systems that recover waste heat or pressure from commercial and industrial processes installed on or after April 1, 2007.

Table 1 lists the percentage requirement for each class of the RPS, which is applied to electricity sales of investor owned utilities but not municipal utilities. Five percent of the total load is

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[1] Grace, Robert (2010) "Connecticut's RPS Policy Report: A Common Starting Point" available at http://www.ctenergy.org/pdf/RPS_WebinarP.pdf

assumed to be from municipal utilities, which is consistent with data obtained from the Energy Information Administration[2].

Table 1: Current CT RPS Requirements in Percentages and Megawatt-hours (MWh)

Year	Total Load (MWh)	Load Subject to RPS (MWh)*	Class I		Class II or Class I		Class III	
			%	MWh	%	MWh	%	MWh
2005	33,095,030	31,440,279	1.50%	471,604	3.00%	943,208		-
2006	31,677,451	30,093,578	2.00%	601,872	3.00%	902,807	1.00%	300,936
2007	34,129,108	32,422,653	3.50%	1,134,793	3.00%	972,680	2.00%	648,453
2008	30,956,551	29,408,723	5.00%	1,470,436	3.00%	882,262	3.00%	882,262
2009	29,715,757	28,229,969	6.00%	1,693,798	3.00%	846,899	4.00%	1,129,199
2010	30,701,397	29,166,327	7.00%	2,041,643	3.00%	874,990	4.00%	1,166,653
2011	31,542,114	29,965,008	8.00%	2,397,201	3.00%	898,950	4.00%	1,198,600
2012	31,588,794	30,009,354	9.00%	2,700,842	3.00%	900,281	4.00%	1,200,374
2013	31,897,338	30,302,471	10.00%	3,030,247	3.00%	909,074	4.00%	1,212,099
2014	32,052,801	30,450,161	11.00%	3,349,518	3.00%	913,505	4.00%	1,218,006
2015	32,178,789	30,569,850	12.50%	3,821,231	3.00%	917,095	4.00%	1,222,794
2016	32,408,904	30,788,459	14.00%	4,310,384	3.00%	923,654	4.00%	1,231,538
2017	32,534,250	30,907,538	15.50%	4,790,668	3.00%	927,226	4.00%	1,236,302
2018	32,707,092	31,071,737	17.00%	5,282,195	3.00%	932,152	4.00%	1,242,869
2019	32,818,434	31,177,512	19.50%	6,079,615	3.00%	935,325	4.00%	1,247,100
2020	32,986,392	31,337,072	20.00%	6,267,414	3.00%	940,112	4.00%	1,253,483

*Assumes 95% of Total Load is subject to RPS compliance.

The major changes that the CT RPS has undergone since its establishment are listed in Table 2.

[2] Utility sales data obtained from the EIA "Monthly Electric Utility Sales and Revenue Data" available at http://www.eia.gov/cneaf/electricity/page/eia826.html.

Table 2: Summary of RPS Legislation in Connecticut

Public Act Number	Year Enacted	RPS Policy Description
98-28[3]	1998	Establishes Class I and Class II resources. Class I includes energy derived from solar, wind, fuel cell, methane gas from landfills, or biomass facilities that began operation on or after July 1st, 2008 and cultivated and harvested energy in a sustainable manner. Class II includes trash to energy facilities, hydropower facilities that were in compliance with federal water regulations and had been exempted from a Federal Energy Regulatory Commission (FERC) license, and biomass facilities that did not meet the Class I requirements.
01-204[4]	2001	Biomass facility definition expanded to include "biomass gasification plant[s] that utilize land clearing debris, tree stumps, or other biomass that regenerates or the use of which will not result in a depletion of resources." It was also clarified that facilities that meet this definition are not considered "wood-burning facilities," meaning they are not Class II resources.
03-135[5]	2003	Adds ocean thermal power, wave or tidal power, low emission advanced renewable conversion technologies, and any electricity generated from a Class I renewable resource to the Class I category. Hydropower has both Class I and Class II requirements. Class I and II biomass source provisions were revised to require that each facility's previous calendar quarter's average NO_X emission rate was equal to or less than .075 lb/MMBtu and .2 lb/MMBtu of heat input, respectively.
03-221[6]	2003	Changes the definition of Class I biomass resources. The changes specified that NO_X emissions limits did not apply to biomass facilities with capacity lower than 500 kWs that began construction before July 1st, 2003.
05-1[7]	2005	Creates Class III renewable resource tier, which includes combined heat and power (CHP) and energy efficiency.
06-74[8]	2006	Class I biomass definition drops specifications regarding gasification plants. Adds word "sustainable" to Class I biomass facilities.
11-80[9]	2011	Combines Department of Environmental Protection and Department of Public Utility Control, creates a CHP infrastructure pilot program, creates a program to solicit long-term contracts for Class I generation projects that emit no pollution(ZRECs) and low emissions (LRECs), and directs DEEP to study the expansion of Class I resources to include hydropower.

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[3] Connecticut General Assembly H.B. 5005 "An Act Concerning Electric Restructuring", 1998.
[4] Connecticut General Assembly H.B. 6997 "An Act Concerning Revisions to the Transfer Act and Other Various Environmental Statutes", 2001.
[5] Connecticut General Assembly S.B. 733 "An Act Concerning Revisions to the Electric Restructuring Legislation", 2003.
[6] Connecticut General Assembly H.B. 6428 "An Act Concerning Technical Revisions to the Utility Statutes and Telecommunication Towers on Agricultural Land", 2003.
[7] Connecticut General Assembly H.B. 7501 "An Act Concerning Energy Independence", 2005.
[8] Connecticut General Assembly S.B. 212 "An Act Concerning Biomass", 2006.
[9] Connecticut General Assembly S.B. 1243 "An Act Concerning the Establishment of Energy and Environmental Protection and Planning for Connecticut's Energy Future", 2011.

The Center for Energy, Economic, and Environmental Policy (CEEEP) and the Rutgers Economic Advisory Service (R/ECON™) at the Edward J. Bloustein School of Planning and Public Policy at Rutgers University has conducted a review of Connecticut's RPS policies. The CEEEP Team's findings and final recommendations are presented in Section II.

As part of its assignment, the CEEEP Team used the R/ECON econometric model, tailored to Connecticut, to analyze the economic impacts current RPS Policies are likely to have on the State's economy. The data and assumptions were developed in part by Robert Grace of Sustainable Energy Advantage, LLC, which provided a review of both Connecticut and New England's RPS in a webinar and at the Roundtable event described below. The results of the economic analysis are shown in Section III.

The CEEEP Team's assignment also included a review of documents relevant to the CT RPS, which is presented in Section V. The CEEEP Team was also asked to organize and conduct a stakeholder process, which culminated in a series of Roundtable discussions on April 11, 2011 at the Department of Environmental Protection in Hartford, Connecticut. These were followed by an opportunity for the public and stakeholders to submit written comments. A summary of this stakeholder event is provided in Section IV. In addition, submitted written comments are compiled in Appendix A. In addition, the CEEEP team has solicited, reviewed, and addressed stakeholder comments on the draft "Review of Connecticut's Renewable Portfolio Standards" in June and included the written comments in Appendix B.

This report articulates the goals of the CT RPS and related policies, summarizes some possible strategies to achieve those goals, and reviews documents that provide insight and analysis relating goals to strategies. Figure 1 provides a suggested structure of the CT RPS goals. The term *goal* is used to mean the most important and desired outcomes of the CT RPS and related policies.

Figure 1: Structuring the CT RPS Goals

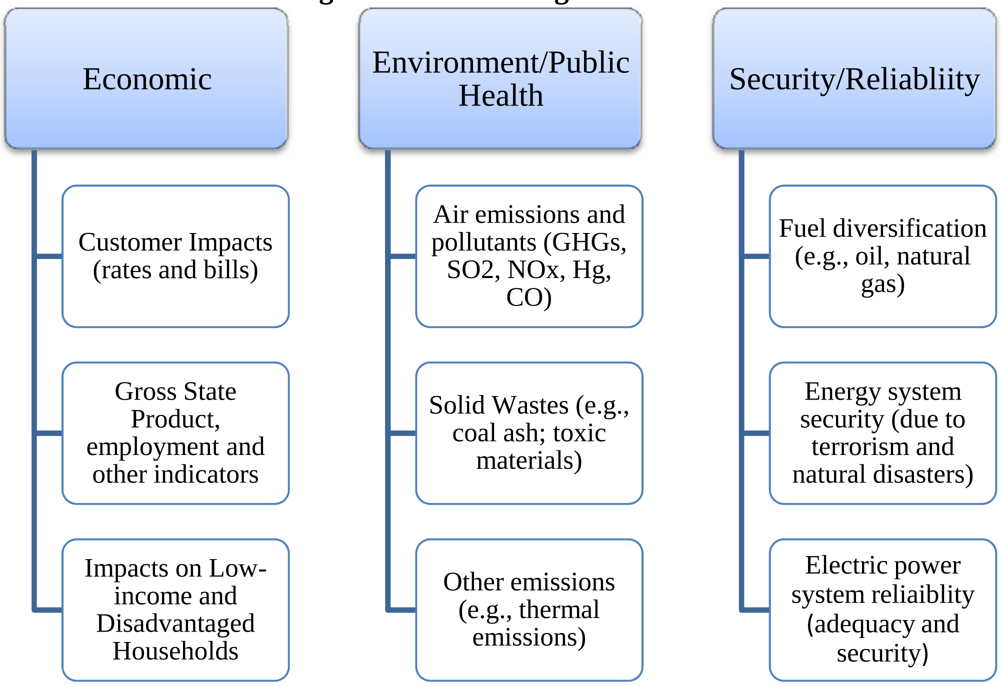

Figure 2 shows some of the potential costs and benefits associated with an RPS policy. Note that the RPS provides both energy security and environmental benefits, in addition to economic costs and benefits. Note that Figure 2 is not to scale and is meant for illustrative purposes only.

Figure 2: Relative Costs and Benefits of RPS Policy

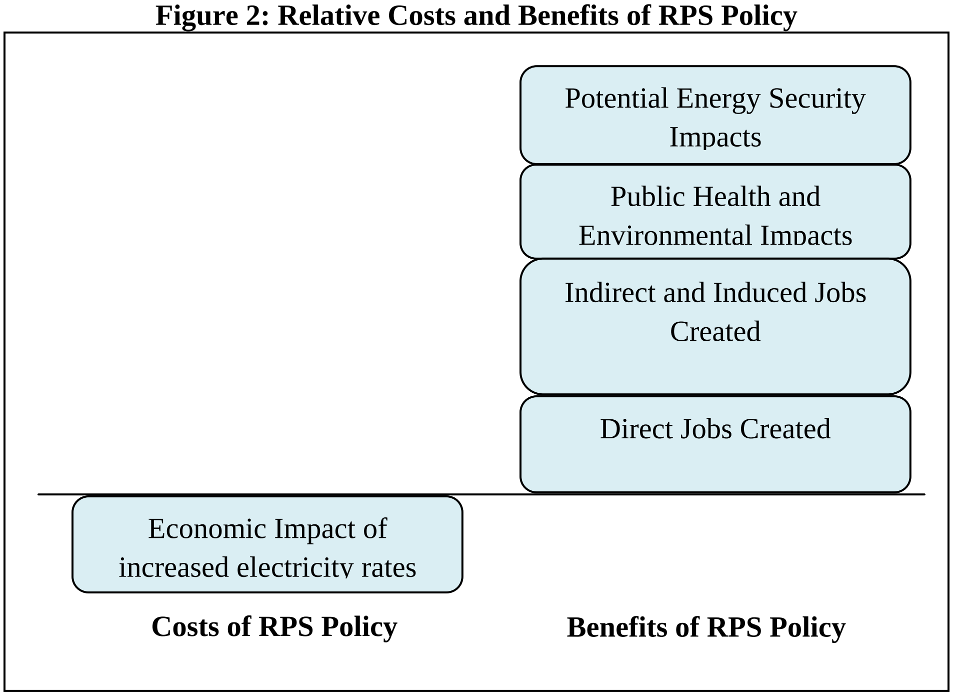

Table 3 identifies six possible, and by no means all, clean energy strategies, their implications for each of the three major goals of economic development, environment/public health, and energy security. It also summarizes best practices and other considerations related to each strategy. Table 3 provides the framework for both policymakers and stakeholders in Connecticut to begin discussions on which strategies would be most effective at helping the State to meet its fundamental RPS goals. The table attempts to highlight the major benefits and drawbacks to each of the policy options and discusses how quickly they can each be implemented. The policy options discussed in Table 3 include achieving all cost-effective energy efficiency, developing RPS carve-outs, feed-in tariffs and long-term contracts, including large-scale, out-of-state hydro and wind, developing a regional RPS, and RPS "trigger points".

Table 3: Clean Energy Strategies and Implications

Option	**Economic Development**	**Environment/Public Health**	**Energy Security**
A. All cost-effective energy efficiency (*emphasized in PA 11-80)	Best energy option for economic development: minor impact on electricity rates, reduces electricity bills for participants (although increases them for non-participants), reduces costs of RPS by reducing REC purchases, and expenditures occur in-state thereby promoting economic growth	Substantial reductions in emissions and pollutants	Important positive implications discussed in the CEAB Comprehensive Resource Plan, 2010
Best Practices/Considerations: Need to be able to measure accurately savings due to energy efficiency; must account for rebound/snapback effect; energy efficiency can be pursued in multiple ways including using an RPS framework (increasing Class III, energy efficiency rebates/loans, etc.); this option is not mutually exclusive with other options discussed below *Timing:* Energy efficiency can be rapidly increased in the near term			
B. RPS carve-outs (e.g., solar, distributed generation (DG), linking trash to energy to recycling rates)	May result in higher rate and bill impacts than a generic RPS but, if the carve-out results in in-state economic expenditures, may be positive overall to the State's economy	Some result in lower emission levels; those with fuel involved may increase emissions	With appropriate definition of distributed generation and with decentralization, enhances security/reliability
Best Practices/Considerations: The more carve-outs, the less competition between technologies; requires policymakers to set and review sizes of carve-outs; enables targeting technologies that are readily available in-state; carve-outs can work well within an RPS framework *Timing:* Can be implemented in the near term, but its benefits will occur over the medium to long-term because takes time to phase in			

<table>
<tr><th>Option</th><th>Economic Development</th><th>Environment/Public Health</th><th>Energy Security</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>C. Technology neutral feed-in tariff /long-term contracts</td><td>May result in higher rate and bill impacts than a generic RPS but, if it results in in-state economic expenditures, may be overall positive to the economy</td><td>Magnitude and direction of environmental outcomes depends on the technology eligible for the carve-out and size of carve-out</td><td>With appropriate technologies, enhances security/reliability</td></tr>
<tr><td colspan="4">Best Practices/Considerations: Shifts technological obsolescence risk to ratepayers from developers; provides long-term financing for developers facilitating financing and lowering costs; requires policymakers to forecast accurately technology costs over time; possibly inconsistent with a restructured electricity market; long-term contracts do not have the legislative and regulatory risk that feed-in tariffs and RPS have

Timing: Can be implemented in the near term, but its benefits will occur over the medium to long-term because takes time to phase in</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>D. Large-scale out-of-state hydro and/or wind</td><td>Economic impacts depend on costs, which are very project specific in part due to whether substantial transmission is needed; potential for low cost and large scale renewable resources for CT</td><td>Provides very large sources of renewable resources that can dramatically improve environmental outcomes</td><td>Depending on resource, may introduce additional security/reliability concerns; wind raises issue of intermittency and associated reliability concerns</td></tr>
<tr><td colspan="4">Best Practices/Considerations: Requires long-term financing, which may shift technological obsolescence risk to ratepayers from developers; provides long-term financing for developers facilitating financing and lowering financing costs; requires policymakers to forecast accurately technology costs over time; requires substantial coordination, including transmission planning and cost allocation, among the New England states

Timing: Long-term option</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>E. Regional RPS</td><td>Economic impacts depend on costs and location of renewable resources; regional coordination of economic development may improve economic outcomes for Connecticut</td><td>Provides very large sources of renewable resources that can dramatically improve environmental outcomes</td><td>Depending on resource, may introduce additional security/reliability concerns; wind raises issue of intermittency and associated reliability concerns</td></tr>
<tr><td colspan="4">Best Practices/Considerations: Requires substantial coordination, including transmission planning and cost allocation, among the New England states, which may not be able to come to agreement due to major</td></tr>
</table>

Option	Economic Development	Environment/Public Health	Energy Security
differences in states' interests. Currently this is under consideration by DEEP Commissioner Daniel Esty, in coordination with New York and Massachusetts. *Timing:* Long-term option			
F. Maintain current Class I targets but provide "trigger points" to prevent unacceptable rate impacts and to achieve goals	Maintains status quo in realizing development goals for current 20% by 2020 RPS.	Maintains status quo in realizing environment/public health goals for current 20% by 2020 RPS.	Maintains status quo in realizing energy security goals for current 20% by 2020 RPS.
Best Practices/Considerations: Requires the setting of conditional trigger-points that will provide some certainty to the market. *Timing*: Can be implemented in the near-term			

II. Findings and Recommendations

This section presents the CEEEP Team's findings and recommendations with respect to its review of the CT RPS. For ease of reference, findings are labeled with numbers; recommendations follow and are labeled with letters. Documents mentioned in the findings are reviewed in Section V or a footnote is provided in this section. The CEAB's 2010 Comprehensive Plan is frequently referred to in this section and is denoted CEAB 2010.

A. Definition and Goals of the Connecticut's "Renewable Portfolio Standard"

1. The CT RPS perhaps may be more accurately characterized as a Cleaner Energy Portfolio Standard (CEPS) than an RPS. The associated renewable energy credits (RECs) should be described as cleaner energy credits (CECs) as opposed to RECs. Although typically desirable, non-renewable technologies such as energy efficiency, waste-to-energy facilities, combined heat and power (CHP), and natural gas-fired fuel cells are RPS eligible resources. Moreover, several of the qualifying resources emit air emissions (Brattle, 2010, Table 3.14), although fewer than traditional resources, and hence the term "cleaner" rather than "clean" perhaps might be used. To avoid confusion, this report continues to use the less-accurate terms RPS and RECs rather than the more descriptive terms CEPS and CECs.

2. Connecticut needs to articulate a set of goals for its RPS. In more general Connecticut energy policy documents (CEAB, 2010), the goals relate to economic development, environmental improvement, and energy security. These more general statements of goals may be a useful starting point in articulating the goals of the CT RPS. Other states have explicit RPS goals (CEEEP, 2005). A variety of goals were suggested in the written stakeholder comments to the CEAB including consistent/transparent program (Boralex), minimizing ratepayer impact (Earth Markets), economic development (CL&P), and improved environmental quality (GE Financial Services).

3. The relative importance of goals must be determined, specifically, the relative importance of economic development, environmental improvement, and energy security of energy supplies and delivery. It is unlikely that stakeholders will ever agree on the goals (Section VI), their definition, and their relative importance. That being said, for Connecticut to have consistent, effective, and efficient RPS, a set of well-defined goals and their priorities must be established by policymakers.

4. In 2010, the CEAB identifies four key goals: provide electric services at an affordable and competitive cost; maintain reliable electric supply; improve environmental performance of the electric system; and enhance independence and security of electric supply (CEAB, 2010, p. 4). Notice that economic development, commonly mentioned as a goal of CT RPS (Section VI), is not listed, although providing electric services at an affordable and competitive cost is a component of economic development. One stakeholder (Shirley Bergert of Connecticut Legal Services) raised the issue of economic equity and support for low-income and disadvantaged ratepayers as a goal that should be considered as part of the CT RPS.

5. Goals should be distinguished from the approaches of achieving those goals. For instance, energy efficiency, CHP, fuel cells and renewable resources are approaches to the goals previously listed.

6. Discussing and modifying approaches and numerical targets without having articulated goals and their relative importance may not be productive. Absent knowing what the goals are, it is difficult to determine whether they could be achieved with any particular approach or target.

7. The selection of goals requires careful consideration and should avoid double counting, be conceptually distinct, be specific and, if possible, quantifiable, and not be too numerous (Hobbs and Meier, 2000[10], Chapter 1).

8. The CEAB's goals of maintaining reliable electric supply and enhancing energy independence and security of electric supply may overlap. The use of the term *security* with two different meanings is confusing. In the context of bulk power system reliability, reliability comprises two parts. The first is *resource adequacy*, that is, whether the bulk power system has sufficient resources to meet firm demand; in this context, security is the ability of the bulk power system to continue to serve load upon the failure of generation or transmission facilities. *Security* also refers to energy independence and the ability to respond to physical or cyber attacks on the energy infrastructure of the state, region and nation as well as the ability of the grid to remain viable in circumstances where critical components or materials may not be available due to interruption of global supply chains (e.g. multiple, large generation step-up transformers).

9. In addition to articulating and prioritizing goals, a credible, verifiable, and objective process is needed to quantify the impact that various policies have or that proposals are likely to have on these goals. Without such analysis, policymakers will be unable to understand whether a particular policy has a material impact on one or more goals and compare tradeoffs among goals.

   Recommendation A*: Connecticut should clearly define its goals of economic development, environment/public health, and energy security, determine the relative priorities of each of them, and establish a process by which it can evaluate the extent to which current or future policies achieve those goals and evaluate associated tradeoffs.*

B. Framework for a Renewable Energy Portfolio Standard

10. One particularly powerful critique of RPS is that the approach is prescribed, although with some flexibility, within a grouping of technologies. This means that the goals may not be achieved efficiently, and thus may result in outcomes that are not cost effective and are even undesirable in some cases (Michaels, 2008).

11. Within each of the classes of the CT RPS, there is competition between qualified technologies and their vendors and developers. There is not, however, competition between

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[10] Benjamin F. Hobbs and Peter Meier, *Energy Decisions and the Environment: A Guide to the Use of Multicriteria Methods*, Kluwer Academic Publishers, 2000.

classes, which raises questions of whether the desired goals are being achieved in the most efficient manner or at the lowest cost. The optimization of the size and definition of various classes of technologies is left to policymakers, not to competition between technologies. The fewer number of technology classes and the broader the definition of a given technology class, the more competition there will be among resources, leading (at least in theory) to reductions in costs although it is recognized that the current paradigm may represent its own means of prioritization/preference in terms of competition between classes. Covanta Energy, in written comments, suggested that Connecticut should eliminate the Class system in the RPS to reduce costs for ratepayers, to allow for greater competition among the renewable industry and to maintain existing and encourage growth of in-state renewable resources. On the other hand, some stakeholders have pointed out that renewable energy technologies and energy efficiency are complementary approaches, one addressing supply and the other addressing demand, and should not be in direct competition with one another.

12. Connecticut may want to consider other approaches of achieving the desired goals without using the RPS. For example, Summit Hydropower suggested that the current RPS structure be abandoned for a fixed $/kWh payment over a set number of years. It is beyond the scope of this report to raise the many other possibilities, but if Connecticut is to be assured that it is accomplishing its goals in the most cost-effective manner, it must systematically consider and compare such alternatives. This may require a fundamental policy change, with many important ramifications that would need to be carefully considered.

13. Connecticut needs to make some strategic choices regarding the means by which it wants to achieve its goals of economic growth, environmentpublic health improvement, and energy security in the context of its RPS.

14. One strategic choice discussed extensively at the stakeholder meeting (Section IV) is whether developers or ratepayers should bear the risks of long-term investment in RPS eligible energy technologies. The RPS assigns the risk of technology obsolescence to developers by using RECs. (The risk of performance is borne by developers both under the RECs and under long-term financing assuming that the mechanism assigns performance risk to the developer.) Connecticut also has policies that promote long-term financing in which the risk or technical obsolescence is borne by ratepayers, for example Project 150[11]. There are advantages and disadvantages to each approach, and Connecticut needs to decide what percentage of the long-term investment risk should be assigned to developers and ratepayers, respectively.

15. If Connecticut chooses to have developers bear the long-term technological obsolescence risk, prices of RECs will likely be volatile. In addition, the cost of capital, and therefore the total costs, will be higher than if ratepayers bear some proportion of these long-term risks. Projects that turn out to be uneconomic (e.g., due to advances in technology) will not be paid for by ratepayers. If Connecticut chooses to have ratepayers bear the long-term technical obsolescence risk, developers will obtain payments that are less volatile and will, presumably, be able to obtain capital at lower costs than if ratepayers did not bear these risks. That being said, uneconomic projects would be paid for by ratepayers, not developers, and

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[11] Connecticut General Assembly S.B. 733 “An Act Concerning Revisions to the Electric Restructuring Legislation”, 2003.

over the life of long-lived assets there will be projects that at one time or another are uneconomic due to the fluctuation in wholesale electricity prices (among other factors). It is therefore, ambiguous, whether ratepayers would pay more or less under RECs versus long-term financing.

16. The percentage of technical obsolescence risk does not have to be assigned entirely to either developers or ratepayers. A portfolio or combination of long-term financing (risk borne by ratepayers) and short-term RECs (risks borne by developers) can allocate risks between both parties. This decision should be made explicitly, with full acknowledgement of the tradeoffs.

17. The combination of long-term financing and RECs to procure technologies should also be informed by views on future cost reductions and improvements in rapidly developing technologies, such as solar. If relatively certain and rapid cost reductions are viewed as likely, the risk of technological obsolescence increases, perhaps favoring the greater use of RECs rather than long-term financing.

Recommendation B*: Connecticut needs to study other approaches besides its RPS to determine whether those approaches can better achieve its goals, and then compare these alternative approaches explicitly to its RPS taking into account that new approaches may introduce some uncertainty into the renewawble industry.*

C. Policy Consistency and Predictability

18. CT RPS has undergone substantial changes that have resulted in uncertainty and unpredictability (Sustainable Energy Advantage (Robert Grace), 2011; Energy Plan for Connecticut, 2007; Connecticut Academy of Science and Engineering, 2008; Section III). The uncertainty to market participants created by frequent changes was noted by CL&P in their written comments to the CEAB.

19. Major uncertainties in federal energy policy, commodity prices (especially for natural gas), technological advances, cost reductions (particularly of renewable resources such as solar and wind), and general economic conditions, among other factors (CEAB, 2010; CEEEP 2008; CEEEP 2004), have likely contributed to the many changes the CT RPS has undergone. These and other structural uncertainties, along with the difficulty of predicting the future, whether by experts or lay people, complicate the ability to achieve predictability and consistency in RPS policies.

20. Connecticut's energy policy is fragmented among multiple agencies with overlapping and competing mandates (La Capra, 2008), although recently passed legislation is aimed at addressing this issue.

21. Connecticut does not have a formal, multi-year RPS review process, although it does have a broader integrated resource planning process (Brattle, 2010; CEAB, 2010). Such a process may help reduce policy uncertainty and flux surrounding the CT RPS if it includes setting of goals, review of past RPS performance, examination of current challenges, and analysis of alternatives to improve the RPS given its goals, but it will not eliminate these challenges.

Recommendation C*: Connecticut should have a formal ongoing CT RPS review and* *evaluation cycle that will provide a review timeline, analysis, and proposed changes to the CT RPS for consideration. This would arm policymakers and stakeholders with updated information and analysis needed to evaluate changes to its RPS and related policies.*

D. Economic Impact of CT RPS

22. The starting point for any economic impact analysis of CT RPS is the resource potential within Connecticut and the region. Such an analysis has not been completed by Connecticut, except for a biomass assessment in 2004[12].

23. A comprehensive economic impact analysis and cost-benefit analysis of the CT RPS has not been conducted, although such a study has been conducted for solar resources (KEMA, 2009). The KEMA study provides a starting point for analyzing the economic impacts of solar, but more work needs to be done, including comparisons of cost-effectiveness in obtaining goals across different technologies, not only a single category of technologies.

24. The narrow economic impact – not including environment/public health, or energy security benefits – depends on the RPS costs above what ratepayers would have paid absent the RPS (which is the product of its size and per-unit costs minus the revenues the resource obtain), and the extent to which manufacturing, construction, operations, and maintenance expenditures occur within Connecticut.

25. For a given project, manufacturing, construction, and installation expenditures are one-time costs and the economic benefits of these expenditures on Connecticut's economy and employment are one-time effects. Operation and maintenance expenditures and benefits are ongoing costs that occur over the life of the project. It is, therefore, important that economic costs and benefits of CT RPS be identified clearly as either one-time or ongoing.

26. As noted by CL&P and Earth Markets in their written comments, Connecticut has few opportunities for indigenous RPS eligible resources and, to date, almost all of the renewable resources (not including energy efficiency, fuel cells, or CHP) used to comply with the CT RPS are located outside of Connecticut (Grace, 2011; Brattle, 2010, p. 3-2; CEAB, 2010). The recent energy legislation passed in June 2011 establishes a CHP infrastructure pilot program to expand the number of projects of less than 2 MW in the State.

27. One major economic benefit of renewable resources is the positive impact that expenditures have on the local economy. To the extent that renewable projects have and continue to be located primarily out of state, Connecticut ratepayers are bearing the costs but Connecticut is not receiving most of the direct economic benefit of these expenditures. That being said, locating these resources within the state is generally more expensive and may not achieve the same level of emission reductions if located out of state (Brattle, 2010, p. 3-2 & p. 3-8; CEAB, 2010).

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[12] Antares Group Inc., "Fuel Supply Assessment for Waterbury and Plainfield Area" Prepared for Keith Frame, 2004.

28. The economic analysis (Section III) of the CT RPS is a starting point for discussion and contains some important caveats that should always be mentioned when discussing the results. The CT RPS has a slight negative impact on the state's economy, not including any of its environment/public health and energy security benefits. The CT RPS raises electricity rates and mostly funds projects that are located out of state. As a result, the economic impact to the state is negative, again excluding the environment/public health and energy security benefits.

29. Technologies that are cost-effective, meaning that the total costs (REC costs and costs to the participant) are less than the electricity savings on a net present value basis, would result in positive economic benefits to the state even before accounting for the environment/public health and energy security benefits. Many energy efficiency technologies fall into this category, and sometimes are referred to as cost-effective energy efficiency. Not surprisingly, recommendations for Connecticut to pursue all achievable cost-effective energy efficiency are common (Secs. 51-52 of PA 07-242[13]; Brattle, 2010; CEAB, 2010; Section IV). The CEEEP Team could not account for these types of technologies because data on the percentage of cost-effective technologies that are part of the CT RPS were not available. (Brattle, 2010).

30. The slight negative economic impact diminishes for low-cost technologies located in-state (e.g., energy efficiency, combined heat and power, and in-state biomass) because, at a minimum, installation, operation, and maintenance costs are expended within the state. This creates direct, indirect, and induced economic activity, including employment. Locating higher-cost technologies within Connecticut increases the cost of the RPS, resulting in negative economic impacts, but retains more money within the state. Detailed analysis to explore this tradeoff is needed.

31. If Connecticut can retain and increase its share of the supply chain of RPS eligible technologies such as manufacturing and assembly facilities (which may be difficult to accomplish), the slight negative impact due to the CT RPS would be further reduced, if not become positive[14].

32. It is important that Connecticut quantify the environment/public health and energy security benefits specific to its RPS in order that a complete economic impact analysis can be conducted. (To date, quantification of these benefits is not available and is beyond the mandate of the CEEEP Team's assignment.)

33. The quantitative results depend on a variety of assumptions, all of which are subject to ranges of uncertainty (Section III). That being said, the qualitative findings are robust to broad ranges of uncertainty.

E. Environmental/Public Health and Energy Security Implications of CT RPS

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[13] Connecticut General Assembly H.B. 7432 "An Act Concerning Electricity and Energy Efficiency", 2007.
[14] Navigant Consulting, "CT Renewable Energy/ Energy Efficiency Economy Baseline Study: Phase 1", March 2009.

34. The 2010 Connecticut IRP and Comprehensive Plan calculates the amount of CO_2, NO_x, and SO_2 emissions under different CT RPS approaches (Brattle, 2010, Table 3.4; CEAB, 2010). The economic benefits of resulting emission reductions, however, are not quantified, and environmental implications other than those three categories of air emissions are not discussed (e.g., production of coal ash, mercury emissions, water thermal emissions, etc.).

35. There is a complex interaction between many but not all emissions (e.g., SO_2) and the resulting amount, deposition, and damage of resulting pollutants (e.g., acid rain) (CEEEP 2004). Detailed analyses of changes in emissions due to the CT RPS and how that affects pollutants is needed, particularly since Connecticut is a non-attainment state[15].

36. The CEAB (2010) has undertaken the study of energy security implications of the CT RPS, and these implications need to be investigated and quantified systematically. The next step is to provide a clear and precise definition of security and reliability, carefully distinguishing between multiple meanings of individual terms, along with metrics that measure the different key attributes of these definitions. Without a much more precise and quantitative approach, security/reliability implications are too vague to make meaningful judgments about their magnitude[16].

    Recommendation D*: The necessary foundational studies need to be conducted on a routine basis that assess the technical and economic potential of RPS eligible resources, the economic impact on Connecticut's economy of the current CT RPS and proposed changes, their associated environment/public health impacts (including not only changes in emissions, but also on pollution levels), and their impact on energy security, so that policymakers may make informed decisions regarding the tradeoffs between goals.*

F. Policy Interactions between the CT RPS and Related Policies

37. There are important and sometimes contradictory interactions between CT RPS and other state and regional policies, such as air emission polices, that need to be considered when evaluating the effectiveness of CT RPS (Felder, 2011; CEEEP, 2004).

38. One such interaction that deserves more attention is the interaction of cap-and-trade emission allowance policies and CT RPS, which was noted by Robert Fromer in his written comments to the CEAB. In the case of Connecticut (or states with similar policies), reductions in air emissions due to its RPS may not necessarily result in reductions in air emissions, because these reductions may free up emission allowances that can be used. Thus, it is important that CT RPS be coordinated with policies that cap emission allowances so that the air emission reduction benefits materialize (Felder, 2011; CEEEP, 2004).

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[15] If the concentration of one or more criteria pollutants in a geographic area is found to exceed the regulated or 'threshold' level for one or more of the National Ambient Air Quality Standards (NAAQS), the area may be classified as a "nonattainment area". The list of sites in Connecticut that are currently designated as "nonattainment" can be found at: http://www.epa.gov/oaqps001/greenbk/ancl.html.

[16] Gordes, J.N., S.M. Gouchoe, and S.S. Kalland. "Rating the States for Energy Security", American Solar Energy Society, 2003. Accessed at : http://www.ctenergy.org/pdf/Security.pdf

39. Another such interaction is between the price of wholesale energy, RECs, and capacity markets. Introducing zero and low-variable-cost resources into wholesale electricity markets may suppress wholesale energy prices (although an equilibrium analysis needs to be conducted before arriving at that conclusion), but may also increase capacity costs and the prices of RECs (Felder, 2011).

40. The CT RPS must also be evaluated within the context of the RPS's of other states and New England's wholesale electricity market administered by ISO-NE (Brattle, 2010, p. 3-3).

Recommendation E*: Connecticut should undertake detailed and systematic analyses of the interactions between its RPS, policies that cap air emissions such as the Regional Greenhouse Gas Initiative (RGGI), and regional wholesale electricity and transmission expansion policies to understand the interactions between these various policies.*

III. Economic Impact Analysis of the RPS on Connecticut's Economy

Below is the description of the economic impact analysis conducted by CEEEP and the Rutgers Economic Advisory Service (R/ECON) and a summary of the findings. The economic analysis does not include environment/public health or energy security benefits**.** The economic analysis presented here is not intended to forecast the exact quantitative effect that the RPS requirement will have on Connecticut's economy, but instead to show the direction and magnitude of effects under varying scenarios.

A. Description of Economic and Energy Impact Analysis

The economic and energy impacts of Connecticut's RPS requirements are estimated using an econometric model of the Connecticut economy developed for this contract by R/ECON™. R/ECON Connecticut™ comprises more than 100 equations, based on historical data for Connecticut and the United States, which are solved simultaneously. The heart of the model is a set of equations modeling employment, wages, and prices by industry. In general, employment in an industry depends on demand for that industry's output and the state's wages and prices relative to those of the nation. Demand can be represented by a variety of variables including (but not limited to) Connecticut personal income, population, and sectoral output or U.S. employment in the sector. Other metrics in the model include population and energy. The U.S. data come from IHS Global Insight, Inc., a national leader in economic forecasting.

Connecticut's RPS requirements directly affect electricity prices and employment. The electricity price and direct employment changes have indirect and induced effects on the state's economy and energy prices, which are accounted for in the R/ECON Connecticut™ model. The analysis included six scenarios, shown in Table 4. The Comparison Scenario uses the current Class I, Class II, and Class III RPS requirements for Connecticut, but assumes that RECs cost $0 and that there are no additional direct jobs in-state as a result of the RPS. The Comparison scenario, as the name implies, is intended to be a means of comparison to the other scenarios to show the effect of varying REC costs, RPS requirements, and direct jobs on the real gross state product, non-agricultural employment, electricity prices, electricity consumption, and electricity revenues in Connecticut.

Table 4: Economic Impact Analysis Scenario Descriptions

Scenario	Description
Comparison	R/ECON Connecticut™ output with current Class I, Class II and Class III RPS standards through 2020, no additional RPS jobs in CT, no REC cost
High-Cost REC	R/ECON Connecticut™ output with current Class I, Class II and Class III RPS standards through 2020, a high estimate of future renewable energy credit prices[17], no additional RPS jobs in CT
Lower-Cost REC	R/ECON Connecticut™ output with current Class I, Class II and Class III RPS standards through 2020, a lower estimate of future renewable energy credit prices[18], no additional RPS jobs in CT
High REC Plus Energy Efficiency (EE) Jobs	R/ECON Connecticut™ output with current Class I, Class II and Class III RPS standards through 2020, a high estimate of future renewable energy credit prices, assumes that 100% of Class III requirement goes to creating energy efficiency jobs
High REC Plus Solar Carve-out	R/ECON Connecticut™ output with current Class I, Class II and Class III RPS standards through 2020, a high estimate of future renewable energy credit prices, a solar carve-out as part of Class I requirement[19], and associated solar construction and O&M jobs
Flat RPS	Same as Comparison scenario, except RPS is kept flat after 2010

For the High-Cost, Lower-Cost, and High REC Plus Solar Carve-out scenarios, the CEEEP team calculated the additional cost of electricity (the Electricity Price Adder) that would result from the policies described above. For the High-Cost and Lower-Cost scenarios, the CEEEP team used projected REC price data provided by Robert Grace, Sustainable Energy Advantage[20] and electricity consumption data from the R/ECON Connecticut™ model. Table 5 shows the projections. Note that the Class II and Class III REC prices are the same for both scenarios. Table 5 also shows the cumulative energy efficiency savings in GWh, adapted from the 2010 Comprehensive Plan[21]. The energy efficiency savings were not subtracted from the total load

[17] Grace, Robert (2010) "Connecticut's RPS Policy Report: A Common Starting Point" available at http://www.ctenergy.org/pdf/RPS_WebinarP.pdf
[18] Ibid.
[19] *KEMA Inc.* "Sustainable Solar Strategy for Connecticut", 2009
[20] Grace, Robert (2010) "Connecticut's RPS Policy Report: A Common Starting Point" available at http://www.ctenergy.org/pdf/RPS_WebinarP.pdf
[21] Connecticut Energy Advisory Board, "2010 Comprehensive Plan for the Procurement of Energy Resources: Demand Side Management Technical Paper", April 2010. Figure 4

forecast out to 2020, though a reduction in electricity consumption would be expected to reduce electricity prices and increase real gross state product and non-agricultural employment.

Table 5: Projected Electricity Consumption and REC Prices 2010 - 2020

	Total Load (MWh)	Class I Lower Cost REC ($/MWh)	Class I High Cost REC ($/MWh)	Class II ($/MWh)	Class III ($/MWh)	Cumulative EE Savings (GWh)[22]
2010	30,701,397	$16.20	$16.20	$0.60	$12.10	330
2011	31,542,114	$11.00	$11.00	$0.20	$10.50	750
2012	31,588,794	$11.00	$25.00	$0.20	$10.50	1,000
2013	31,897,338	$11.00	$40.00	$0.20	$10.50	1,300
2014	32,052,801	$11.00	$50.00	$0.20	$10.50	1,500
2015	32,178,789	$11.00	$50.00	$0.20	$10.50	1,749
2016	32,408,904	$11.00	$50.00	$0.20	$10.50	2,000
2017	32,534,250	$11.00	$50.00	$0.20	$10.50	2,250
2018	32,707,092	$11.00	$50.00	$0.20	$10.50	2,500
2019	32,818,434	$11.00	$50.00	$0.20	$10.50	2,750
2020	32,986,392	$11.00	$50.00	$0.20	$10.50	2,894

For the High REC Plus EE Jobs scenario, the CEEEP team adjusted the model inputs for the proposed energy efficiency requirement's direct installation jobs created within Connecticut. The CEEEP team assumed that 100 percent of the Class III requirement would be met by energy efficiency and thus would result in energy efficiency jobs. This assumption was used because the actual mix of combined heat and power and energy efficiency currently being retired under the Class III requirement could not be ascertained. The annual direct jobs created per $1 million invested in Connecticut energy efficiency are estimated based on data gleaned from two recent national studies. The direct job estimate was applied to the annual cost of the Class III requirement, determined based on the annual incremental Class III requirement and the projected cost of Class III REC's (see Table 5). Table 6 presents the direct jobs per $1 million invested. The R/ECON analysis presented in this section uses 7.91 direct energy efficiency jobs per $1 million. The study from Navigant Consulting, which indicated that the weighted average of direct jobs per $1 million was 9.1, focused on accounting for green jobs in Connecticut. The focus is not specifically on the RPS, but also on Connecticut renewable energy and energy efficiency industries that serve out-of-state RPS.

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[22] Ibid. Values in table are approximate, based on Table 4 in Demand Side Management Technical Paper

Table 6: Average Direct Job-Years per $1 Million Invested in Energy Efficiency[23]

Study	Direct Job-Years
White & Walsh	9.50
Ehrhard-Martinez & Laitner	6.32
Average	**7.91**
Navigant CT[24] (weighted-average)	**9.1**

The High REC Plus Solar Carve-out scenario was determined based on the current solar capacity in Connecticut (11 MW in 2011) and was projected into the future to meet the requirement of 4,350,000 MWh of solar by 2025 under Connecticut General Assembly Bill SB1, "An Act Concerning Connecticut's Energy Future[25]". The projected solar carve-out and KEMA's projected solar renewable energy credit (SREC) incentives[26] are shown in Table 7. As a point of comparison, in Reporting Year 2010 (June 1, 2009 – May 31, 2010) the cumulative weighted average price of SRECs in New Jersey was $615/MWh[27].

Table 7: Assumed Solar Carve-out Requirement and SREC Prices

	Solar Requirement (MW)	SREC Price ($/MWh)
2010	0	$320
2011	13.0	$320
2012	15.2	$280
2013	17.7	$280
2014	20.7	$240
2015	24.2	$240
2016	28.2	$200
2017	32.9	$200
2018	38.4	$160
2019	44.9	$160
2020	52.4	$120

[23] White, S. & J. Walsh, "Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy.", Center on Wisconsin Strategy, The Workforce Alliance and The Apollo Alliance, 2008; Ehrhardt - Martinez, K. & J. Laitner, "The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture.", American Council for an Energy-Efficient Economy, 2008.
[24] Navigant Consulting, "CT Renewable Energy/ Energy Efficiency Economy Baseline Study: Phase 1", March 2009. The weighted-average direct jobs per $1 Million includes 12.9 for residential, 9.1 for small business, and 7.6 for C&I.
[25] Accessed on May 23, 2011 at http://www.cga.ct.gov/asp/cgabillstatus/cgabillstatus.asp?selBillType=Bill&bill_num=1&which_year=2011
[26] *KEMA Inc.* "Sustainable Solar Strategy for Connecticut", 2009, Table 6-1.
[27] New Jersey Board of Public Utilities, "New Jersey's Renewable Portfolio Standard Rules – 2010 Annual Report" 2011.

The analysis assumes that the solar requirement is met solely by SRECs, not solar alternative compliance payments (SACPs). Additionally, the annual direct solar jobs created within Connecticut are estimated based on data gleaned from two comprehensive studies. Direct one-time solar installation job-years were applied to the annual incremental solar requirement. Direct solar O&M jobs occur over the life of the photovoltaic system; therefore, the annual jobs were applied to the annual solar requirement. Table 8 presents the direct installation and O&M jobs per MW. Note that Tables 6 and 8 show direct jobs, which are inputs into the R/ECON Connecticut™ model. The multiplier effects, which include indirect and induced jobs, are model outputs and are included in the employment results presented in Tables 11 through 15. In addition, if Connecticut attracts additional solar assembly and manufacturing jobs, the total economic impact would be more positive.

Table 8: Average Direct Installation and O&M Solar Job-Years per MW[28]

Study	Installation	Annual O&M
EPRI	7.14	0.12
Navigant	5.80	0.25
Average	**6.47**	**0.19**

[28] EPRI, "California Renewable Technology Market and Benefits Assessment" prepared for the California Energy Commission, 2001; Navigant, "Economic Impacts of the Tax Credit Expiration" prepared for the American Wind Energy Association and the Solar Energy Research and Education Foundation, 2008.

B. R/ECON Connecticut™ Model Output

As stated in the model description above, the U.S. inputs to R/ECON Connecticut™ come from a U.S. Economic forecast from IHS Global Insight. Table 9 shows the summary statistics for 2010 and projection to 2020, and is used for all scenarios presented in this analysis.

Table 9: Summary of U.S. Economic Data from 2010 to 2020

Outputs	2010	2015	2020	% Change from 2010 to 2020
Real Gross Domestic Product (GDP) ($ Billions)	13,253	15,427	17,567	32.6%
Non-Agricultural Employment (millions)	130.3	142.6	150.1	15.2%
Consumer Price Index (1982-84 =100)	218.1	240.6	266.4	22.1%
CT Population	3,574,239	3,649,513	3,721,604	4.1%
Producer Price Index: Electricity	1.85	2.14	2.46	33.0%
Producer Price Index: Natural Gas	2.05	2.14	2.2	7.3%
Unemployment Rate	9.7%	6.7%	5.2%	-46.4%

Table 10 is a summary of the model output for Connecticut's baseline economic and electricity forecasts from 2010 to 2020. The Comparison scenario includes the current RPS requirements out to 2020, includes no cost for RECs, and assumes that all additional job creation under the RPS is outside of Connecticut. Under the Comparison scenario, the real gross state product is expected to increase more than 23 percent, the number of jobs is expected to increase by almost 9 percent, and electricity prices are expected to increase by more than 64 percent from 2010 to 2020. The increase in electricity price for the Flat RPS scenario from 2010 to 2020 is 62 percent, thereby indicating that only about 0.39 cents/kWh (1.36%) of the 2020 electricity price is associated with the RPS.

Table 10: Summary of CT Baseline Economic & Electricity Forecast from 2010 to 2020

	2010	2015	2020	% Change from 2010 to 2020
Real Gross State Product (GSP) ($ millions)	203,236	228,724	251,629	23.8%
Non-Agricultural Employment (thousands)	1617.1	1701.3	1759.7	8.8%
Consumer Price Index: NY NJ CT (1982-84 =100)	241	265.7	297.5	23.4%
Electricity Prices (cents/ kWh)	17.49	21.89	28.72	64.2%
Electricity Total MWh Consumption	30,701,397	32,178,789	32,986,392	7.4%
Electricity Revenue ($ Millions)	5369.7	7043.9	9473.7	76.4%

Figure 3, Figure 4 and Figure 5 show historical and projected electricity consumption, electricity consumption per capita, and electricity prices in Connecticut, respectively, and are not weather normalized. Figure 3 shows the total energy consumption in Connecticut in GWh from 1990 through 2020. The solid line shows historical data, while the dashed line shows data projected by the R/ECON Connecticut™ model. Energy consumption increased steadily between 1990 and 2007, with a brief dip in 2006. The recent recession caused energy consumption to decrease just below 30,000 GWh. Energy consumption has since increased, and is expected to be around 33,000 GWh by 2020.

Figure 3: CT Total Energy Consumption: 1990 - 2020

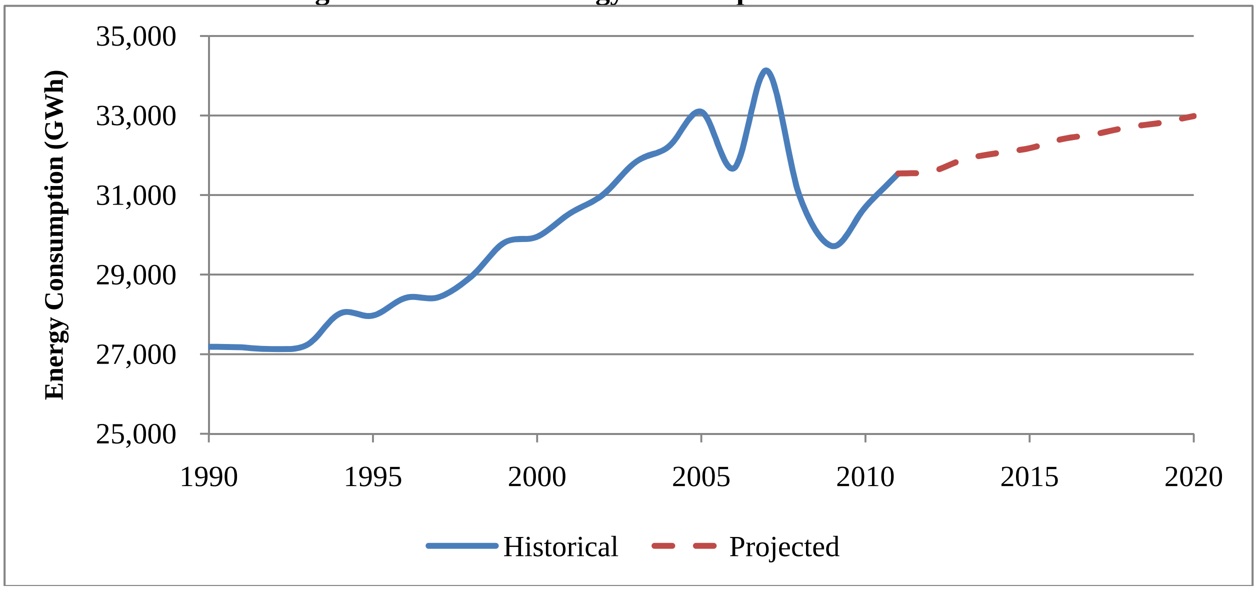


Figure 4 shows per capita energy consumption in MWh from 1990 through 2020. Energy consumption per capita increased steadily between 1990 and 2007, with a brief dip in 2006. The recent recession caused annual energy consumption to decrease 1.3 MWh/person. Annual energy consumption has since increased, but is expected to increase slowly over the next 10 years from 8.8 MWh/person to 8.9 MWh per person.

Figure 4: CT per Capita Energy Consumption: 1990 - 2020

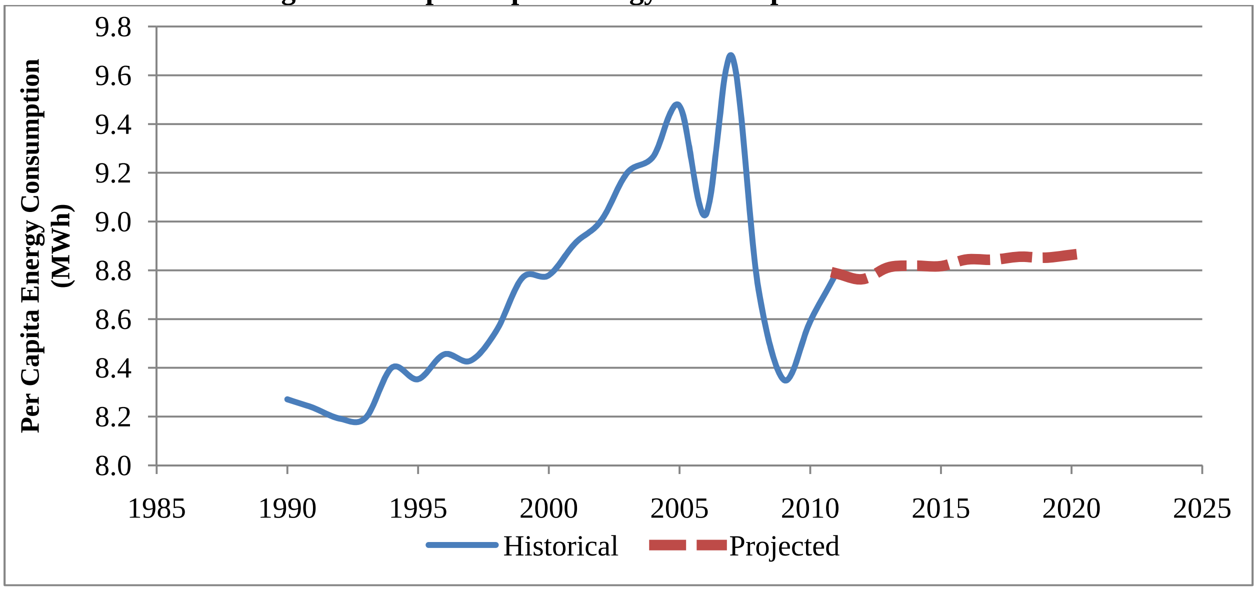
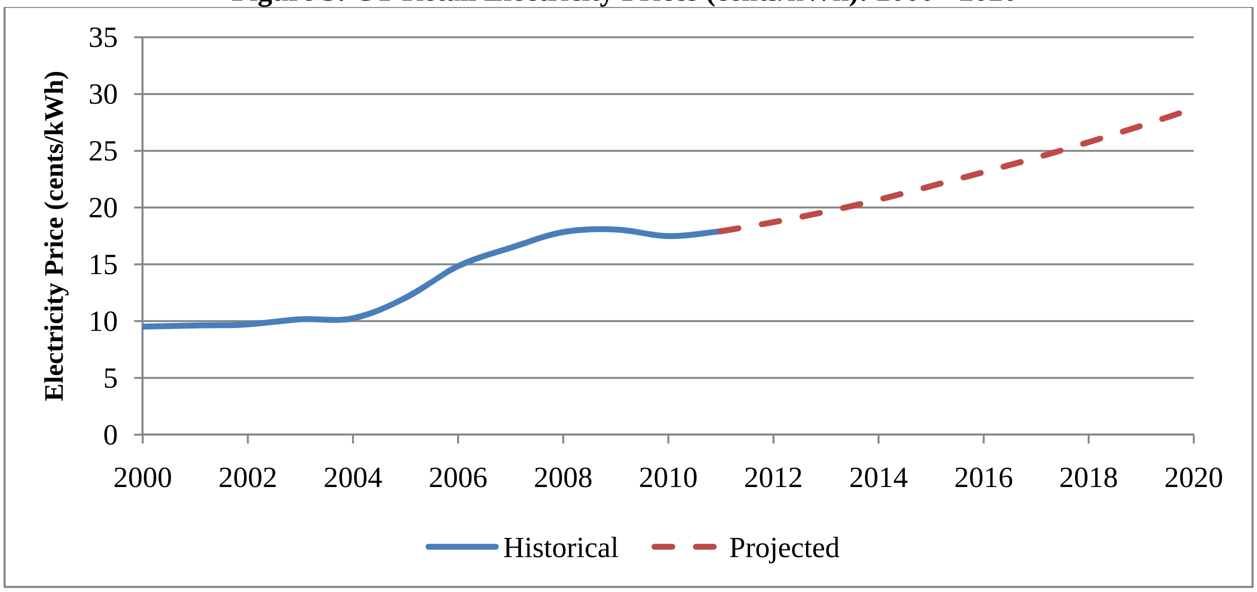


Figure 5 shows retail electricity prices in cents/kWh from 2000 through 2020. They are projected to increase from 18 cents per kWh in 2011 to 29 cents per kWh in 2020. Some of the reasons for this increase include increasing natural gas prices and increases in the producer price index, which captures increasing costs to produce and deliver electricity.

Figure 5: CT Retail Electricity Prices (cents/kWh): 2000 - 2020



Tables 11 through 15 show the difference between the High-Cost REC, Lower-Cost REC, High REC Plus EE Jobs, High REC Plus Solar Carve-out, and Flat RPS scenarios and the Comparison scenario for 2010 and for 2020. The metrics shown include average electricity price, electricity consumption, electricity revenue, Connecticut real gross state product, and non-agricultural employment. In addition to the percent difference between the scenario and Comparison in 2010 and 2020, the total difference from 2010 to 2020 is shown. The total difference represents the cumulative sum from 2010 to 2020 of the difference between the two scenarios.

Table 11: Comparison of High Cost REC Scenario vs. Comparison Scenario

Comparison Points	Percent Difference		Total Difference from 2010 to 2020
	2010	2020	
Electricity Prices ($/MWh)	0.48%	3.45%	N/A
Electricity Consumption (MWh)	-0.06%	-0.37%	-970,254
Electricity Revenue ($ millions)	0.41%	3.06%	1813.80
CT Gross State Product ($ millions)	0%	-0.03%	-786.30
Non-agricultural employment (thousands)	0%	-0.02%	-2.79

Table 11 compares the High-Cost REC scenario to the Comparison scenario. By 2020, the price of electricity is increased by 3.45 percent as compared to the Comparison scenario, while electricity consumption decreases by 0.37 percent. The Connecticut real gross state product and employment are both only marginally affected, by 0.03 percent and 0.02 percent, respectively.

Cumulatively, under the High-Cost REC scenario, Connecticut loses fewer than 2800 jobs and consumes 970 GWh less electricity than under the Comparison scenario.

Table 12 compares the Lower-Cost REC scenario to the Comparison scenario. By 2020, the price of electricity is increased by 0.86 percent as compared to the Comparison scenario, while electricity revenue increases by 0.76 percent. The Connecticut real gross state product and employment are both only marginally affected by 0.01 percent. Cumulatively, under the Lower Cost REC scenario, Connecticut loses less than 900 jobs and consumes 306 GWh less electricity than under the Comparison scenario. The Lower-Cost REC scenario has less of a negative economic impact than the High Cost REC scenario because Class I REC's in 2020 are $11/MWh in the Lower Cost REC scenario and $50/MWh in the High Cost REC scenario.

Table 12: Comparison of Lower Cost REC Scenario vs. Comparison Scenario

Comparison Points	**Percent Difference**		**Total Difference from 2010 to 2020**
	2010	**2020**	
Electricity Prices ($/MWh)	0.48%	0.86%	N/A
Electricity Consumption (MWh)	-0.06%	-0.09%	-306,297
Electricity Revenue ($ millions)	0.41%	0.76%	544.31
CT Gross State Product (GSP) ($ millions)	0%	-0.01%	-226.20
Non-agricultural employment (thousands)	0%	-0.01%	-0.88

Table 13 compares the High REC Plus EE Jobs scenario to the Comparison scenario. The addition of the energy efficiency jobs has no effect on electricity prices[29], consumption, revenue, or real gross state product. The number of jobs that are cumulatively loss decreases, from 2791 to 1420, a net increase in 1371 jobs. As described earlier, a 2009 Navigant Consulting study indicated that the number of jobs per $1 million invested would be approximately 15% higher than the number of jobs used in this analysis. It is expected that more energy efficiency jobs would slightly improve the indicators presented in Table 13, including a smaller decline in both real gross state product and employment.

[29] Note that this analysis does not account for the price reduction effect of energy efficiency, as the exact mix of energy efficiency measures that will be used is not known.

Table 13: Comparison of High REC Plus EE Jobs Scenario vs. Comparison Scenario

Comparison Points	Percent Difference		Total Difference from 2010 to 2020
	2010	2020	
Electricity Prices ($/MWh)	0.48%	3.45%	N/A
Electricity Consumption (MWh)	-0.06%	-0.37%	-969,228
Electricity Revenue ($ millions)	0.41%	3.06%	1814.14
CT Gross State Product (GSP) ($ millions)	0%	-0.03%	-781.70
Non-agricultural employment (thousands)	0%	-0.01%	-1.42

Table 14 compares the High REC Plus Solar Carve-out scenario to the Comparison scenario. As described above, this scenario coupled high REC costs with a suggested solar carve-out from KEMA and the associated construction and O&M jobs. The addition of the solar carve-out does increase the electricity price and revenue slightly, by about 0.03 percent, and has a very small effect on electricity consumption and real gross state product. The largest impact of this scenario is on jobs, which increase over 2900 as a result of the addition of a solar carve-out and result in a net increase in jobs over the Comparison.

Table 14: Comparison of High REC Plus Solar Carve-out vs. Comparison Scenario

Comparison Points	Percent Difference		Total Difference from 2010 to 2020
	2010	2020	
Electricity Prices ($/MWh)	0.48%	3.48%	N/A
Electricity Consumption (MWh)	-0.06%	-0.37%	-984,792
Electricity Revenue ($ millions)	0.40%	3.10%	1843.92
CT Gross State Product (GSP) ($ millions)	0%	-0.03%	-785.80
Non-agricultural employment (thousands)	0%	0.01%	0.13

Table 15 compares the Flat RPS scenario to the Comparison scenario. By 2020, the price of electricity is decreased by 1.36 percent as compared to the Comparison scenario, while electricity consumption decreases by 0.16 percent. The Connecticut real gross state product and employment are both only marginally affected by 0.02 percent and 0.01 percent, respectively. Cumulatively, under the Flat RPS scenario, Connecticut gains less than 600 jobs and consumes 215 GWh more electricity than under the Comparison scenario.

Table 15: Comparison of Flat RPS vs Comparison Scenario

Comparison Points	**Percent Difference**		**Total Difference from 2010 to 2020**
	2010	**2020**	
Electricity Prices ($/MWh)	0%	-1.36%	N/A
Electricity Consumption (MWh)	0%	0.16%	215,697
Electricity Revenue ($ millions)	0%	-1.20%	-413.78
CT Gross State Product (GSP) ($ millions)	0%	0.02%	181.80
Non-agricultural employment (thousands)	0%	0.01%	0.56

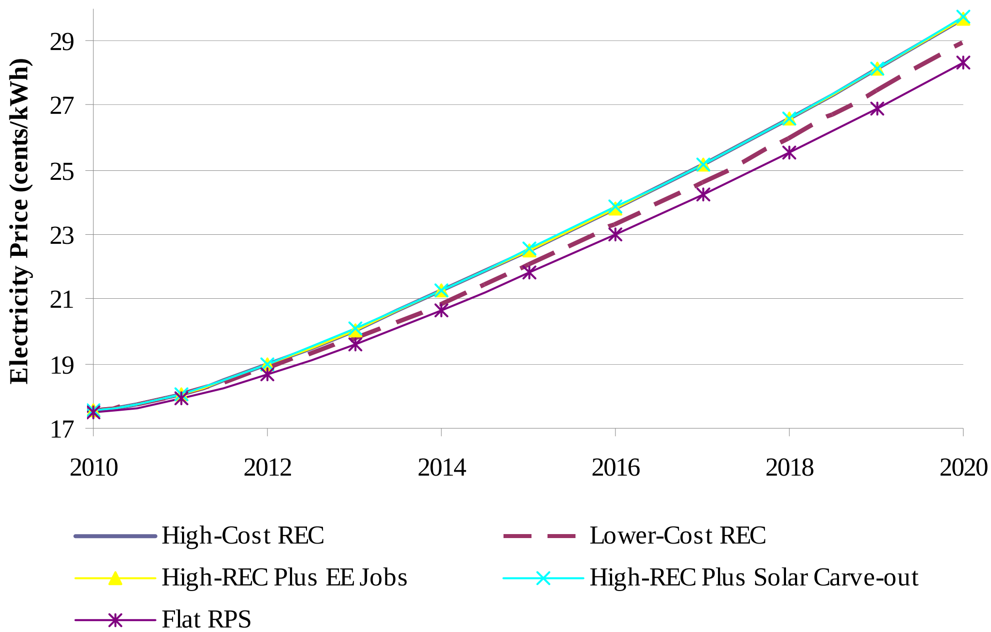
Table 16 shows the potential residential bill impact as a result of the Lower Cost REC, High Cost REC, and High REC Plus Solar Carve-out scenarios. In addition, the estimated total residential bill was calculated using the Comparison scenario electricity price from the R/ECON Connecticut™ model. CEEEP assumed that the average residential energy usage was 724 kWh per month in 2009[30] and increased it by 1.5 percent per year. Under the various scenarios, the average residential bill may increase between $26 and $103 per year in 2020. When compared to the estimated total residential electricity bill, these increases amount to less than 1% of the total bill for the Lower-Cost REC scenario and about 3.5percent for the High-Cost REC and High REC Plus Solar Carve-out scenarios. Figure 6 shows the retail electricity prices under the various scenarios. Under the Flat RPS scenario retail electricity prices increase to about 28 cents/kWh in 2020, a 62 percent increase from 2010. The other four scenarios show increase of between 0.64 and 1.39 cents/kWh above the Flat RPS scenario in 2020, indicating that the effect of the RPS policy on retail electricity prices is only a 2 to 5 percent increase, depending on the scenario. Reasons for electricity price increases cited in the CEAB 2010 report include the introduction of carbon legislation and transmission upgrades and capacity related to renewable energy.

[30] U.S. Energy Information Administration, "Electric Sales and Revenue: Table 5A. Residential Average Monthly Bill by Census Division, and State 2009", Accessed at http://www.eia.gov/cneaf/electricity/esr/table5_a.xls

Table 16: Annual Residential Bill and Impact Due to Various Scenarios

	Total Residential Bill	Lower-Cost REC Bill Impact	High-Cost REC Bill Impact	High REC Plus Solar Carve-out Bill Impact
2010	$1,542	$13.71	$13.71	$13.71
2011	$1,603	$11.11	$11.11	$12.43
2012	$1,699	$12.22	$23.10	$24.45
2013	$1,808	$13.37	$38.77	$40.32
2014	$1,932	$14.55	$52.69	$54.20
2015	$2,072	$16.25	$60.25	$61.98
2016	$2,217	$18.01	$68.02	$69.63
2017	$2,370	$19.81	$76.02	$77.84
2018	$2,536	$21.67	$84.24	$85.78
2019	$2,712	$23.57	$92.68	$94.41
2020	$2,900	$25.53	$101.36	$102.55

Figure 6: Retail Electricity Prices under Various Scenarios[31]



In conclusion, Table 17 shows a summary of the change in electricity prices between the Comparison scenario and the other five scenarios, and Table 18 shows a summary of the change in non-agricultural employment between the Comparison scenario and the other five scenarios.

[31] Please note that the electricity prices do not start at 0 cents/kWh.

Table 17: Projected RPS Premium and Percent Change to Connecticut's Baseline Retail Cost of Electricity (cents/kWh)

RPS Scenarios	**2010**		**2015**		**2020**	
	cents/kWh	**% change**	**cents/kWh**	**% change**	**cents/kWh**	**% change**
High-Cost REC	0.08	0.48%	0.63	2.86%	0.99	3.45%
Lower-Cost REC	0.08	0.48%	0.17	0.76%	0.25	0.86%
High REC Plus EE Jobs	0.08	0.48%	0.63	2.86%	0.99	3.45%
High REC Plus Solar Carve-out	0.08	0.48%	0.65	2.97%	1.00	3.48%
Flat RPS	0.08	0.48%	-0.09	-0.39%	-0.39	-1.36%

Table 18: Projected RPS Premium and Percent Change to Connecticut's Baseline Non-Agricultural Employment

RPS Scenarios	**2010**		**2015**		**2020**	
	Jobs	% change	Jobs	% change	Jobs	% change
High-Cost REC	-9	-0.001%	-319	-0.019%	-399	-0.023%
Lower-Cost REC	-9	-0.001%	-90	-0.005%	-99	-0.006%
High REC Plus EE Jobs	-59	0.004%	-189	-0.011%	-261	-0.015%
High REC Plus Solar Carve-out	-9	-0.001%	-70	-0.004%	96	0.005%
Flat RPS	0	0.000%	35	0.002%	150	0.009%

Overall, the economic analysis shows that the effect that the RPS has on increasing Connecticut’s electricity prices is very small, between less than 1 percent and 3.5 percent of the typical residential electricity bill in 2020. The analysis has also shown that REC prices need to be kept low and that the more jobs that can be generated in-state (such as construction, manufacturing, operation, and maintenance), the more economic benefits (real gross state product) that Connecticut will realize from the RPS. This analysis is very high-level and does not take into account the environment/public health and energy security benefits associated with the RPS. It is suggested that more analysis be undertaken to quantify the various RPS benefits in the future, such as the benefits that the Class I, Class II, and Class III requirements provide to Connecticut.

IV. Summary of Stakeholder Input

Public and stakeholder input have been solicited throughout the preparation of this report. A stakeholder meeting was held on April 11, 2011 in the Connecticut Department of Environmental Protection's Phoenix Auditorium. The purpose of the stakeholder event was to assess the strengths, weaknesses, opportunities, and threats pertaining to Connecticut's RPS policy and goals through an interactive conversation between moderators, roundtable participants, and stakeholders. The stakeholder meeting had 146 registrants representing private energy suppliers and utilities, academia, government, non-profit groups, environmental advocates, and private consultants.

The meeting began with a brief presentation from Robert Grace of Sustainable Energy Advantage on the history of Connecticut's RPS policy and goals. This presentation summarized a webinar he had conducted on April 4, 2011, the purpose of which was to present participants with core background information so the in-person stakeholder meeting could progress from a common factual basis. The webinar, was attended by 96 live viewers (and potentially more given that a recording of it was made available on the CEAB website) and covered four main sections: RPS policy and economics, Connecticut and New England Renewable Portfolio Standards and related policies, the CT and NE RPS experience to date, and the CT and NE RPS looking forward. Grace's presentation at the start of the stakeholder meeting outlined the types and best practices of RPS design, the history of Connecticut's RPS and how it compared to the experiences of other states. It also discussed why Connecticut's REC prices are usually volatile and what factors influence REC prices, and finally, what policy choices need to be made for Connecticut's RPS in the future.

The first roundtable was on the topic of Connecticut's current RPS policy goals and the implications of those policies. The panel was moderated by Joel Gordes of CEAB; participants included Shirley Bergert of Connecticut Legal Services, Inc., Kevin DelGobbo of CT DPUC, Bryan Garcia of the Yale Center for Business and Environment, Anne George of ISO-NE, Jim Shuckerow of Connecticut Light and Power Company, Roger Smith of Clean Water Action, Jessie Stratton of Environment Northeast, and Alan Trotta of United Illuminating Company.

The second roundtable focused on the experience of market participants interacting with CT's RPS policies and was moderated by David Goldberg of Connecticut Clean Energy Fund. The panel included Dan Allegretti of Constellation Energy, Christie Bradway of Connecticut Light and Power, Duncan Broatch of Summit Hydro, Susan Bruce of McNees Wallace & Nurick LLC on behalf of Kimberly-Clark, Bob Cleaves of Biomass Power Association, Tim Daniels of Deepwater Wind, Amy Fisher of GE Capital, Jonathon Gordon of NRG, Thomas Jacobsen of Element Markets, Thomas Lyons of Covanta Energy, Paul Michaud of Renewable Energy and Efficiency Business Association, Tom Swank of Noble Environmental Power, and Mike Trahan of Solar Connecticut.

The third roundtable focused on CT's RPS policies in the context of the New England region and was moderated by Frank Felder of Rutgers University. Panel participants included Dwayne Breger of the Massachusetts Department of Energy Resources, Kate Epsen of the New Hampshire Public Utilities Commission, Daniel Esty of the Connecticut Department of Environmental Protection, John Fonfara of the Connecticut General Assembly Energy and Technology Committee, Jeff Gaudiosi of CEAB, Heather Hunt of NECOE, Warren Leon of the

Clean Energy States Alliance, Vickie Nardello of the Connecticut General Assembly Energy and Technology Committee, Francis Pullaro of Renewable Energy New England, Joe Rosenthal of the Connecticut Office of Consumer Counsel, and Catherine Smith of the Connecticut Department of Economic and Community Development.

After each roundtable, audience members were encouraged to direct questions and comments to the panel. Participants were also encouraged to answer feedback questions in writing after the stakeholder meeting. These questions were:

1. What do you see as the primary RPS objectives Connecticut should focus on and commit to over the next 5 to 10 years? In addition, please rank these objectives in order of priority.

2. How should we define our approach to renewables policy to make it most attractive and rewarding to market participants?

3. Please describe your "ideal" energy policy for Connecticut. Would it be an RPS (as described in question 2 above)? Would it involve tiers or carve-outs? How would you take into account the regional RPS market? What would be the best financing mechanism for renewable projects?

Any summary of the oral remarks made at the stakeholder meeting and of submitted written comments risks being incomplete or inaccurate. (The written comments received by stakeholders have been compiled in Appendix A.) That being said, it is useful to attempt a high-level summary. The following is based on the CEEEP Team's assessment, informed by discussions with the CEAB, and include references to written stakeholder comments where applicable:

1. Importance of the economic impact of the CT RPS, particularly given Connecticut's, the region's, and the nation's economy, particularly high rates and out of state renewable projects. In particular, Connecticut Light and Power (CL&P) and Earth Markets both mentioned the importance of economic development as an objective of Connecticut's RPS.
2. Different views on the use of long-term contracts versus using RECs to finance renewable, although many developers want long-term financing (feed-in tariffs or contracts). Boralex mentioned feed-in tariffs as a key component of an ideal energy policy, while Renewable Energy New England and the Connecticut Office of Consumer Counsel each mentioned the importance of long-term contracts in making the RPS attractive to market participants. CL&P proposed long-term REC power purchase agreements.
3. Desire for policy stability by stakeholders, although frequently stakeholders are the ones asking for legislative changes to the CT RPS. The uncertainty to market participants created by frequent changes in policy was noted by CL&P.
4. No clear consensus on fundamental goals, their priorities, or how to pursue them. Some fundamental goals mentioned were consistent/transparent program (Boralex), minimizing ratepayer impact (Earth Markets), economic development (CL&P), and improved environmental quality (GE Financial Services).
5. Recognition of the importance of Connecticut understanding and perhaps integrating its RPS policies within New England; stakeholders had different views on the extent to

which this should be done, particularly in light of estimates of large transmission integration costs. CL&P noted that there will be a 1,200 MW transmission power line between New England and Quebec that will allow for a substantial increase in imports of clean hydro-electric power from Canada to New England.

6. Different views on appropriateness of the Class III price floor.
7. Importance of increasing energy efficiency investment, which is considered the most cost-effective means to meet RPS goals, but not at the expense of renewable energy investment. McNees, Wallace and Nurick, in particular, suggested that the Class III requirement be increased to promote a healthier supply/demand balance in the market.

V. Review of Connecticut, Regional, and National Renewable Portfolio Standard Documents

A. Introduction and Summary of Document Review

As part of the review of Connecticut's Renewable Portfolio Standard (RPS), a literature search was conducted of approximately thirty-six publicly available and credible studies focusing on Connecticut's or New England's renewable portfolio standards and other energy policies. This review is not meant to be a comprehensive one related to renewable portfolio standards but focuses on reports that pertain to Connecticut and the region. The summaries are divided into four sections: economic impacts, policy impacts, resource assessments and interactions with other policies. Table 19 shows the breakdown of studies by category and by focus. Given the nature of literature reviews, each of the following summaries draws heavily from the material found in the literature in an effort to preserve the intent of the language and to avoid confusion or misrepresentation.

Table 19: Summary of CT RPS Document Review

Category	Economic/ Resource Development	Environment/ Public Health	Energy Security	Energy Policy
Connecticut Specific with Quantitative Results	CEAB (2010) Grace (2010) CT IRP (2010) Navigant (2009) McMillen (2009) KEMA Inc. (2009) CEAB (2007) Antares Group Inc. (2004)	CT IRP (2010) CEAB (2010)	CEAB (2010)	KEMA Inc. (2009) McMillen (2009)
Connecticut Specific with only Qualitative Results				Electric Rate Relief (2010) LaCapra Associates (2010, 2009) CT ASE (2008)
Non-Connecticut Specific	Jenkins et al. (2011) Chen et al. (2010) Barbose et al. (2010) Howland et al. (2009) Hornby et al. (2009) Micheals (2008) NE ISO (2007) CEEEP (2004)	Chen et al. (2010) Hornby et al. (2009)	Gordes (2008) Greenberg et al. (2007) LaCommare (2004)	NJBPU (2011) Felder (2011) Kubert et al. (2011) NYSERDA (2010) Koplow (2010) Transue et al. (2009) Cory et al. (2009) NE Governors' Conference(2009) Micheals (2008) Hurlbut (2008) Cory et al. (2007) CEEEP (2005) Fitzgerald et al. (2003)

B. Recent Connecticut Studies

1. Connecticut's RPS Policy Report: A Common Starting Point [32] (2010)

"Connecticut's RPS Policy Report: A Common Starting Point" was a webinar presentation by Robert Grace of Sustainable Energy Advantage, LLC on April 4, 2011 on behalf of the Connecticut Energy Advisory Board. The webinar provides policymakers and stakeholders with background information on Connecticut's RPS, including the policy, context and experience to

[32] Grace, Robert, "Connecticut's RPS Policy Report: A Common Starting Point", 2011, available at http://www.ctenergy.org/pdf/RPS_WebinarP.pdf

date. The webinar has four main areas of focus including RPS Policy and Economics, Connecticut and New England RPS and Related Policies, Connecticut and New England RPS Experience to Date, and Connecticut and New England RPS Looking Forward.

The webinar also provides information on best practices in RPS design. The report concludes that clear objectives, attention to detail, sufficient analysis of supply and demand, and a balance of design elements were all key elements to designing a successful RPS programs.

2. Comprehensive Plan for the Procurement of Energy Resources [33] (2010)

The 2010 Comprehensive Plan for the Procurement of Energy Resources (Comprehensive Plan; CEAB 2010) was prepared by the CEAB and builds upon the Integrated Resource Plans developed in 2008, 2009 and 2010. The Comprehensive Plan includes a 20-year planning horizon in order to address such issues as climate change and energy independence and security, which require fundamental changes in the electric system. The Comprehensive Plan addresses four key objectives that are driving the need for action, including managing costs, maintaining reliable electric supply, improving environmental performance of the electric system, and enhancing energy independence and security. Managing costs is a key objective moving forward because electricity prices have been historically high in Connecticut.

Maintaining a reliable electric supply is also listed as a key objective because transmission and electricity infrastructure have been updated in the past few years, and the CEAB wishes to maintain this higher standard of deliverability. The desire to improve the environmental performance of the electric system is a reflection of Connecticut's long commitment to environmental stewardship. Enhancing energy independence and the security of electric supply will ensure the availability of electricity in the event of an emergency. In addition, several resource options are considered including demand-side resources, renewable energy, transmission, combined heat and power, nuclear power, repowering/natural gas fired generation, and emerging technologies.

The CEAB, when developing the Comprehensive Plan, relied on a market simulation planning tool, AURORA, to examine a number of resource options and to test several long-term portfolio additions and combinations. The Reference Case is market-driven and assumes that the current market structure remains in place over the next 20 years with no further State intervention. Other sensitivity cases varied the carbon allowance price outlook, unit retirements, natural gas prices, and resource contingencies. In addition portfolios involving energy efficiency, renewable energy build-out, efficient gas generation and longer-term resource prospects (CHP, nuclear) are considered.

With Connecticut's aggressive RPS requirement of 20% by 2020, the state will need approximately 4,000 MW of new renewable projects by 2020 and 6,000 MW by 2030. Connecticut's in-state renewable resource potential is very limited due to its relatively poor wind resource potential. It is estimated in the Comprehensive Plan that only 26% of the state's Class I requirement will be met with in-state resources in both 2020 and 2030. In the near term, renewable resources will be expensive for Connecticut to develop and deploy, thus a sound

[33] Connecticut Energy Advisory Board ,"Comprehensive Plan for the Procurement of Energy Resources", 2010.

strategy will be imperative. The CEAB identifies several challenges and concerns through the planning process including that renewable energy development is excessive in the current economic climate, the need for increased transmission investment to integrate renewable energy resources, the affordability of RPS projects for consumers, and the potential to lose investment opportunities in Connecticut due to the limited renewable energy generation opportunities in-state.

An important part of the Comprehensive Plan was the ability of stakeholders to provide information to the CEAB. A Renewable Energy Technical Paper was developed that incorporated the information that the CEAB received from both the EDCs and stakeholders during the planning process, and was an appendix to the Comprehensive Plan. The CEAB analyzes several sensitivity cases including one where the current RPS requirements were met entirely with in-state resources, one where energy efficiency was considered Class I, and one where the RPS requirement was decreased from 20% to 11.5% in 2020. The In-State Sensitivity Case resulted in price increases of 169% over the reference case. The CEAB noted that some benefits, such as in-state capital investments and reduced transmission costs, had not been quantified. The demand-side management (DSM) as a Class I Case resulted in price decreases of 92% and the Reduced RPS Case resulted in price decreases of 89%.

Additionally, the Technical Paper subsection of the Comprehensive Plan reviewed current literature on job creation for renewable energy development. The CEAB noted one study that estimated that 9% of jobs currently in Connecticut are green jobs, including 7,000 renewable energy sector jobs[34]. A second study noted that a national Renewable Energy Standard of 25% would create 274,000 jobs nationwide, with only 2,500 in Connecticut[35]. This is likely associated with the limited renewable resource potential in Connecticut.

In the end, the Comprehensive Plan recommended that a public stakeholder process to fully review the State's RPS and renewable energy policy be conducted to ensure that the policy is consistent with the current objectives of the State.

3. Integrated Resource Plan for Connecticut[36] (2010)

This annual report was prepared by the Brattle Group for the electric distribution companies (EDCs) in CT (i.e. CT Light and Power Company and United Illuminating Company) to submit to the Connecticut Energy Advisory Board. The IRP, which is prepared periodically on January 1st of each year, assesses the state's energy and capacity resources and develops a comprehensive plan for the procurement of energy resources to meet the projected requirements of Connecticut electricity customers in a manner that minimizes costs and maximizes environmental benefits over time.

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[34] Nardello, V., Esty, E., Genga, H., Johnson, S., Lesser, M., O'Rourke, J., Reed, L., "Green Jobs Panel Report and Executive Summary of Recommendations.", House Democrats of Connecticut, 2010.
[35] Navigant Consulting, "Job Impact of National Renewable Energy Standard: Report for RES Alliance for Jobs", 2010.
[36] Brattle Group Inc. "Integrated resource Plan for Connecticut", 2010.

The foundation for this IRP is comprised of (i) ten subject-area whitepapers (Section III of the report), and (ii) a detailed ten year analysis (Section II of the report), starting with a Base Case outlook. The report identifies seven key findings. They are:

1. Assuming the New England states are successful in building enough new renewable generation and associated transmission to meet RPS requirements, there should be no need for any additional generating resources for resource adequacy purposes over the next ten years under a wide range of demand uncertainty.

2. Based on a reasonable assumptions regarding supply and demand and transmission, Connecticut has sufficient generation installed or under contract to assure locational resource adequacy requirements for reliability over the next 10 years, even if significant uneconomic, high-emissions generating plants retire.

3. Due to the effects of RPS and climate legislation, power supply-related costs are expected to increase from 11¢/kWh today and in 2013 to nearly 14¢/kWh in 2020 (in 2010 dollars) under expected supply and demand and moderate fuel and emissions costs.

4. A targeted expansion of demand side management (DSM) programs beyond those currently planned can lead to significant reductions in emissions and costs. It is anticipated that the additional program costs would be more than offset by a reduction in generation service costs and rates.

5. For New England to meet each respective state's 2020 Class-I RPS requirements, New England needs to add about 4,800 MW of new renewable generation, primarily wind that will be located in areas distant from load centers. This would require investments of approximately $20 billion in new renewable generation and about $10 billion of investment in transmission resources to access this new renewable generation.

6. Assuming the Class 1 renewable generation build-out and continuation of the Connecticut DSM measures, New England's CO_2 emissions, NO_X emissions, and SO_2 emissions in 2020 will be substantially below 2007 actual levels.

7. New England electric energy prices are highly dependent on the price of natural gas. It is expected that the large supply of economically recoverable shale gas, which can be found as close to New England, may allow natural gas prices to remain moderate and may thereby help to moderate energy prices.

The following are the key recommendations of the report.

1. Given that the targeted DSM Expansion strategy would reduce customer costs and emissions while even reducing rates for non-participants, the report recommends that this strategy be funded by the State.

2. Connecticut policy makers need to engage with other New England states to develop a comprehensive regional renewable energy policy. The New England states should work to define the best and most cost-effective approaches to expand renewable energy development in region while meeting environmental goals.

3. United Illumination (UI) recommends, in light of the potential benefits of a nuclear strategy identified in the analysis, that the CEAB conduct, sponsor, or otherwise support a more detailed study of the potential costs and benefits of nuclear power, with the objective of providing a more complete picture of the tradeoffs encountered with nuclear power as a long-term resource strategy for Connecticut.

C. Economic Impacts

Several studies weigh the economic impacts of RPS policy at both the national and state levels. The studies examine various issues such as RPS best practices, rate impact, and job impact.

1. Energy Emergence: Rebound and Backfire as Emergent Phenomena[37] (2011)

Energy efficiency is widely viewed as an inexpensive way to reduce aggregate energy consumption and associated emissions. Many public policies are based on the mistaken assumption of a linear relationship between energy efficiency and reduction in energy consumption. Economists have long observed that promoting energy efficiency could potentially result in greater consumption of energy due to cheaper costs and greater availability. This is known in the energy economics literature as "rebound" effect or, when the rebound is greater than the initial energy savings, as "backfire". This report from Breakthrough Institute surveys the literature on energy efficiency "rebound" and "backfire", and its implication on climate change policy. The report concludes that "rebound" effect has the potential to erode much of the reductions in energy consumption expected to arise from below-cost energy improvements. This non-linear relationship between efficiency improvements and energy consumption calls for a new framework for envisioning the role of below-cost efficiency improvements in driving energy modernization and de-carbonization efforts. The major considerations for the new framework are:

- Below-cost efficiency measures are not the only option for greater energy efficiency. To avoid rebound effect, the final price of energy service should be allowed decrease moderately or kept constant.
- There are very good economic reasons to accelerate the adoption of below-cost energy efficiency improvements even though such measures may be unlikely to result in a significant reduction of long-term global energy demand or associated carbon emissions.
- Finally, there is the larger process of energy modernization and the ways in which economic growth, energy intensity, and the carbon intensity of energy supply are highly correlated and interconnected.

2. Tracking the Sun III: The Installed Cost of Photovoltaics in the U.S. from 1998 - 2009[38] (2010)

This report is the third in a series analyzing the installation costs and trends of solar photovoltaic (PV) system installation in the country. The analysis is based on installed cost data for

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[37] Jenkins, J., Nordhaus. T. and M. Shellenberger. "Energy Emergence: Rebound and Backfire as Emergent Phenomena", Breakthrough Institute, 2011.
[38] Barbose, Galen ; Darghouth, Naim, and Ryan Wiser, "Tracking the Sun III: The Installed Cost of Photovoltaics in the U.S. from 1998-2009". Lawrence Berkley National Laboratory, 2010.

approximately 78,000 residential and non-residential PV systems, totaling 874 MW and representing over 70% of all grid-connected capacity in United States till 2009. Some of the key findings of the report are that the pre-incentive installation cost of PV is around $7.5 per watt, both module and non-module costs have declined significantly over time, and PV installed costs exhibit significant economies of scale, with project size of over 1 MW costing less than $7 per watt. International experience suggests that greater near-term cost reductions may be possible with increased market scale in the U.S. The average net-installed cost for the customers after taxes stood at $4.1/ W for residential PV and $4.0/W for commercial PV. The study determined that REC revenue adds to the overall incentives but the impact varies widely. The revenue potential from the sale of RECs depends on where the system is located and what type of RECs is available. In voluntary REC markets, prices averaged $1.4/ MWh which is equivalent to $0.02/ W_{DC} on a pre-tax basis. In traditional REC markets, revenues averaged at $0.4 / W_{DC} if extrapolated over a 20 year period. Solar REC prices in New Jersey averaged the highest in the country at $542 in 2009, equivalent to $6.4 /$W_{DC}$, if extrapolated on a 15-year period.

3. Energy Efficiency: Engine of Economic Growth [39] (2009)

This study quantifies the macro-economic impact of increased energy efficiency investments in New England. Energy efficiency is emerging as a key policy solution to address high energy costs and mitigate the threat of climate change. The study utilizes a multi-state policy forecasting model by regional Economic Models Inc. (REMI) to project macroeconomic impacts of expanded energy efficiency programs. The study analyzes efficiency programs for electricity, natural gas, and “unregulated fuels,” (fuel oil, propane, and kerosene), using a conservative estimates of investment levels needed to capture the potential cost-effective efficiency. In order to investigate the complementary nature of efficiency programs across jurisdictions, two scenarios were modeled for each fuel: first where each state acts alone (the “individual” scenario); and second where all New England states implement at once (the “simultaneous” scenario). In all cases simultaneous action resulted in greater economic benefits to the region.

Benefits from increased efficiency investments in New England are significant for each fuel type. Increasing efficiency program investments in all six states to levels needed to capture all cost-effective electric efficiency over 15 years ($16.8 billion invested by program administrators) would increase economic activity by $162 billion (2008 dollars), as consumers spend energy bill savings in the wider economy. Sixty-one percent of increased economic activity ($99 billion) would contribute to gross state products (GSPs) in the region, with $73 billion returned to workers through increased real household income and employment equivalent to 767,000 job years (one full-time job for a period of one year). Over 15 years, increased natural gas efficiency ($4.1 billion invested by program administrators) would increase regional economic activity by $51 billion, boost GSPs by $31 billion, and increase real household income by $22 billion while creating 208,000 new job years of employment. Unregulated fuels efficiency programs ($6.3 billion invested by program administrators) would increase regional economic activity over 15 years by $86 billion, boosting GSPs by $53 billion, and increasing real household income by $37 billion while creating 417,000 job years of new employment.

[39] Howland J., Murrow D., Petraglia L. and T. Comings. “Energy Efficiency: Engine of Economic Growth”. Economic Development Research Group, 2009.

Table 20: Summary of New England Economic Impacts

	Electricity	Natural Gas	Unregulated Fuel
Total Efficiency Program Costs ($ Billions)	16.8	4.1	6.3
Increase in GSP ($ Billions)	99.4	30.6	53.1
Maximum annual GSP Increase ($ Billions)	5.6	1.8	2.9
Percent of GSP increase resulting from Efficiency spending	12%	11%	9%
Percent of GSP increase resulting from energy savings	88%	89%	91%
Dollars of GSP increase per $1 of program spending	5.9	7.4	8.5
Increase in Employment (in job-years)	767,011	207,924	417,061
Maximum annual employment increase (jobs)	43,193	12,907	24,036
Percent of GSP increase resulting from efficiency spending	16%	15%	12%
Percent of GSP increase resulting from energy savings	84%	85%	88%
Job-years per $ million of Program spending	46	50	66

This study illustrates that the economic benefits of efficiency programs supplement and exceed the impacts of spending on implementing efficiency measures, and that efficiency investments quickly pay for themselves through increased economic activity and job creation. The total energy savings and reduced greenhouse gas emissions associated with the modeled levels of efficiency investments are also very significant.

4. Connecticut Renewable and Energy Efficiency Economy Baseline Study[40] (2009)

This report includes a baseline assessment of renewable energy (RE) and energy efficiency (EE) companies, jobs, revenue and employment income in Connecticut (CT). This report identifies the number of RE/EE companies in Connecticut, the number and types of RE/EE jobs, revenue and employment income generated by this sector. The baseline assessment considers direct, indirect, and induced jobs in CT's RE/EE economy. Overall, this analysis estimates CT has 4,544 direct jobs in the RE/EE sector, which is about 0.27% of the overall CT workforce of 1.7 million. The report also identifies 7,220 indirect and induced jobs in RE/EE sector (assuming an economic multiplier factor of 1.6). Unlike the DECD s "top-down" approach, this study calculates the job potential based on primary research like interview, cross-verification, consultations with industry experts etc. Some of the key findings of the report are: EE/RE industry has a significant growth potential for the CT economy; the top ten employers accounted for nearly half of the direct jobs and revenues; the dominant RE areas fuel cells and solar power; with the exception of fuel cells the CT RE/EE economy is primarily service based with little manufacturing activity, and a $1 million subsidy in RE/EE sector creates roughly around 11-39 direct job-years. Product/ manufacturing jobs dominates in RE (82% of total RE jobs) while most jobs in EE are expected to be from service companies (80% of total EE jobs).

5. Economic Impact of the Renewable Energy/ Energy Efficiency Industry on Connecticut Economy[41] (2009)

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[40] Navigant Consulting. "Connecticut Renewable and Energy Efficiency economy Baseline Study", 2009.

The Connecticut Clean Energy Fund (CCEF) contacted the Department of Economic and Community Development (DECD) to perform an economic and fiscal impact analysis of the renewable energy and energy efficiency (RE/EE) industry group on the State's economy. The study uses a REMI model of the state economy. DECD's analysis identifies nearly 53 industries in which firms operate in the renewable energy/ energy efficiency (RE/EE) field. The study also calculates the employment levels in 2007 for these 53 industries.

The following table shows the direct, indirect, induced and total employment changes from a baseline forecast of the Connecticut economy as a result of the presence and ongoing operations of the RE/EE industry in Connecticut.

	Low Job Estimate	**High Job Estimate**	**Low Estimate Fraction of State**	**High Estimate Fraction of State**
Direct Employment	3,661	5,830	0.23%	0.36%
Plus Indirect & Induced Employment	6,002	8,937	0.38%	0.56%
Total Employment	9,663	14,767	0.60%	0.92%
State GDP (billions- fixed 2007 $)	$2,524	$3,722	1.17%	1.72%
Personal Income (billions-fixed 2007 $)	$901	$1,363	0.47%	0.71%
Net State Revenue (billions-fixed 2007 $)	$81	$123	NA	NA

For the two RE/EE employment estimates, these results indicate that Connecticut's RE/EE industry contributes between 1.17% and 1.72% of Connecticut's GDP, between 0.6% and 0.92% of the state's nonfarm employment, and between 0.47% and 0.71% of the state's personal income on average each year. This analysis however not take into account energy savings costs that could result in increased consumption in other sectors and also the non-financial benefits like reduced environmental emissions.

6. A National Renewable Portfolio Standard: Practically Correct, Economically Suspect[42] (2008)

The paper calls into question the economic efficiency claims of a proposed nationwide Renewable Portfolio Standards. Predictions that a nationwide RPS would be a "free lunch" for the economy because low natural gas prices will cancel rising electricity prices is based on an incorrect analysis of gas markets. As an environmental policy, it violates the economic principles of efficient emissions control. Also, the employment benefit claims of renewables are questionable. Some of the disadvantages of RPS standards are:

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[41] McMillen, S. "Economic Impact of the Renewable Energy/ Energy Efficiency Industry on Connecticut Economy" Department of Economic and Community Development, 2009.
[42] Micheals, R.J., "A national Renewable Portfolio Standard: Practically Correct, Economically Suspect.", The Electricity Journal 21-3, 9-28, 2008.

- An RPS is a design standard that restricts the allowable set of technologies even if there are cheaper alternatives (e.g., demand management may be a cheaper alternative but may not be recognized as a qualifying technology to meet the RPS).
- Energy independence and national security claims are, at best, related tenuously to renewables. Geo-political security concerns center on oil, but only 2 percent of power generation comes from oil-fired units (the percentage of oil-fired generation in Connecticut is 1%[43] .
- Diversification of generation sources would result in reliability issues and additional transmission investments. For example, losing a radial line to an isolated wind source would render the power generated there with no other transmission path to loads, which necessitates costly reliability arrangements.
- Since poorer households spend a higher percentage of income on energy, an RPS that raises electricity prices is similar to a regressive tax.
- States that have passed RPS have higher incomes, on average. A national RPS advances the interest of high-income states by raising electricity costs in others.
- Most RPS programs generate few in-state jobs. The capital spent on RPS in the form of higher tariff prices and project expenditure is unavailable for people and businesses to spend elsewhere.

7. Weighing the Costs and Benefits of State Renewables Portfolio Standards: A Comparative Analysis of State-Level Policy Impact Projections[44] (2007)

This report was prepared by the Lawrence Berkeley National Laboratory for the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability and the Office of Energy Efficiency and Renewable Energy

The report compares the various types of renewable portfolio standards employed by 18 different states by reviewing the results and methodologies of nearly 30 cost impact analyses that examined the RPS and emissions policies. Connecticut's RPS was not assessed because there were no cost impact reports to be reviewed. The report summarizes the key findings of the various RPS programs, examines the sensitivity of projected costs to model assumptions, assesses the attributes of different modeling approaches, and suggests possible areas of improvement for future state RPS analysis.

The report found that the projected rate impacts in the various studies are generally modest (less than 1% increase in electricity rates) and that wind generation is anticipated to be the dominant renewable energy used to meet RPS standards. The report also found that cost projections are particularly sensitive to input variables such as the availability of federal production tax credits, varying projections of renewable technology cost, and fossil fuel price uncertainty. It also found that the impact on public benefits, such as job creation or risk mitigation, was quite variable and that the assumptions employed in the analysis are as likely to affect the outcomes as the choice

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[43] U.S. Energy Information Administration, 2009 Connecticut Electricity Profile. Accessed at http://www.eia.gov/cneaf/electricity/st_profiles/connecticut.html

[44] Chen, C., Wiser, R., Bolinger, M., "Weighing the Costs and Benefits of State Renewables Portfolio Standards: A Comparative Analysis of State-Level Policy Impact Projections", Lawrence Berkeley National Laboratory, 2007.

of projection model. According to the report, renewable energy costs as well as avoided fuel costs tended to be overestimated in the studies assessed.

The report made many recommendations intended to improve future RPS studies. These include improved treatment of transmission costs, integration costs, capacity values, and public benefits. The report also recommends more rigorous estimates of the future performance and costs of renewable technologies as well as natural gas and coal. The report suggests more attention be paid to policy characteristics, such as future carbon regulations and competing state RPS requirements. Multiple future scenarios should be assessed to improve projection accuracy. The report also lists some assumptions that could under- or overestimate actual RPS costs, including low wind capital cost assumptions, the disregard of potential demand for renewable energy sources from other states, and the potential for future carbon emissions regulations.

The report finds generally that cost reporting is not standardized, which made comparing figures across the studies difficult and limits states' ability to understand the economic and environmental costs and benefits other states face when an RPS is adopted.

8. Short and intermediate economic impacts of a terrorist-initiated loss of electric power: Case Study of New Jersey[45] (2007)

This paper analyses the economic impacts of a terrorist initiated attack on the New Jersey electric power grid. The impacts are analyzed using a regional econometric model. The magnitude and duration of the effects vary by type of business and income measure. The paper assumes damage is done during in the summer 2005 quarter, a peak period for energy use. The state economy recovers within a year, if the economic activity is restored by the next time period. However, if the attacks prompt an absolute of loss of economic activity due to firm relocation, closing, and geographical changes in business expansion plans, then the economy does not fully recover by the year 2010. Hence, the electrical power system's resiliency to damage is the key to the extent and duration of any economic consequences of a terrorist attack, at least in New Jersey. The major policy implication of the study is that the costs and benefits of making the electric power system more resilient to plausible attacks should be weighed and that the restorative capacity of the system should be strengthened.

9. Economic Impact Analysis of a 20% New Jersey Renewable Portfolio Standard[46] (2004)

The New Jersey Board of Public Utilities (BPU) engaged Rutgers University's CEEEP to conduct an economic impact analysis of increasing New Jersey's RPS requirement to 20 percent in 2020. This report discusses, and where possible, quantifies the incremental costs and benefits of the proposed 20 percent RPS in New Jersey. Increasing the RPS targets increases the cost of electricity. This, in turn, reduces the growth of the state's economy. However, reducing emissions from fossil fuel generation would lessen harmful emissions and provide a benefit by avoiding the associated costs due to those emissions. Increasing the RPS would also attract jobs in the renewable sector of the economy. The report highlights that there is a large degree of

[45] Greenberg, M.; Mantell, N.; Lahr, M.; Felder, F. and R. Zimmerman, "Short and intermediate economic impacts of a terrorist-initiated loss of electric power: Case Study of New Jersey" Energy Policy 35,722–733, 2007.
[46] CEEEP, "Economic Impact Analysis of a 20% New Jersey Renewable Portfolio Standard", Rutgers University, 2004.

uncertainty in quantifying the benefits of RPS. Finally, the proposed 20 percent RPS would improve reliability by providing electricity from solar generators when the grid power is not available, and may reduce expenditures on transmission and distribution (T&D) within the state. The report relies on the expected cost reduction in solar and wind generation due to improved economies of scale and technology.

For New Jersey, the report concludes that the 20 percent RPS would raise retail electricity prices by 3.7 percent in 2020 and have no measurable impact on the growth of the state economy. Were natural gas prices to remain high, the RPS would actually bring down electricity prices. The RPS would also bring down the price of natural gas by reducing its consumption for electricity generation. Also, if New Jersey were to develop the offshore wind capability as outlined in the RPS, the state would stand to gain nearly 11,700 jobs between 2008 and 2020.

10. Understanding the Cost of Power Interruptions to U.S. Electricity Consumers[47] (2004)

This report was prepared in the aftermath of the massive electricity blackout of 2003. The report develops a comprehensive framework for assessing the cost of power interruptions and power-quality events to U.S. consumers. The framework factors in the cost as a function: number of customers by class, region etc.; duration and frequency of reliability events annually; cost of reliability event, by type, customer class and region; and vulnerability of customer to reliability events. The study estimates the baseline annual cost of power interruptions to be at least $80 billion. Out of this, commercial sector bears nearly $57 billion (or 72%) of the cost, the industrial sector bears $20 billion (or 26%) of the cost and the residential sector bears $2 billion (or 2%) of the costs. This estimate does not include power-quality events.

The majority of the costs are borne by the commercial and industrial sectors. The total cost of reliability events by region tend to correlate roughly with the number of commercial and industrial customers in each region. The costs tend to be driven by the frequency rather than the duration of reliability events. The cost of momentary interruptions (lasting less than five minutes) accounts for nearly 67% of the annual cost. The study also estimates the costs for important sensitivity cases involving different regions and timing of power interruption. For these sensitivity cases, the cost of power interruption could range from as low as $22 billion to $135 billion a year. The study calls for a coordinated nationwide collection and update of information on the cost of reliability events to customers. Also, there is a need to adopt a consistent definition and tracking of the frequency, duration, timing, and number and type of customers affected by reliability events, including power-quality events.

11. **New England Wind Integration Study[48] (2010)**

The report was prepared for ISO New England by GE Energy Applications, EnerNex Corporation and AWS Truepower. Anticipating the possible penetration of large-scale wind power in New England, ISO-NE also commissioned this comprehensive wind integration study in 2009 – the New England Wind Integration Study (the NEWIS) – to assess the operational

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[47] LaCommare K.H. and J.H.Eto. " Understanding the Cost of Power Interruptions to U.S. Electricity Consumers", Lawrence Berkley National Laboratory, 2004.

[48] New England Wind Integration Study (2010). ISO New England

effects of large-scale wind penetration in New England using statistical and simulation analysis of historical data. The report identifies the following as the key drivers of wind power: rapid construction time, environmental standards like RPS and stricter emissions control. Also the economics of wind power in New England is directly affected by the outlook for the price of natural gas. Large-scale wind integration adds complexity to power system operations by introducing a potentially large quantity of variable-output resources and the new challenge of forecasting wind power in addition to load. To facilitate the work of the NEWIS, it is broken into five tasks: Wind integration study survey, technical requirements for interconnection, mesoscale wind forecasting and wind plant models, scenario development and analysis and scenario simulation and analysis.

D. Policy Impacts

Several reports examining the policy implications of RPS in Connecticut have been written for and by the Connecticut General Assembly. Other studies focus on New England and the nation. For instance, studies note that energy efficiency is often the most cost-effective way to reduce ratepayer expenditures and negative environmental externalities in Connecticut.[49] Savings due to energy efficiency are more difficult to measure and verify than from electricity produced from solar or wind generation, although Connecticut has policies and procedures in place to measure and verify energy savings.

Additionally, there is an economic response to energy efficiency, known as "Jevons paradox" or, more simply, the "rebound" or "snapback" effect.[50] Energy efficiency lowers the cost of consuming energy and the price of energy itself, thereby resulting in the consumption of additional energy due to the lower cost.

1. State Support for Clean Energy Deployment: Lessons Learned for Potential Future Policy[51] (2011)

This paper was prepared by the Clean Energy States Alliance (CESA) for NREL to explore past state and utility experience with Energy Efficiency (EE) and Renewable Energy (RE) incentives and financing mechanisms and complementary policies to identify key lessons learned that could inform funding streams for the deployment of EE and distributed RE. The paper explored the lessons learned from the state and utility experiences in managing EE and RE programs. These lessons include the need for consistent, long-term government support; engagement of diverse stakeholders to increase accountability; an adequate, sustained, and protected funding source; tailoring the program to market needs and program goals; and coupling direct incentives with support services, such as consumer education, technical support, and adequate marketing.

The paper covered nine current and emerging financing tools: rebates, performance-based incentives, feed-in tariffs, custom incentives/grants, loans, on-bill financing, property assessed

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[49] Chupka, M., Faruqui, A., Murphy, D., Newell, S., Wharton, J., "Integrated Resource Plan for Connecticut", The Brattle Group, 2008. p. 27.
[50] Jenkins, J., Nordhaus, T. and Schellenberger M., "Energy Emergence: Rebound and Backfire as Emergent Phenomena", Breakthrough Institute, 2011.
[51] Kubert, C. and M. Sinclair, "State Support for Clean Energy Deployment: Lessons Learned for Potential Future Policy" National Renewable Energy Laboratory, April 2011.

clean energy loans, leasing programs, and credit enhancement tools. Table 21 discusses the various financing tools and their strengths and weaknesses.

Table 21: Current and Emerging Financing Tools

Financing Tool	Description	Strengths	Weaknesses
Rebates	Primary form of support for EE/RE investment	Simple, stimulate demand	May be economically inefficient (free-ridership)
Performance-based Incentives	Paid on a per kWh basis for a set number of years	Greatest incentives go to most productive projects	Lack of up-front project support, ongoing financial burden for program
Feed-in Tariffs	Utilities purchase electricity at long-term, fixed rated approved by regulators	Rewards production, lowers project risk, customizable, low overhead	Needs up-front legislative authority and ongoing regulatory review, price difficult to establish, lack of up-front project support
RE Grants	Generally use RFP process and require comprehensive applications	Flexible	Requires up-front financial and administrative resources, may carry risks
Direct Loans	Stand alone loan funds, generally revolve	"Sustainable" use of funds	Compete against commercial lenders, risk of default
Interest rate buy-down	Program subsidizes interest rate of private lender	No default risk, no loan administration	Large lump sum payments required
Property Assessed Clean Energy Loans	Special taxing district created to finance EE/RE through property tax bills	Up front financing, tax-deductible, stays with property	Mortgage defaults, burden on new property owners to pay for project
Leasing	Outside financing company owns projects and host makes monthly payments	No upfront capital cost, public funds not needed	Lease payments make exceed energy savings, difficult to sell property with obligation

2. New Jersey's Renewable Portfolio Standard Rules – 2010 Annual Report[52] (2011)

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[52] New Jersey Board of Public Utilities (BPU), "New Jersey's renewable Portfolio Standard Rules – 2010 Annual Report", 2011.

The annual report, prepared by the New Jersey Board of Public Utilities (BPU), summarizes the results of compliance with New Jersey's Renewable Portfolio Standard (RPS) by regulated electricity suppliers and renewable energy developers. The Office of Clean Energy in the BPU oversees the implementation of the state's RPS rules. Retail sale of electricity in the New Jersey wholesale market was the lowest since compliance year 2005. This could be attributed to mild weather and economic recession. For the reporting year 2010, the Class I and Class II renewable energy requirement was met entirely by RECs, with little or no use of Alternative Compliance Payments (ACPs). In contrast to Class I and II RECs, the solar RECs were in short supply. Only about 72% of the solar requirement was met by retired SREC units. The rest of the obligation was met through Solar Alternative Compliance Payment (SACP). The NJ BPU also approved a rule amendment which proposes a process for returning these SACP payments to ratepayers. The market for solar in New Jersey remains strong despite the nation's subdued post-recession recovery. The high SRECs prices and attractive financing options for solar continues to attract diverse participants to New Jersey's solar market.

3. Electric Rate Relief Panel Report[53] (2010)

An Energy Policy Workgroup drafted a set of recommendations for then-Governor-elect Dan Malloy to provide a blueprint for developing his administration's energy policies. These were put forward by a broad-based group of Connecticut energy stakeholders. The following are the key energy policy recommendations:

a. Reduction of Rates and Electricity Costs

Proposed near-term action**:** Better utilization of competitive energy markets by state and local agencies, an examination of Class III energy certificates utilization, and optimization of load data to allow better price determination by the competitive markets.

Proposed long-term action**:** With more than 2,000MW of Connecticut generation resource slated to retire soon, the problem of aging generation infrastructure must be addressed. The transmission infrastructure also needs to be improved to meet the future requirements of ISO-NE.

b. Development of Additional Renewable Energy Resources

Proposed near-term action**:** Although an increasing number of renewable energy projects are being approved, the actual MW commissioned is still not sufficient. The Governor's office is expected to work with the General Assembly to pass legislation authorizing the DPUC to conduct a series of annual renewable energy RFPs over the next five years. Additionally, there will be a need to assess the fiscal impact of such legislation.

Proposed long-term action**:** Address issues related to energy projects siting. Projects that are beneficial to the state must be accorded an expedited permitting process. Some stakeholders have also called for additional incentives for Energy Improvement Districts (EIDs).

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[53] Governor Malloy Transition Team: Energy Policy Workgroup,"Energy Working Group Policy Statement", 2010.

c. Development of Comprehensive Energy Policy

There is a need to establish a dedicated agency/office for energy planning and policy. This needs to be an integrated unit with expertise in renewable and energy efficiency technology research and development, policy implementation, finance and investment, RFP management, grant acquisition, education, and outreach.

4. New York State Renewable Portfolio Standard Performance Report[54] (2010)

This Performance Report summarizes the activities conducted by the New York State Energy Research and Development Authority (NYSERDA) and the Department of Public Service (DPS) in implementing New York's Renewable Portfolio Standard. The RPS was adopted by the New York State Public Service Commission in September 2004, with a goal of 25 percent of renewable energy used by New York consumers by the end of 2013. The RPS goal was expanded in 2010 to be 30 percent by 2015. NYSERDA was designated as the central procurement administrator for the RPS program. NYSERDA does not procure renewable energy directly, but pays a production incentive to renewable electricity generators selected through competitive solicitations for the electricity they deliver for end use in New York. In exchange for the production incentives, NYSERDA receives all rights and/or claims to the RPS Attributes, which are similar to RECs. By acquiring these attributes, the RPS program ensures that increasing amounts of renewable electricity will be injected into the state's power system, while minimizing interference with the state's competitive wholesale power markets.

The New York Public Service Commission established two tiers of resource types under the RPS program. The Main Tier consists of medium- to large-scale electric generation facilities. The Customer-Sited Tier includes smaller, behind-the-meter resources that produce electricity for use on site. In addition, the Commission designated that at least 1 percent of the 25 percent would be contributed by voluntary renewable purchases by retail customers. This has been accomplished by capping Main Tier bids at 95 percent to guarantee that 5 percent is available for voluntary sales. In addition, contractors have flexibility to suspend deliveries to NYSERDA in order to make sales to the New York voluntary green market. The Commission also created a Maintenance Resource program to ensure the continuing availability of renewable energy that existed before the adoption of the RPS in 2004. To be eligible for this program, a baseline resource is required to demonstrate financial hardship. Two biomass resources have been approved for this program, retaining approximately 39 MW of in-state capacity.

At present, in the Main Tier, New York has 1,300 MW of wind, 37 MW of hydroelectric, and 130 MW of biomass. In the Customer-Sited Tier, New York has 22 MW of solar photovoltaics, 0.43 MW of fuel cells, 8 MW of anaerobic digestors, and 0.63 MW of small wind. To date, New York has procured 4,366 GWh of renewable energy under the RPS program. This represents progress of about 42 percent towards the 2015 RPS target of 10,398 GWh. The shortfall is a result of financing and construction delays, in addition to shortfalls in long-term energy production of projects. To mitigate the effect these setbacks have on attaining the RPS program's

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[54] NYSERDA, "New York State Renewable Portfolio Standard Performance Report: Program Period Ending April 2010", September 2010.

goal, the Commission built in certain program and contract language that allows NYSERDA to decrease the number of attributes it purchases from a project if certain energy production goals are not met for a predetermined amount of time. This allows money to be freed up for new projects if existing projects are not delivering the energy expected.

5. EIA Energy Subsidy Estimates: A Review of Assumptions and Omissions[55] (2010)

This review was conducted by Earth Track, Inc. and detailed the limitations of the Energy Information Administration's (EIA) report[56] on federal subsidies to the nation's energy sector. Studies reviewed for this report indicate that subsidies for all fuels are in the range of $43.3 billion to $75 billion, while the EIA estimated $16.6 billion. Subsidies for nuclear power are in the range of $2.2 billion to $3.5 billion, while EIA estimated $1.3 billion. Subsidies for fossil fuels are in the range of $32.2 billion to $270.4 billion, while EIA estimated $2.1 billion. Subsidies for liquid biofuels are in the range of $6.6 billion to $9.0 billion, while EIA estimated $3.2 billion.

In its findings, EIA asserted that total renewable energy subsidies in 2007 were $4.9 billion, which was nearly 30 percent of total energy subsidies provided by the federal government and the highest "beneficiary" of subsidies of any fuel. The Earth Track study indicates that the federal subsidies for fossil fuels were vastly underestimated by EIA, as were nuclear and liquid biofuels, calling into question EIA's assertion that natural gas, coal, and petroleum subsidies have been declining since 1999.

6. Energy Efficiency and Conservation Programs in Connecticut[57] (2009)

This report was undertaken by the Legislative Program Review and Investigations Committee to assess the progress Connecticut had made toward achieving two of the goals of the State's energy policy: "assist citizens and businesses in implementing measures to reduce energy consumption and costs" and "ensure that low income households can meet essential energy needs." The report's general conclusion is that it is difficult to measure Connecticut's progress in reducing energy consumption because there is no goal specific baseline from which to reduce energy consumption. In discussing Connecticut's Renewable Portfolio Standard, the report notes that measuring how well electricity generators and suppliers are achieving RPS goals is also problematic because of a nearly two-year lag in compliance reporting. The report also notes that the inclusion of energy efficiency as a Class III resource will allow it to be measured and tracked for RPS compliance. The Program Review Committee adopted the recommendation that Connecticut establish a 10 percent reduction in per capita energy consumption off the 2006 baseline by 2015.

7. Various Energy Issues Study Report: Phase II[58] (2009)

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[55] Koplow, D. "EIA Energy Subsidy Estimates: A Review of Assumptions and Omissions", Earth Track, Inc., March 2010

[56] EIA, "Federal Financial Interventions and Subsidies in Energy Markets", April 2008.

[57] Legislative Program Review & Investigations Committee, "Energy Efficiency and Conservation Programs in Connecticut", January 2009.

[58] La Capra, Various Issues Study Report: Phase II. Connecticut Energy Advisory Board, 2009.

This report was produced by the Connecticut Energy Advisory Board (CEAB) to inform the Connecticut General Assembly of ways to improve coordination and integration of the state's energy entities and about approaches to reach associated environmental objectives. The report recommends that Connecticut's future needs will be best served by projecting not only the state's future electricity use and cost, but also heating and transportation fuel costs and use. It also recommended that the CEAB review all state entities for opportunities to pursue beneficial energy, environmental, and economic outcomes. Finally, it recommended that the Integrated Resource process remain unchanged for a time so as to assess its efficacy before making any proposed changes to its format.

Connecticut's major energy problems include high and variable energy prices and the limited availability of viable renewable energy resources. The report also summarizes the roles of the legislative and executive branches and opportunities for inter-agency coordination, such as the sharing of information.

The report also assesses how Connecticut differs from similar states with RPS policies. New York has its own ISO, California has a relatively streamlined energy assessment energy entity structure, and whereas Massachusetts is a member of groups in which Connecticut also participates, the two states differ, for example, with respect to who acts as the consumer advocate and the presence or lack of a dedicated energy board. The report authors note that states, particularly those that have restructured in the past, are showing increased interest in the procurement of renewable energy based on the perception that market-based procurement is not providing an adequate mix of resources.

The report outlines the complicated nature of Connecticut's procurement plan process and contrasts it with states that have only four entities involved in the process of resource procurement, demonstrating that the process can be far less time and money consuming than it is currently. The report also contrasts Connecticut with New York, Massachusetts, and California in regards to their RPS's siting and permitting and financing and incentives policies. The report assesses the Regional Greenhouse Gas Initiative's impact on electricity policies among the states and on the indigenous alternatives fuels available in each.

8. Comparison of Energy Efficiency Incentive Programs: Rebates and White Certificates[59] (2009)

This paper was prepared by Rutgers University's CEEEP to compare two incentive-based approaches to energy efficiency portfolio standards (EEPS) in New Jersey: rebates and white certificates. EEPS are analogs of RPS that stipulate how much energy efficiency portfolio potential must be installed. Rebate programs involve refunds or discount payments to consumers of qualifying EE products. In contrast, white certificates are the energy efficiency analog of RECs; they are generated through energy efficiency measures and accrue to entities owning the measure. Quantitative modeling suggests that white certificate approaches that depend on market-clearing prices generate much larger upfront incentive outlays than rebate programs. They do not, however, increase the societal burden. Both programs overcome high upfront

[59] Transue, M., Felder, F., "Comparison of Energy Efficiency Incentive Programs: Rebates and White Certificates", Journal of Utilities Policy, 2009.

efficiency measure costs and both recoup the expenses over the long run. Administrative costs and participation rates can affect this dynamic, though, and require additional research to determine which approaches are most cost effective for various energy efficiency measures.

9. New England Governor's Renewable Energy Blueprint[60] (2009)

This report was prepared by a conference of the New England Governors in 2009. The report highlights the renewable energy potential of the New England region. The region has over 10,000MW of combined on-shore and off-shore wind potential. The report calls for the regional grid operator ISO-NE to conduct an economic study (referred to as the Renewable Scenario Development Analysis (RSDA)) on the various renewable energy development scenarios and associated transmission investment planning. Harnessing the wind energy potential of the region is expected to exert a downward pressure on the marginal prices for electricity. The addition of these renewable sources is expected to facilitate the retirement of coal and oil-fired generation in the region. The report cites the opportunities that exist to synchronize the States' power procurement and contracts. Through these measures, the conference hopes to facilitate development of the low-carbon resources at minimum ratepayer impact. The report also calls for greater coordination in the siting process to address the reliability needs of the region. The region has over $5 billion worth new transmission projects under review. There is a lot of potential for cost-savings if states could co-ordinate the siting review process. Also, the report highlights the importance of a state-federal partnership in financing and achieving the region's energy objectives.

10. Feed-in Tariff Policy: Design, Implementation, and RPS Policy Interactions[61] (2009)

This paper explores the design and operation of feed-in tariff (FIT) policies and touches on the potential interactions between FIT policies and RPS policies at the state level.

A FIT is an energy-supply policy focused on supporting the development of new renewable power generation. In the United States, FIT policies may require utilities to purchase either electricity, or both electricity and the renewable energy (RE) attributes from eligible renewable energy generators. The FIT contract provides a guarantee of payments in dollars per kilowatt hour ($/kWh) for the full output of the system for a guaranteed period of time (typically 15-20 years). There are two main methods for setting the overall return that RE developers receive through FIT policies. The first, considered to be the most effective, is to base the FIT payments on the levelized cost of RE generation; the second is to base the FIT payments on the value of that generation to the utility and/or society. In the first approach, the payment level is based on the levelized cost of RE generation, plus a stipulated return (set by the policy makers, regulators, or program administrators). The advantage of this approach is that the FIT payments can be specifically designed to ensure that project investors obtain a reasonable rate of return, while creating conditions more conducive to market growth.

While an RPS prescribes how much customer demand must be met with renewables, properly structured FIT policies attempt to support new supply development by providing investor

[60] New England Governors' Renewable energy Blueprint, 2009.
[61] Cory, K., T. Couture, and C. Kreycik, "Feed-in Tariff Policy: Design, Implementation, and RPS Policy Interactions", National Renewable Energy Laboratory, March 2009.

certainty and are focused on setting the right price to drive RE deployment. Experience in Europe is beginning to demonstrate that due to the stable investment environment created under well-designed FIT policies, renewable energy development and financing can happen more quickly and often more cost-effectively than under competitive solicitations. One of the most important elements of FIT design is the guarantee of reliable revenue streams. This has helped catalyze renewable energy development in countries such as Germany, where both small and large developers can invest for a profit in renewable energy technology.

The paper describes several challenges to new renewable project financing that may be addressed using FIT policies. First, FIT policies provide long-term support that project investors require and can ensure that enough supply comes online. Second, the guaranteed contract terms make FIT's a cost-effective mechanism for renewable energy procurement. Third, they ensure that the best portfolio of projects move forward by establishing eligibility criteria and payment levels available to all investors. Fourth, they focus on estimates of actual project costs rather than "least-cost" projects that may not secure funding. Fifth, they include a risk premium and long-term assurance for emerging technologies. Finally, they are backed by ratepayers and are not subject to retroactive regulatory prudency review.

Finally, the paper describes the challenges of FIT policies. The first is the up-front administrative requirement; detailed analysis is required to set the payment level properly at the outset. Second, in contrast to other financial incentives for renewable resources, FITs do not decrease a developer's up-front costs. Third, costlier emerging technologies may drive up the total cost of the program. Finally, frequent updates to the FIT program structure can lead to policy uncertainty.

Overall, a FIT policy can be developed to work in concert with an RPS policy. A properly structured FIT policy attempts to provide investor certainty to help support development of new supply. FIT policies generally provide preapproved guarantees of payments to the developer and investors, whereas RPS policies leave the compliance and investment up to the market. To provide assurance to investors, drive more capital to the market, and get more projects built, a FIT can be a useful, complementary policy to an RPS.

11. State Clean Energy Practices: Renewable Portfolio Standards[62] (2008)

This paper was written by the National Renewable Energy Laboratory to "provide a summary of the policy objectives that commonly drive the establishment of an RPS, the key issues that states have encountered in implementing an RPS, and the strategies that some of the leading states have followed to address implementation challenges." One key conclusion was that an RPS is not a standalone policy, but instead depends on complementary policies, especially those relating to transmission.

The paper notes that improving the environment, economic development, and energy security are the common policy drivers behind an RPS. A program's design affects the relative importance of these drivers, including the inclusion of out-of-state resources and expansion of voluntary green power markets. One important consideration for state policymakers, when the most cost-

[62] Hurlbut, David. "State Clean Energy Practices: Renewable Portfolio Standards", National Renewable Energy Laboratory, July 2008.

effective resources are in neighboring states, is prioritizing between local economic growth and minimizing ratepayer impacts. Ratepayer impacts can be reduced by allowing out-of-state resource eligibility, but this lets other states realize local economic benefits. When environmental benefits are paramount, policymakers may want to integrate the RPS with voluntary green power purchase programs. This strategy augments the overall demand for renewable energy, which can increase investment.

The paper discussed important lessons learned from state experiences with RPS. The author notes that if a state does not have its own abundant and low-cost resources, achieving the maximum benefit will involve policies to ensure a robust regional transmission system to move renewable power from resource-rich areas to the state's load centers. This may require the creation of multistate institutions to coordinate transmission planning and expansion. The author also notes that available resources and available transmission capacity are the two factors that affect what an RPS can accomplish in a state. These have a bearing on the cost-effectiveness of in-state resources relative to regional resources. When resources from neighboring states are more cost-effective, coordination on a regional scale is important. This is especially important when these resources are part of the same regional transmission organization. RPS coordination can create a larger seamless demand for renewable energy, and larger markets tend to be more competitive.

Two program elements, qualifying out-of-state resources and an REC tracking system, take on larger importance if renewable resources are regionally dispersed. If neighboring states share a transmission system, a substantial amount of power will cross state borders as part of normal grid operations. Regional resource qualification allows a broader geographic space for load-serving entities to find the least-cost options for meeting an RPS requirement. Additionally, an REC tracking system can simplify the energy accounting required for an RPS, significantly reducing the administrative burden of coordinating different state requirements and transaction costs for sellers and buyers of renewable power.

The paper also suggests complementary policies to an RPS that can make achieving the goals easier and less costly. A resource assessment, or mapping out the location of the best resources, can improve both the effectiveness of an RPS and the ability to develop its renewable energy resources at the least cost to ratepayers. Increasing transmission access needs to accompany an RPS if it is to be successful. The leading example is Texas, which passed legislation waiving certain "used and useful" criteria for transmission serving Competitive Renewable Energy Zones designated by the Texas Public Utilities Commission (PUC). In contrast, the lack of available transmission capability has compromised Nevada's ability to use its abundant geothermal resources to achieve its RPS goals. A voluntary green power program allows surplus supply to be used to meet additional, voluntary demand for renewable power. In fact, a 2007 report by the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) showed that customer participation rates in 2006 utility green power programs were statistically higher, on average, in states with an RPS than in those without.[63] This model, which has been used by a number of states that have seen the greatest increase in renewable resource use, relies on an RPS goal that is high enough to convince investors that future demand will never fall below a

[63] Cory, K. S.; Swezey, B. G., "Renewable Portfolio Standards in the States: Balancing Goals and Implementation Strategies." 36 pp.; NREL Report No. TP-640-41409, 2007.

predictable level, yet low enough to permit a surplus to develop. Finally, many RPS policies require specific, minimum support to help new projects secure financing, which can be critical. For example, 10 states require load-serving entities to sign long-term contracts (usually at least 10 years in length) to reduce the financial risk that renewable energy developers face. In New York and Illinois, state agencies procure RECs centrally to meet the RPS requirement. Nevada implemented a special ratepayer charge to protect payments to generators, while California exempted utilities until they had reestablished their creditworthiness. All of these mechanisms lower investment risk, making it easier for the state to attract investment in resources to meet its RPS.

Overall, achieving an RPS goal depends on knowing where the most cost-effective renewable resources are and how they are going to get to market. An RPS results in more capacity expansion when accompanied by complementary policies that will help achieve RPS goals, such as resource assessments, transmission expansion, and regional collaboration.

12. A Report on Various Energy Issues for Connecticut: Phase I, Research Report [64] (2008)

This report was prepared by La Capra Associates with Heather Hunt and Jane Stahl for the Connecticut Energy Advisory Board. The goals were to develop an understanding of how energy market actors interact, assess how other states organize the agencies that address renewable and energy efficiency efforts, summarize RGGI and its relationship to Connecticut's energy production, and review demand-side management and renewable energy policies that advance the Regional Greenhouse Gas Initiative's goals.

The report found that Connecticut has more energy entities than most other states and that, in addition, it convenes more committees or boards than most other states. It also found that there are several means of administering energy efficiency programs. While Connecticut's is run by utilities authorities, other states allow a third-party administrator to assume control or permit administration by a state agency. Additionally, many states are moving towards comprehensive energy planning rather than a sole focus on electricity. States are developing or reviving an interest in renewable energy and are considering mechanisms such as procurement planning and loading orders, or energy type prioritization.

Demand-side management tools enjoy widespread support among the states surveyed, as do mechanisms to fund research and development of new technologies through ratepayer surcharges. Financing and incentives are geared almost exclusively toward demand-side management and renewable energy. Among the states covered in the report, only Massachusetts has a dedicated siting agency; many states do not have a siting process at all and, instead, fold tasks commonly associated with siting into environmental impact reviews.

13. Preparing for Connecticut's Energy Future[65] (2008)

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[64] La Capra Associates, Inc., Hunt, H., Stahl, J., "A Report on Various Energy Issues for Connecticut: Phase I, Research Report", Connecticut Energy Advisory Board, 2008.

[65] The Connecticut Academy of Science and Engineering, "Preparing for Connecticut's Energy Future". Connecticut General Assembly Energy and Technology Committee, 2008.

This report was produced by the Connecticut Academy of Science and Engineering for the Connecticut General Assembly Energy and Technology Committee. The goal was to determine the manner in which Connecticut should plan, oversee, develop, implement, and manage energy issues and programs to maximize economic and environmental benefits for the state and its energy customers.

The report found that energy is among the government's central concerns because of the economic opportunities it presents for the state's citizens and businesses. Energy policy overlaps with many other objectives, such as greenhouse gas emissions mitigation and environmental regulations and goals. This is reflected in the numerous Connecticut agencies involved in the implementation of energy programs and results in too little interaction between the various state agencies and federal programs intended to expose states to funding opportunities and information on best practices. The report states that a comprehensive energy plan would aid in the articulation of the state's long-term goals while improving agencies' efficiency at minimal cost.

The report recommends the creation of an independent Connecticut Energy Office, which, along with the Connecticut Energy Coordinating Council and the Connecticut Energy Advisory Group, would be overseen by the secretary of energy. The report proposes that the Energy Office take responsibility for prioritizing energy goals and objectives as well as assessing the efficacy of Connecticut's energy programs. The Energy Office would also establish long-term energy goals, streamline the operations of existing energy agencies, coordinate between state energy entities, enforce energy planning in all state agencies, prepare energy emergency preparedness plans, conduct relevant policy research to inform legislative decisions, and promote the creation of in-state "green jobs." The suggested method of funding for the Office is via ratepayer charges. The proposed creation of the Energy Office would enable flexibility in state energy programming and would facilitate communication between agencies and action on energy policies.

14. Comments and Testimony toward Best Management Practices on Energy Security Risks & Considerations (Joel Gordes) [66] (2008)

Connecticut Siting Council (CSC) solicited the testimony of Joel Gordes, the President of Environmental Energy Solutions, on the best management practices (BMPs) for mitigating energy security risks. The purpose of the EES's combined comments and testimony is to provide information that CSC might wish to consider for incorporation into its BMPs. The testimony identifies five distinct threats to the electricity grid in the U.S.

- Energy security threat in the form of fuel supply interruption/cost escalation
- Physical security of grid components (generation, transmission, distribution)
- Foreign dependency via disruption of globalized supply chains for critical grid components and minerals used in component manufacturing processes
- Cyber security threats including distributed denial of service, hacking, electromagnetic pulse, embedded codes in foreign sourced components
- A combined or "blended" combination of the aforementioned threats

The testimony also offers the following comments/recommendations:

[66] Joel N Gordes. Comments and Testimony toward Best Management Practices on Energy Security Risks & Considerations, 2008.

- As a BMP, the CSC could attempt to minimize dependence on oil and natural gas sources by promoting as much combined heat and power (CHP) as possible.
- The CSC could consider fuel offset for new generating facilities of over 25 MW capacity.
- Another BMP is that the CSC must document the dependence of foreign component suppliers for critical electricity grid/ generation set-up.
- The testimony also highlights the vulnerability of semi-conductor based grid components to cyber-attack and electro-magnetic pulsation (EMP) attacks.
- The CSC should actively encourage installation of distributed generators by private industries/ businesses to run in tandem with the grid as a back-up to insure power reliability and quality. In addition, utilities in the State should be allowed to construct large scale distributed generators (up to 25 MW) with the possibility of recovering the investment costs through ratepayer contribution.
- The testimony also offers the following definition of distributed generation

  > Distributed Resources (DR) include conservation, load management, and electric generation and/or storage located near the point of use either on the demand or supply side. DR includes fuel-diverse fossil and renewable energy generation (known as distributed generation or DG) with or without waste heat utilization and can either be grid-connected or operate independently. Distributed resources typically range from under a kilowatt up to 50 MW. In conjunction with traditional grid power, DR is capable of high reliability (99.9999%) and high power quality required by a digital society.

- The use of load management, energy efficiency, distributed generation etc, could provide a first line of defense against potential cyber attacks and fuel supply disruption.

15. Renewable Portfolio Standards in the States: Balancing Goals and Implementation Strategies[67] (2007)

This report was prepared by the National Renewable Energy Laboratory for the U.S. Environmental Protection Agency's (EPA) Climate Protection Partnership Division.

It summarizes the purpose and structure of Renewable Portfolio Standards and the benefits of Renewable Energy Certificates, such as ownership verification and double-counting avoidance. It also describes differences between state standards on RECs and what sources are considered renewable as well as the difficulty different state definitions of renewable resources may cause in future efforts to regionalize and possibly nationalize an RPS policy. Additionally, many states have not yet implemented RPS policies on their own, which will make a transition to a regional or national scheme more abrupt and costly than for those states currently operating with an RPS. Further, many states wish to confine economic benefits to within their borders, increasing prices for ratepayers and isolating themselves from regional REC trading.

The Report concludes that best practice RPS policies must balance a state's goals regarding price effects for consumers, environmental benefits, economic development, and fuel diversity. Because these vary from state to state, one state's successful RPS may be another state's failure. Additionally, some goals are likely to compromise other goals.

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

16. Northeast RPS Compliance Markets: An Examination of Opportunities to Advance REC Trading[68] (2005)

The Northeast RPS Compliance Markets report was prepared by Rutgers University's CEEEP for the Clean Energy States Alliance. Renewable energy credits are defined by state-based policies. With more states set to implement RPS-type regulations, the seemingly small differences in defining a REC from state to state limits the creation of a true regional market for clean energy. The major differences are in the definition of qualifying technologies and in the method of power delivery. The report compares the RPS scheme in the New England region on the following bases: objective, fuel definition, treatment of out-of-state generator, and RPS policy design element.

The report discusses the RPS policy objectives of several Northeast states and highlights that Connecticut has no clear RPS objectives. Table 22 shows the categories of RPS policy goals that are listed by the northeastern states. The columns for Pennsylvania and Connecticut are shaded to indicate that no policy goals are listed. An 'X' indicates which goals are listed by the states.

Table 22: RPS Policy Goals from "Northeast RPS Compliance Markets"[69]

Goal	CT	DC	DE	ME	MD	MA	NJ	NY	PA	RI
Economic		X	X	X	X		X	X		
Environmental		X	X	X	X	X	X	X		X
Reliability			X				X			
Security		X	X	X	X	X	X	X		X
X – listed under policy goals										

Some of the policy recommendations include: educating policymakers about the barriers of current RPS policy patchwork, resolving conflicts with rulemaking and regulatory actions, and pursuing long-term solutions such as harmonizing legislative actions and inter-state agreements.

17. The Experience of State Clean Energy Funds with Tradable Renewable Certificates[70] (2003)

This policy paper was drafted by Lawrence Berkeley National Laboratory and adopts a case-study methodology to identify the best practices among states that implement the RPS and renewable certificates trading. Tradable renewable certificates (TRCs) represent the non-energy attributes of electricity produced from renewable energy sources. The states covered in the study includes California, Connecticut, Illinois, Massachusetts, Minnesota, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, and Wisconsin.

The authors note that the Connecticut Clean Energy Fund (CCEF) supports the development of the TRC market to help facilitate the financing and construction of new renewable energy

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[68] CEEEP, "Northeast RPS Compliance Markets: An Examination of Opportunities to Advance REC Trading", Rutgers University, 2005.
[69] Ibid.
[70] Fitzgerald, Garret; Wiser, R., Bollinger, M., "The Experience of State Clean Energy Funds with Tradable Renewable Certificates". Lawrence Berkeley National Laboratory, 2003.

technologies. CCEF obtains TRCs from various projects it funds, with an eye toward selling them in the marketplace to offset the cost of some of its programs. CCEF has also provided education about and promoted the purchase of green tags by end-use customers, both through its own website and its support of SmartPower.

Other states have established innovative TRC initiatives, such as offering financial incentives to companies that sell TRCs directly to end-use customers. Funding educational campaigns about TRCs and supporting the development of accounting and verification systems for TRCs are additional approaches. Restricting the use of TRCs by funded generators and offering renewable energy projects or project intermediaries risk management products that mitigate the potential impact of fluctuations in the value of TRCs are still more strategies other states have adopted. Some states have taken direct title to TRCs based on renewable energy project funding, either by default or by specifically purchasing the TRCs.

18. **A Study of the Feasibility of Utilizing Fuel cells to Generate Power for the New Haven Rail Line[71] (2007)**

This study was conducted for Connecticut Department of Transportation (DOT) by the Connecticut Academy of Science and Engineering (CASE). The objective of the report is to study the feasibility of using fuel cells to power New Haven railway line in Connecticut. The study estimates that the annual electricity demand of New Haven line is over 200 million kWh, with a peak demand of 50,000 kW. Traction power for the trains is responsible for 61% of the total demand, with maintenance yard power, station power and control and signal power accounting for 33%, 6% and less than 1%, respectively. Fuel cell power plants produce both power and heat. This could be potentially useful as a back-up power in facilities like maintenance yards and passenger stations. Fuel cell power plants are in early stages of commercial deployment and cost is high, in part, because production volume is still low. At historic fuel cell costs of $4,000 to $5,000 per kW, fuel cells are not competitive in New Haven Line applications. Fuel cells are not economical to generate the high voltage traction power. The best application of fuel cells to New Haven Line electrical power appears to be for new maintenance buildings in the New Haven yard as a backup power. These buildings provide good use for the power plant heat, and use of fuel cells would reduce or eliminate the cost of back-up power.

E. Resource Assessment

Several studies have examined Connecticut's available energy resource potential, including solar, wind biomass, fuel cells, energy efficiency, and combined heat and power. In addition, two studies examined the New England electric system to assess the economic impact of renewables.

1. Avoided Energy Supply Costs in New England: 2009 Report-[72] (2009)

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[71] King, J.M. (2007). "A Study of the Feasibility of Utilizing Fuel Cells to Generate Power for the New Haven Rail Line". Connecticut Academy of Science and Engineering.

[72] Hornby, R., Chernick, P., Swanson, C., White, D., Goodman, I., Grace, B., Biewald, B., James, C., Warfield, B., Gifford, J., Chang, M., "Avoided Energy Supply Costs in New England: 2009 Report". Synapse Energy Economics, Inc, 2009.

This report was prepared by Synapse Energy Economics, Inc. for the Avoided-Energy-Supply-Component (AESC) Study Group, which comprises a number of electric utilities, gas utilities, and other efficiency program administrators from across New England. The report projects marginal energy supply costs that can be avoided by reducing the use of electricity, natural gas, and other fuels through the energy efficiency programs offered to New England customers. The report assesses wholesale markets for electric energy, capacity, renewable energy, natural gas, crude oil, and related fuels. It also assesses the sensitivity of wholesale electricity prices to changes in inputs and explains how the assorted data tables should be interpreted.

The report's discussion of avoided costs to retail customers outlined the benefits associated with reductions in annual electricity demand. These included avoided electric energy costs due to a reduction in the annual quantity of electric energy that must be generated and due to a reduction in the price of electric energy that is generated to serve remaining load, which will be met at prices set by more efficient generating units. Additional benefits are associated with avoided electric capacity costs due to a reduction in the annual quantity of electric capacity and/or demand reduction that load serving entities are required to procure to ensure an adequate quantity of generation during peak demand hours and due to a reduction in the price of electric capacity acquired to serve remaining load because that remaining load will be met at prices set by less-expensive capacity resources. Benefits are also gained from avoided environmental emissions due to a reduction in the quantity of electric energy that has to be generated as embodied by the externality value of carbon dioxide emissions.

The report found that 15-year levelized avoided electric energy costs for Connecticut in 2009 ranged from $76 per MWh to $99 per MWh depending on season and peak or off-peak usage. In 2009, these costs for Connecticut were estimated to be $17.81 per kW-year. Demand reduction was found to decrease Connecticut energy and capacity prices by $6.45 per kW-year for 2009. Avoided externality costs for Connecticut in 2009 ranged from $0.029 to $0.031 per kWh depending on season and peak or off-peak usage. A significant finding was that savings from avoided costs to retail customers are anticipated to decrease over time due to lower projections of peak load and greater quantities of generation from renewable resources in peak periods.

2. Sustainable Solar Strategy for Connecticut[73] (2009)

This study was prepared by KEMA Inc. for the Connecticut Clean Energy Fund's Long-Term Sustainable Solar Strategy Workgroup members. KEMA and its subcontractor Economic Research Development Group Inc. were engaged to create a study that will provide the necessary tools for the workgroup to develop a long-term strategy for solar power development in Connecticut.

The workgroup identified a set of goals for solar energy, including a recommended goal of 300 MW of solar in the state by 2025, which would satisfy about 3.5 percent of projected total demand in Connecticut. The workgroup then examined a suite of strategies to meet the goals. A cost-benefit analysis was done for each scenario considered.

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[73] KEMA Inc. "Sustainable Solar Strategy for Connecticut", 2009.

Several strategies were recommended, including residential solar incentives, a program similar to the Connecticut Clean Energy Fund's solar photovoltaic rebate program that provides a monetary incentive for the installation of solar panels. Energy efficiency requirements, education and training, and a solar lease program were also recommended. Other funding strategies included financing solar installations for "zero net-energy" homes, installing solar photovoltaic systems on government buildings, and virtual net-metering, which would allow community-based or captive solar installations to offset electricity accounts that are not directly "behind the meter." The study also recommended integrating solar development costs into the rate base.

A benefit-cost analysis was executed on each of the scenarios. The report considered a state-level societal definition for benefit-cost analysis of each scenario. The major benefits are: avoided energy savings (dollar value of avoided energy and capacity supply costs); spin-off economic activity (multiplier effect from energy savings); emissions (dollar value of emissions); solar generation's import substitution effect; and federal incentives. The major costs are gross project costs and a new in-state funding mechanism.

Table 23: Summary of Benefit-Cost Analyses

Program	BC Ratio
Residential Rebate	2.87
Zero Net Energy Home Pilot	2.13
Solar Lease	1.92
Solar RECs	2.39
State Government Installation	1.90
Utility Ownership Pilot	1.92

A REMI model of Connecticut economy was used to calculate the spin-off economic effects from each proposed scenarios by forecasting business sales, Gross State Product (GSP), jobs, and real after-tax income. The impact of SREC-eligible and estimated net-costs of the utility developed solar programs would be less than $10 per household annually.

3. New England Electricity Scenario Analysis[74] (2007)

This study was commissioned by the ISO New England to explore the economic, reliability, and environmental impacts of various resource outcomes for meeting the region's future electricity needs. The study projects a one-year snapshot of a comparable set of outcomes or scenarios of New England's future electricity markets. The objective of this study was twofold. One was to discuss the ways of meeting of electricity demand with minimum ratepayer and environmental impact. The other was to provide information and data that stakeholders could consider as they formulate energy policies for New England.

The study considers seven supply scenarios: a combination of power plant technologies; energy efficiency and demand response measures; additional nuclear plants; coal combined-cycle; natural gas combined cycle; new renewable plants; and increased imports of hydroelectric and other low-emission technologies. The key result of the analysis was that under all scenarios, New

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[74] New England ISO, "New England Electricity Scenario Analysis", 2007.

England would continue to depend on natural gas to supply electricity and fossil fuel prices drives the region's electricity prices and level of emissions. Also, the addition of demand-response provided capacity and electric energy benefits to the system and resulted in lesser emissions.

The result of scenario analysis suggests that natural gas would be the capacity of choice in the near future for the New England region. A spreadsheet model on the scenario runs is available at the ISO web site for public stakeholders. This spreadsheet can help stakeholders undertake their own investigations and assess the impacts of different assumptions.

4. 2007 Energy Plan for Connecticut-[75] (2007)

This energy plan was prepared by the Connecticut Energy Advisory Board to be submitted to the joint standing committees of the Connecticut General Assembly. The goal of the 2007 Energy Plan was to outline for state policymakers the initiatives that are essential to meet the state's long-term goals and help the state create a successful energy policy.

The 2007 Energy Plan explores various energy issues, including electricity supply and demand, natural gas supply and demand, petroleum supply and demand, low-income energy affordability and sustainable development. In addition, the 2007 Energy Plan discusses the issues related to renewable energy supply and demand in Connecticut and offers suggestions to the Connecticut General Assembly to both reduce the cost and increase the availability of renewable energy options.

The supply issues for renewable energy in Connecticut included inconsistent state policies in the amount and timing of renewable energy procurement requirements, administrative barriers such as siting and permitting that add additional costs, insufficient funding in state incentive programs that fail to attract developers, and technical barriers that inhibit the development of emerging technologies. To counteract these issues, the CEAB recommended promoting a regional standardization of renewable energy definitions and renewable portfolio standards, reducing or removing administrative barriers to projects, reducing technical barriers for emerging technologies with new policy goals and financial incentives, and lowering the cost differential of renewable energy by supporting net metering up to 1 MW and offering tax incentives on renewable energy equipment and projects.

Additionally, the 2007 Energy Plan highlighted several demand issues for renewable energy, including inadequate reliability for customer needs, high prices acting as a barrier to large-scale user investment, and the need for lower prices and increased marketing to increase customer participation in the Connecticut Clean Energy Options program. The recommendations to address these issues included establishing a base use of renewable energy by state agencies, subsidizing the purchase and installation of solar panels at certain public schools, and employing marketing and other incentives to encourage consumers to use renewable energy for their homes, businesses, and municipalities.

Resource Assessment Summary

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[75] Connecticut Energy Advisory Board, " 2007 Energy Plan for Connecticut". Connecticut General Assembly, 2007.

The following tables summarize the key results from the various resource assessment studies. Table 24 lists the technical potential of energy efficiency, combined heat and power, and renewable resources in Connecticut. Table 25 lists estimated costs of these technologies, and Table 26 lists their carbon dioxide (CO_2) emission.

Table 24: Technical Potential of Renewable Energy Resources in Connecticut

Technology	Unit	2010 Comprehensive Plan (2010)	Sustainable Solar Energy for Connecticut (2009)	Various Energy Issues for CT Pt I (2008)
Energy Efficiency	MW/year	38	-	100
	MWh/year	-	-	-
Combined Heat and Power	MW/year	-	-	-
	MWh/year	-	-	-
Biomass/Waste to Energy	MW/year	139	-	60
	MWh/year	-	-	-
Wind	MW/year	0	-	41
	MWh/year	-	-	-
Fuel Cells	MW/year	45	-	-
	MWh/year	-	-	-
Solar	MW/year	66	-	-
	MWh/year	-	3522	-

Table 25: Cost of Renewable Energy in Connecticut ($/MWh)

Technology	Integrated Resource Plan for Connecticut (2008)
Energy Efficiency	-
Combined Heat and Power	-
Biomass/Waste to Energy	$121.6
Wind	$93.4
Fuel Cells	$178.4
Solar	$442.4

Table 26: Carbon Dioxide Emissions from Various Technologies (lbs/MBTU)

Technology	New England Electricity Scenario Analysis (2007)
Energy Efficiency	-
Combined Heat and Power	120
Biomass/Waste to Energy	170
Wind	0
Fuel Cells	120
Solar	0

5. Fuel Supply Assessment for Waterbury and Plainfield Area[76] (2004)

This study was commissioned by the Connecticut Clean Energy Fund (CCEF) to clarify the feasibility of a synthetic natural gas (SNG) plant at Waterbury and for an alternative site at Plainfield, CT. This study is a project specific resource assessment. The review provides a third-party review of the key project assumptions of the proposed SNG plant. One of the central recommendations of the report is to develop a project-specific fuel supply plan. The report predicts that such plans would infuse certainty in establishing the cost of the fuel feedstock. As a part of the feasibility study, the report estimates the cost and quantities of suitable biomass feedstock. The study estimates that the plant requires about 200,000 tons of wood waste per year. The bio-mass feedstock prices are expected to range from $10-$30 /ton range.

F. Impact of interactions with other policies

1. Examining Electricity Price Suppression Due to Renewable Resources and Other Grid Investments[77] (2011)

This paper examines critically the issue of price-suppression effect of renewable resources. This effect occurs when zero- or low-marginal-cost resources such as renewables displace higher-marginal-cost conventional resources, thereby suppressing or lowering the energy portion of the wholesale price of electricity. The paper analyzes the price suppression effects under two different scenarios: with and without price elasticity of demand; and with adjustments for capacity of resources. The price suppression effect is due not only due to near-zero marginal cost of renewables, but also because the wholesale cost of electricity is split between multiple products as opposed to having the costs of the out-of-market renewable resources internalized in a single electricity price. Whether out-of-market resources should be developed depends on two fundamental questions. Is society better off with or without these resources? Are consumers of

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[76] Antares Group Inc. Fuel Supply Assessment for Waterbury and Plainfield Area, 2004.

[77] Felder, F.A., "Examining Electricity Price Suppression Due to Renewable Resources and Other Grid Investments", Electricity Journal 24-4, 34-46, 2011.

electricity better off? The first question relates to overall societal efficiency, while the second relates to equity issues. A holistic analysis is needed to answer these questions.

VI. Conclusions

Policymakers have many challenges ahead of them. Society demands them to achieve multiple and, in many cases, conflicting goals. Furthermore, they are asked to make these choices based on incomplete and contradictory information, frequently in public settings and processes with competing input from the public and stakeholders. Energy, economic, and environmental policymaking in the context of the CT RPS reflects all of these difficulties.

Within this context, the focus of this report has been to inform the policymaking process with a thorough review of key CT RPS-related documents, facilitate the informed contribution of the public and stakeholders, provide a preliminary economic impact analysis, and highlight key findings and recommendations for consideration.

Appendix A: Stakeholder Written Comments

The following Stakeholders submitted written comments to the Connecticut Energy Advisory Board. Their full comments follow.

Boralex, Inc.

Boston Power Supplies Inc.

Connecticut Light & Power

Core Metrics

Covanta Energy

Deepwater Wind

Earth Markets

Robert Fromer

GE Energy Financial Services

GrowJobs CT

McNees Wallace & Nurick LLC (on behalf of Kimberly Clark)

Renewable Energy New England (RENEW)

State of Connecticut Office of Consumer Counsel

Summit Hydropower, Inc.

BORALEX

April 21, 2011

CEAB RPS Subcommittee
c/o CERC
805 Brook Street, Building 4
Rocky Hill, CT 06067
gdeans@cerc.com

RE: Comments of Boralex on the Connecticut RPS policy objectives

Thank you for the opportunity to comment on the review of RPS policy in Connecticut. Below please find responses to your specific questions.

About Boralex

Employing over 300 people, Boralex operates 29 power stations with a total installed capacity of over 650 MW in the Northeastern United States, Canada, and France. In addition, Boralex has power projects under development that will add close to 300 MW of power. Boralex holds in-depth experience in three power generation segments – wind, hydroelectric, and biomass. In addition, Boralex is an active producer of Connecticut Class I RECs.

Question 1: What do you see as the primary RPS objectives Connecticut should focus on and commit to over the next 5 to 10 years? In addition, please rank these objectives in order of priority.

A. The most important RPS objective would be to maintain a consistent and transparent program. It seems this point came across during the roundtable discussion as well. The more tinkering there is with an RPS, the less confidence the investment community and potential market participants will have. We all can understand that in the early years of a program, some adjustments often need to be made to address growing pains almost "on the fly." However, the Connecticut RPS is now over a decade old and it seems proper to maintain one stable goal and expect the market to come meet the goal.

B. The second RPS objective should be to continue a gradually increasing RPS target percentage. Increasing our target renewable participation goals in an orderly and manageable fashion helps to meet our expectations for a cleaner energy portfolio.

C. The third RPS objective should be to foster opportunities for parties to enter into long term contracts. As was mentioned multiple times at the roundtable discussion, renewable projects have a much better chance of success if they can negotiate long-term contracts. Furthermore, it may be in a buyer's best interest to hedge against future volatility through a long-term purchase. Note that no legislative or regulatory action is needed in order to stimulate new long term contracts. Connecticut Light and Power and United Illuminating currently have the authority to enter into long-term REC contracts on behalf of their customers. This could be a tool used to broaden market participants' REC purchase/sales portfolios and encourage stable and predictable renewable growth – it simply needs to be used.

D. It is also important to encourage both nascent technologies and projects within the state that may come at a slightly higher upfront cost. The economic payback of both of these may be good over the long run. The problem is that it is difficult to address some of their specific issues within an RPS. Support for this kind of development may be easier to achieve through specific research grants and other associated funding. Trying to shoehorn specific additional benefits to specific technologies or locations are difficult in the RPS.

Question 2: How should we define our approach to renewable policy to make it most attractive and rewarding to market participants?

In continuation of suggestions made above, an important consideration is that the program is consistent and transparent. To that end, it would be sensible to maintain the existing program as-is. The criteria for accepting any proposed change would be that its benefits must clearly outweigh the costs incurred by introducing uncertainty into the market and creating a reputation for having an unstable program. This mindset alone would provide a positive experience for a majority of the stakeholders in this process. At the moment, none of the approaches for change suggested at the roundtable seem to meet these criteria.

Question 3: Please describe your "ideal" energy policy for Connecticut. Would it be an RPS? Would it involve tiers or carve-outs? How would you take into account the regional RPS market? What would be the best financing mechanism for renewable projects?

With respect to renewable energy, the current RPS mechanism is pretty close to ideal. With the current program, we have gradually increasing standards to meet, a technology-neutral stance which ensures efficiency, tiers which appropriately reflect our goals, and the ability to enter into long-term REC contracts. If the solar program currently being contemplated goes through, we will also have specific incentives for encouraging solar, an industry which has great long-term potential but needs short-term assistance.

The current RPS also addresses the regional RPS well. It has some features in common with other New England states (allowing eligibility from anywhere in NEPOOL and imports into NEPOOL, similar banking abilities, and similar tiers) while maintaining characteristics unique to Connecticut (different ACP, eligibility for landfill gas by pipe and natural gas fuel cells, and different percentage requirements per year). It seems appropriate to maintain a unique RPS for Connecticut while keeping in mind that it is helpful to have substantial overlap with other New England states where there are areas of agreement.

With respect to describing the best financing mechanism for renewable project, as a developer I am naturally inclined to prefer a feed-in-tariff structure. This provides developers the clearest path toward knowing if a project is viable or not. However, an RPS with the ability to engage long term contracts can provide nearly the same level of investor certainty, but with the additional benefit of market efficiencies. As mentioned previously, the RPS already allows utilities to enter into long-term contracts. To date, I am not aware of any that have been signed. Thus one area of potential improvement would be to encourage or insist utilities to enter into these sorts of agreements.

Question 4: In addition, please provide any other comments or suggestions that you would like to share with the Sub-committee.

One topic that was brought up several times at the roundtable was energy efficiency. It is clear that energy efficiency should be the front line in the battle to reduce fossil fuel consumption. The megawatt not used is often the best one. It lessens the load on transmission infrastructure and can save consumers money. That being said, it is important to distinguish the difference between saying that energy efficiency is good and saying that the RPS is wasteful, because energy efficiency should be used exclusively. The latter argument is a false choice.

The state of Connecticut is already a national leader in energy efficiency. The American Council for an Energy Efficient Economy ranked Connecticut #8 in the nation in its Energy Efficiency Scorecard.[1] The Consortium for Energy Efficiency lists Connecticut #5 in the nation for total program expenditures per capita on energy efficiency and load management.[2] There is always room for improvement, and energy efficiency should continue to be a priority. However the RPS Sub-committee should keep in mind that energy efficiency and renewable energy are complementary programs that are both successful. Any claims that the RPS is neutering energy efficiency are simply untrue.

[1] http://aceee.org/sector/state-policy/scorecard

[2] http://www.cee1.org/ee-pe/2010data.php3 (table 6)

Thank you once again for the opportunity to comment on this important review. If you have any questions regarding these comments or anything else, please don't hesitate to contact me at: 514-985-1356 or nathan.hebel@boralex.com

Sincerely,

Nathan Hebel
Boralex, Inc.

Mr. Electricity®

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Ms. Gretchen Deans
CEAB
C/O CREC
805 Brook Street, Building 4
Rockyhill, CT 06067

Please forward this to Mr. Tim Cole vice Chair and CEAB RPS Sub-Committee Members.

Subject: Feedback, RPS Roundtable Discussions.

Dear CEAB Sub-Committee members,

I would first like to the CEAB Members for inviting me to the conference and for the delicious break time treats.

In response to your feedback questions 1 and 2 I would simply advise the CEAB to look at off peak Energy Storage for use during the peak as your best available and lowest cost solution.

Most States have already recognized the fact other RPS products especially intermittent ones such as Wind and Solar need Energy Storage to be a viable source of replacement Energy for conventional sources of generation.

Connecticut should learn from the new direction in other States, even Countries and generate a plan that will lower rates, and add grid reliability with surplus off peak Energy Storage as a new Renewable Energy Source.

Our U.S. Base load Generators wastes enough Energy every day to power numerous smaller Countries 24 hours a day. Adding intermittent Energy Sources without Energy Storage just acerbates this massive Energy waste problem.

Question 3) The Regional RPS Market can best serve CT and CT Ratepayers by storing Regional lower cost surplus off peak Energy both from dirty and green surplus sources in our homes for use the next day during the peak, or anytime the individual homeowner wants to use this lower cost stored energy especially during a power outage.

This will enable CT with a lower potential for Wind and Solar to meet its 2020 goals, while lowering the cost of Energy for CT ratepayers on real, AND GET REAL CL&P/U.I. Time of use Rate Plans, or get out of CT.

The Clean Energy/Carbon Renewable Energy Credits could also be aggregated and sold. The savings alone for CT from not needing to fund any more Transmission lines or other Energy infrastructure gifts to the Utilities could more than pay for off peak Energy Storage and power outage backup power in every home.

Lee A. Hebert

President,
Boston Power Supplies Inc.
Mr.Electricity, “off peak” Energy Storage Systems

CL&P RESPONSES TO CEAB RPS/RENEWABLE POLICY QUESTIONS
04/21/2011

Introduction

The Connecticut Light and Power Company ("CL&P") believes that Connecticut's energy policy should promote the supply and delivery of reliable and affordable clean energy. Energy policy intended to promote clean energy, along with the resulting investment, should not be solely a byproduct of environmental concerns; nor should it be developed absent environmental considerations. Energy and environmental policies need to be developed in tandem and balanced with economic consequences.

Energy policy should strike a practical balance between energy costs, environmental priorities, and initiatives to promote job growth. CL&P recommends four priority action areas for Connecticut's energy policy:

a. Restore historical levels of funding for energy efficiency programs and find ways to expand funding.

b. Develop the most cost effective clean energy supply focused on low carbon emitting resources, inclusive of energy efficiency.

c. Promote the expansion of the state's natural gas delivery system to provide cost-effective options to customers to switch from fuel oil to natural gas.

d. Sustain efforts to make Connecticut friendly to the adoption of electric and natural gas vehicles.

What do you see as the primary RPS objectives Connecticut should focus on and commit to over the next 5 to 10 years? Please rank these objectives in order of priority.

CL&P believes that several factors regarding the current generation environment need to be considered when developing renewable policies for Connecticut.

First, it is not well appreciated that New England and Connecticut's mix of power generation resources have resulted in the second lowest carbon emission intensity of any region in the U.S. With very little coal but significant nuclear, hydro-electric and natural gas generation, the region's generation portfolio emits 828 lbs/MWh of carbon dioxide, more than 30% below the national average of 1,230 lbs/MWh.

Second, the active regional market for renewable energy credits ("REC"), coupled with generous federal subsidy programs such as the Investment Tax Credit and Production Tax Credit, has been effective to date in bringing qualified renewable generation to the New England market. It is expected that Connecticut will meet its RPS goals through the 3-5 years. However, subsequent targets moving out towards "20% in 2020" will become more difficult and more costly to achieve.

Third, even though Connecticut has very limited in-state renewable potential, Connecticut also has the most aggressive RPS goals in New England. Analysis contained in the January 2010 Integrated Resource Plan for Connecticut has demonstrated that, of the total New England renewable resource potential (19,535 MW of nameplate capacity), Connecticut resources would contribute only 351 MW. Even with this limited potential, Connecticut's RPS target of 20% Class I renewable by 2020 exceeds all other New England state RPS policy goals. Massachusetts is second with 15% Class I by 2020.

The bottom line is that Connecticut and the New England region are already well positioned in the U.S. as leaders in clean energy. So as we look to the future, CL&P believes that responsible clean energy policy needs to balance four objectives (ranked in order of priority): 1) impact to customer rates; 2) impact on carbon emissions; 3) impact to local economic development from new clean energy project jobs and 4) impact to overall economic activity due to higher rates (high rates reduce disposable income, which leads to reduced economic activity)[1].

How should we define our approach to renewables policy to make it most attractive and rewarding to market participants? Would it be an RPS? Would it involve tiers or carve-outs? How would you take into account the regional RPS market?

It is important to not lose sight of the impact that clean energy policy will have on customer costs and the Connecticut economy. With that in mind, we recommend that the approach to renewables should focus on ensuring that the most cost-effective clean energy projects are completed first. CL&P believes that this approach would lead to priority funding for energy efficiency and conservation and load management projects. In addition to the direct benefit of customer energy cost savings, energy efficiency measures installed in 2010 through Connecticut's energy efficiency programs will reduce carbon dioxide emissions by more than 240,000 tons annually, and by more than 2.4 million tons over their installed lifetime. The energy efficiency programs provide these benefits at a cost of $0.039 per lifetime kWh saved and a benefit of $3 in utility system benefits for every dollar invested. Energy efficiency also has the added benefit of reducing Connecticut's electric load and thus the amount of renewable energy required to meet RPS requirements.

In addition, CL&P believes that it is appropriate for the state to review RPS goals in order to ensure that the goals are correctly sized to meet clearly defined and broadly accepted objectives. Such an assessment should consider the possibility of establishing a clean energy standard and whether a target of 20% renewables by 2020 is a proper clean energy target for the state.

In order to ensure that cost effective projects are brought to market in Connecticut and the region, it is important for Connecticut to work with other New England states and neighboring regions to identify

[1] To the extent that Connecticut invests in renewable generation that is priced above market, this will tend to raise overall customer rates and lower overall economic activity.

options and innovative solutions for meeting renewable energy needs. CL&P and its parent company Northeast Utilities ("NU") have already sponsored such an undertaking. In collaboration with Hydro Quebec, NU has announced that an agreement has been reached to construct a new 1,200 MW transmission power line between New England and Quebec. This line will allow for a substantial increase in imports of clean hydro-electric power from Canada to New England. The cost of the transmission line will be borne by Hydro-Quebec ("HQ"), and there is no need for a long term power purchase agreement. Connecticut customers will be the beneficiaries from the project's successful implementation, including a reduction in wholesale power costs and carbon emissions.

With respect to the question of how to make the market attractive to market participants, CL&P observes that there has been concern expressed by renewable generation developers that RPS policy in Connecticut has changed often. Such change creates uncertainty, which results in the inability for developers and financiers to value renewables on a long term basis. Therefore, after Connecticut reviews the existing RPS policy and evaluates it against clearly defined and broadly accepted objectives, CL&P believes that a consistent and long term application of the resulting program initiatives must be maintained in order to ensure that the Connecticut marketplace is attractive to investment.

CL&P believes that the continuation of Federal subsidies, such as the Investment Tax Credit and Production Tax Credit are also important to market participants and will help to continue to incent renewable generation development. These Federal programs are scheduled to expire over the next two years.

Additionally, CL&P is skeptical of programs to drive renewable development based on the desire to build new industries and create jobs. In fact, our analysis, based on economic data and analysis, shows that while renewable technologies may create some short term construction jobs, the overall impact on jobs and the economy is negative, as higher electricity costs lead to less disposable income to be used to drive economic activity. From a customer perspective, the impact is likely magnified. In addition, much of the cost of these deployments would likely be borne by less fortunate customers. For example, if residential solar deployments are predominately made by wealthier single family home owners (as one would expect), the portion of distribution system costs they currently pay for will be shifted to other customers. That effect would be further magnified if the state employs a net metering provision. We believe that Connecticut should adopt a "technology agnostic" structure to encourage clean energy development. The projects with the least cost to customers should move to the front, without having ratepayer-funded subsidies "driving" one technology or one project over another.

CL&P does acknowledge the role of short-term subsidy programs to stimulate market development and help new technologies lower costs through learning curve effects. However, CL&P also believes the competitive market place with an active REC market to reward renewables with some "market-based externality value premium" and the generous federal tax subsidies in place should be sufficient to drive those developments. This structure helps to minimize the cost impact of renewable development on Connecticut ratepayers.

What would be the best financing mechanism for renewable projects?

CL&P recognizes that in the current market and despite the generous subsidies provided through RECs and federal programs, many renewable projects are still finding it difficult to secure financing. Some proposals seek to have renewable project developers enter into long term power purchase agreements ("PPA") or fixed price contracts with utilities and leverage that price security to improve the project's financing attractiveness. CL&P is concerned with this business model. Utility backed long term contracts would be treated as an additional financial obligation tantamount to increased debt on CL&P's balance sheet. In addition, this PPA model, in effect, represents a lease on the generation plant, typically resulting in ratepayers paying for the entire plant while the owner is allowed to re-commercialize the residual value at the end of the term. Term priced PPAs are both an inefficient use of the utility balance sheet and frequently result in significantly higher costs for customers.

In addition to the concern above, CL&P is opposed to any utility backed long term priced PPAs for two primary reasons:

1) CL&P is concerned about earmarking contracts or incentives for a technology where costs are expected to improve significantly over the next decade (for example, solar technology is expected to have significantly declining costs in the next 5-10 years);

2) CL&P believes that a consistent and long term application of renewable energy policy must be maintained in order to ensure that the Connecticut marketplace is attractive for renewable investors. So long as policy provides a friendly environment for investment and if retail competitive suppliers in Connecticut begin to approach their customer load obligations on a long term basis, CL&P believes that these suppliers will find it economically attractive to enter into long term REC PPAs. These conditions would improve the financing environment for renewable energy projects in the region. CL&P believes that this market based approach is consistent with the expectations of Connecticut policy makers who supported RPS, and this approach would provide financing opportunities to renewable developers and the best outcome for Connecticut customers.

In addition, please provide any other comments or suggestions that you would like to share with the Sub-committee.

As stated at the beginning of our response, CL&P believes that Connecticut's energy policy should not only focus on the cost effective development of renewable energy sources, but should also 1) restore, and potentially increase, funding of energy efficiency programs, 2) promote the expansion of the State's natural gas delivery system to provide cost-effective options to customers to switch from fuel-oil to natural gas, and 3) sustain efforts to make Connecticut "friendly" to the adoption of electric and natural gas vehicles.

CL&P believes that restoring full energy efficiency program funding is critical and will help ensure that Connecticut residents and businesses are able to plan and take full advantage of these programs. We also support actions that ensure consistent and continued funding for these programs as a tool to help customers better prepare for the future and help the state achieve long term energy and environmental objectives. Additionally, investing in energy efficiency can be more impactful from an economic development perspective. Energy efficiency programs are largely executed by third parties and result in significant local employment benefits including 2,675 direct jobs, $137 million in direct employment income, and 4,280 indirect and induced jobs. Unlike renewable energy development, which adds cost to the system and increases customers bills, properly targeted energy efficiency programs pay for themselves in very short order and lower bills for participating customers, while providing for local jobs.

We believe that natural gas is entering a new era of pricing stability independent of imported oil prices. Because of its cost and environmental benefits, we believe it should be treated as a preferred fuel for space heating. Natural gas emits less than half of the carbon than fuel oil, does not require local storage, and does not require a large fleet of trucks to deliver it. Connecticut is unique in that over half of our residences do not have access to natural gas and instead heat their homes with fuel oil, environmentally much less efficient and increasingly expensive. Over the past three years, new production technologies have been proven to enable gas extraction from shale formations at modest cost, resulting in a substantial increase in recoverable, domestic, natural gas reserves (perhaps as much as 100 year's supply at current consumption levels). This gas provides a tremendous opportunity for Connecticut to cost effectively improve its environmental landscape.

Unfortunately, Connecticut's historical natural gas expansion policies and the resulting constraints embedded in our State's distribution system have resulted in a system that is highly constrained on peak days. The solution to this is the expansion of the state's and region's natural gas systems.

Current policies require a large pool of firm demand (typically a new housing development or a large industrial plant) be created before expansion is justified. Given that residential oil boilers only get replaced stochastically every 20 years or so, it is unlikely that existing developments would ever justify gas distribution expansion under current policies. We believe these structural market issues are not sending the right signals to investors and a pro-active gasification policy could make good economic and environmental sense for the state. Some states, notably North Carolina, have enacted such policies aimed at creating universal access to natural gas supply. This implies a major commitment of state and utility resources and we believe the State should direct the gas LDC's to develop a collaborative 10 year plan to provide a gas service option to every Connecticut residence.

CL&P also believes that plug in electric vehicles (PEVs) could be a very material part of an integrated climate change and energy independence strategy for New England; especially the major urban centers where commute distances are relatively short. Automotive manufacturers have made significant commitments to battery electric (e.g., the Nissan Leaf) and plug-in hybrid or range extended PEVs (e.g., the Chevrolet Volt); most other manufacturers have similar vehicles in development (e.g., Ford, BMW, Mercedes).

A significant conversion to electric transportation could also have significant benefits to the electric system. If the proper mechanisms are put in place and most of the charging occurs at night, system utilization would be improved which would ultimately help drive down rates to our customers. In addition if the charging occurs at night, environmental benefits would be enhanced as the generation fleet used at night time has a cleaner profile. The key is to be able to work with our stakeholders in designing programs and/or incentives to ensure our customers charge during off peak hours.

CL&P will continue its leadership in supporting the roll out of these vehicles with policies and approaches geared to minimize the cost of fuel, infrastructure, and maximize convenience for the PEV customer. The state should guard against proposals whereby third parties pocket the differential between the price of gasoline and the price of electricity, as that fuel savings is the key customer incentive to switch to an electric vehicle. We believe that Connecticut should consider additional incentives to support customers in acquiring these (initially expensive) vehicles, including the potential for an off-peak PEV recharging rate.

We also believe that natural gas transportation will continue to evolve and present an attractive alternative for transportation that is not well suited for electrification, especially for heavy duty fleet vehicles. Our sister company, Yankee Gas Services will continue to work in deploying the proper infrastructure in the state to support increased penetration of natural gas transportation.

CORE METRICS

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April 14, 2011 neubauer@teleport.com

CEAB
c/o CERC
805 Brook Street, Building 4
Rocky Hill, CT 06067

RE: CEAB Roundtable feedback

Dear Sir or Madam:

Thank you for holding Monday's roundtable and inviting follow up comments. I have one observation to offer that doesn't fit neatly in any category.

Among RPS Class III resources, based on my limited understanding, CHP projects have crowded out energy efficiency gains that may have been anticipated. I expect this will continue due to economic advantages of developing CHP for many businesses and large institutions. It won't matter if Class III's target is 4% or the target is raised. In comparison to CHP, energy efficiency opportunities tend to be more diffuse and individually smaller (but large in the aggregate). If Connecticut wants to prioritize energy efficiency, achieving that goal will have to be accomplished through programs other than the current RPS.

Monday's program was very well organized, and the Webinar slides were most informative. Please leave the Webinar online.

Yours truly,

Franklin Neubauer

Franklin Neubauer
Principal

Jennifer Maldonado
Associate Director, Government Relations
Covanta Energy Corporation
445 South Street
Morristown, NJ 07960
Telephone: (862) 345-5246

Via email to gdeans@cerc.com

Mr. Timothy Cole
CEAB
c/o CERC
805 Brook Street, Building 4
Rocky Hill, CT 06067

Dear Mr. Cole:

On behalf of Covanta Energy Corporation ("Covanta"), we are pleased to offer comments on the Roundtable Discussion regarding Connecticut's RPS Policy Objectives. Covanta is a national leader in developing, owning and operating facilities that convert municipal solid waste ("MSW") into renewable energy. Energy-from-waste ("EfW") provides reliable, baseload energy generation, contributes to significant greenhouse gas reductions and provides important fuel diversity. Covanta owns and/or operates over 40 EfW facilities in the U.S., including four (4) in Connecticut.

Covanta supports reform of Connecticut's RPS by eliminating the Class system. The current structure has created an expensive and inefficient renewable market which has ultimately become a job creator for other states.

Connecticut's renewables portfolio standard (RPS) requires each utility to obtain at least 23% of its retail load from renewable energy by January 1, 2020. While the policy remains sound, the structure of the RPS is flawed and unnecessarily limits the types of renewable technologies from which utilities are allowed to buy power. The RPS requires around 20% of the overall 23% goal to be met with technologies which are almost exclusively located out of state, and are largely scarce, and intermittent renewable power. This has led to higher energy prices and little renewable development in –state.

Ironically, and unfortunately, only around 3% of the State's RPS overall 23% goal can be met with in-state, base load power. The result is that Connecticut ratepayers are subsidizing out of state companies, out of state employees and out of state municipalities' local taxes at a premium, and at the expense of in-state companies, employees and local governments.

Ideally, Connecticut should eliminate the Class system in the RPS to reduce costs for ratepayers, to allow for greater competition among the renewable industry and to maintain existing and encourage growth of in-state renewables. This will also provide enough renewable energy for the utilities to meet the State's renewable goals with less or no need to pay penalty payments, which simply drives up costs while contributing nothing to the increased use of renewable energy.

Only 4 percent of Connecticut's Class I renewable power comes from Connecticut. The REC price for Class I is currently $12.75. Conversely, Class II RECs are trading at 55 cents, and that tier is oversubscribed with in-state renewable energy, so not all of the RECs are even being sold. Merging the two classes into one - rather than reducing the goals for Class I - preserves the existing base of renewables while providing incentives for growth. It does this without overburdening Connecticut ratepayers.

A second, potential solution would be to move EfW into Class I. Currently, landfills are considered Class I despite the fact that they generate only 1/10 of the renewable energy from a ton of trash that an EfW facility does. And, instead of mitigating a ton of greenhouse gasses for every ton of trash processed like EfW, landfills are a major source of methane, which is a greenhouse gas 25 times more potent than carbon monoxide. Not only does this policy subsidize out of state landfills, it has the perverse effect of encouraging increased use of them over EfW. Kyoto compliant nations, the United Nations organization leading the fight against Climate Change, and the World Economic Forum all identify Energy from Waste as a key component in producing a low carbon energy future. Moving EfW from Class II to Class 1 would enhance the economics of the program while aligning the RPS policy with the environmental goals and solid waste hierarchy which encourages EfW use over landfill.

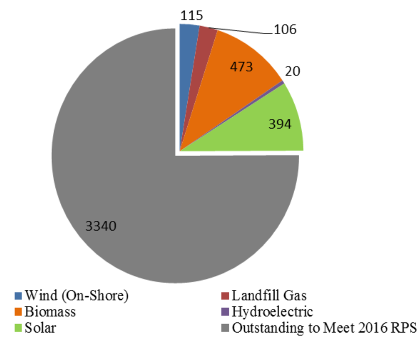
Covanta is proud of its partnership with communities throughout Connecticut. With nearly 200 employees in Connecticut, $4 million in annual local taxes and host community payments paid and over $25 million local goods and services purchased annually, Covanta urges you to consider removing the Classes in the RPS or minimally, modifying it to make EfW a Class I renewable.

Regards,

Offshore Wind: Connecticut's Cost-Competitive, Local and Scalable Renewable Resource

Connecticut (CT) has an outstanding commercial grade offshore wind resource in reasonable proximity to its dominant load centers. Recent technical developments in the scale and efficiency of offshore wind turbines mean that for the first time this clean source of power is available to CT customers: 1) at a cost that is less expensive than the State's other renewable resource options (net of all consumer costs and benefits), 2) without creating a visual impact on coastal communities and 3) while producing new jobs for CT residents.

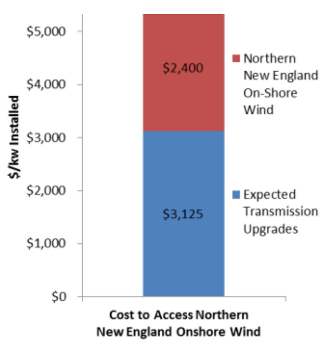
Figure 1: Connecticut's In-State Renewable Energy Potential and 2016 RPS Goal (GWh)



Connecticut's Renewable Portfolio Standard

By January 2020, CT's electric suppliers must obtain 20% of retail load from Class 1 renewable resources.[1] CT's projected cost-competitive, in-state, on-shore renewable energy potential satisfies less than 25% of CT's 2016 renewable energy goal (see Figure 1) and less than 18% of CT's 2020 renewable energy goal.[2]

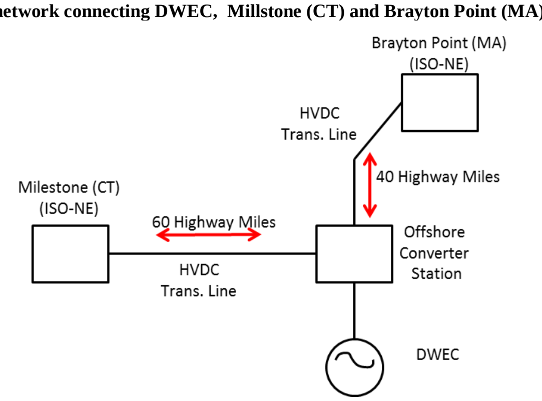
Figure 2: Transmission upgrades may double the cost of on-shore wind



Historically, nearly all of CT's Class 1 renewable generation has been imported from out of state.[3] These remote generators provide limited local benefit: no job creation and limited wholesale price suppression and local emission reductions. Furthermore, there is significant uncertainty regarding the costs of transmission upgrades for CT to meet RPS goals using out-of-state renewable resources. An illustrative comparison based on information from the CEAB's 2010 Procurement Plan indicates that transmission upgrades may more than double the cost of generating and delivering wind energy from northern New England to CT beginning in 2013 (see Figure 2).[4] If CT continues to pursue a RPS strategy that favors out-of-state resources, CT consumers could face approximately $3-4 billion in transmission costs by 2020.[5]

Deepwater Wind Energy Center (DWEC)

Figure 3: Illustrative depiction of the Deepwater Wind transmission network connecting DWEC, Millstone (CT) and Brayton Point (MA)



DWEC is an approximately 1,000MW offshore wind farm under development in federal waters off of RI. In addition, Deepwater Wind is engineering a sophisticated regional submarine transmission network that will allow the wind farm to simultaneously supply wind-generated energy to several states, including MA, RI and CT (see Figure 3). By locating the wind farm approximately 20 miles offshore not only will DWEC avoid creating a visual impact on coastal communities but will also be able to access the much stronger winds that are available far offshore in deep water locations. DWEC will also be the first wind farm to utilize the latest generation of larger (> 5MW) offshore wind turbines (see

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[1] Class 1 resources include solar, wind, fuel cells, methane gas from landfills, ocean thermal, wave or tidal, run of the river hydropower (less than 5MW in capacity) and sustainable biomass facilities.

[2] For Figure 1, in-state renewable energy capacity for all sources except solar is from Sustainable Energy Advantage - Connecticut RPS Webinar on 4/4/11 (Slide 71). Solar capacity assumes that a 300MW solar carve-out in Connecticut's RPS is achievable. Capacity factors to calculate energy generation is from NESCOE RFI Preliminary Results (Biomass: 0.9, Landfill gas: 0.9, Small Hydro: .25, Solar: .15, and Onshore Wind: .32). ISO-NE Regional System Plan 2009 projects Connecticut's RPS for new renewables to be 4,449 GWh by 2016 and 6,509 GWh by 2020.

[3] For instance, in 2007-2008, only 4% of Connecticut's Class I generators were located in-state.

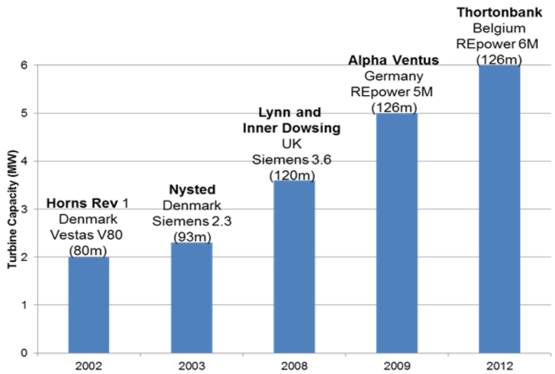
[4] The Connecticut Energy Advisory Board's 2010 Plan assumes transmission cost for wind build-out beyond 2013 levels to be $3,125/kW (2010), the midpoint between the estimates in ISO-NE's Renewable Scenario Analysis. (footnote, pg. 417). The 2010 Plan assumes a $2400 per kW (2010) for on-shore wind projects (pg. 424).

[5] Based on CT CEAB and ISO-NE estimates of $10 billion in transmission costs by 2020 and CT share of New England's RPS demand.

Figure 4) in US waters. As a result of DWEC's large size, use of latest generation turbines, access to stronger winds, and use of a multistate offshore transmission network - DWEC will be able to deliver large quantities of emissions-free renewable power directly to CT ratepayers at prices competitive with or lower than renewable resources located in northern New England.

With CT's support, DWEC could also generate significant economic development benefits for CT through the creation of hundreds of new jobs for the region, in the fabrication and assembly of wind turbine components; the offshore construction and installation of the towers and turbines; and in the operation and maintenance of the wind project and transmission network over its useful life of several decades.

Figure 4: Europe's more mature offshore wind industry is trending toward larger scale turbines (figure on left). Larger-scale turbines are operating successfully in Germany's (Alpha Ventus) and Belgium's (Thortonbank, being installed in figure on right) first offshore wind farms.



Deepwater Wind was selected after a competitive process by the State of RI as the state's preferred developer of offshore wind. The State of Rhode Island and Commonwealth of Massachusetts executed a MOU affirming Deepwater Wind's exclusive right to develop in a defined Area of Mutual Interest. Those two states have supported Deepwater Wind's lease request for DWEC, which was submitted to the U.S. Department of Interior in December 2010.

Developing Connecticut's Offshore Wind Resource: Next Steps

1. ***DEEP Review***. The Department of Energy and Environmental Protection (DEEP), as part of its review of CT's RPS priorities, should consider investigating CT's opportunity to benefit from offshore wind. Specific benefits of having a large, zero emission, and near zero marginal cost resource located close to CT include reduced emissions from conventional fossil fuel plants in CT, reduced wholesale power prices for CT rate payers and important economic development opportunities.

2. ***Long-Term Contracting Law.*** CT should consider a provision that strengthens the utilities' current authority to enter into long-term contracts to procure renewable resources. Key aspects of long-term contracting policy include: 1) utilities should regularly procure renewable resources in close coordination with DEEP and in response to the renewable energy policy priorities established by DEEP; 2) utilities should be provided with a reasonable assurance of cost recovery; and 3) significant and quantifiable costs that are not fully reflected in REC prices (e.g. transmission costs, market price suppression, emissions reduction impacts, and economic development benefits) should be considered in the procurement process.

3. ***Regional approach***. Separate and apart from legislation, DEEP should explore options for coordinating with neighboring states (RI, MA, and NY) to support the development of offshore wind in federal waters off of New England. Applicable organizations include the Atlantic Offshore Wind Energy Consortium[6].

[6] The governors of 10 East Coast states, in coordination with US Secretary of the Interior Ken Salazar, signed a Memorandum of Understanding in June 2010 that formally established the Atlantic Offshore Wind Energy Consortium to promote the efficient, orderly, and responsible development of wind resources on the Outer Continental Shelf.

Kerry E. O'Neill
President
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VIA E-FILING AND U.S. MAIL

April 21, 2011

Tim Cole
C/O: Connecticut Energy Advisory Board
157 Whitney Street, 2nd Floor
Hartford, CT 06105

RE: Written Comments to the Connecticut Energy Advisory Board Regarding the Connecticut Class III RPS

Dear Mr. Tim Cole

Earth Markets, a Connecticut-headquartered company, respectfully submits the following written comments to the Connecticut Energy Advisory Board ("Advisory Board") in response to the request for public comments for RPS stakeholders.

Earth Markets is a Connecticut company that was created to provide <u>residential consumers</u> with innovative, simple, and cost-effective solutions to <u>combat global warming</u> while <u>reducing their energy usage and costs</u>. The company supports the advancement of market-based solutions like the Class III RPS ("RPS") that have the potential to encourage the private sector to invest in energy efficiency projects that benefit the environment, economy, and energy system of our state. Through the Neighbor to Neighbor Energy Challenge, a U.S. Department of Energy Better Buildings supported program, Earth Markets is coordinating an innovative clean energy and energy efficiency project that is assisting residential ratepayers in 14 towns across Connecticut reduc their energy consumption by 20 percent.

To that end, Earth Markets respectfully submits the following written comments.

<u>RPS POLICY RECOMMENDATIONS</u>

With respect to the RPS policy, Earth Markets recommends the following:

- **<u>All Fuels Solution</u>** – whereas energy goes beyond electricity to include natural gas, heating oil, and propane; whereas geothermal and solar thermal should be designated as Class I resources; and whereas an RPS should also support local resources constructed in Connecticut;

  Earth Markets makes the following recommendation:

Recommendation #1 **–** create an "all fuels" REC for Connecticut sited projects only for Class I, II and III renewable resources that equates 1 MWh to 3.412 MMBtus of clean energy produced or energy reduced.

Recommendation #2 **–** classify solar thermal and geothermal as Class I resources.

- **Cap on System Benefit Funds** – whereas an RPS policy is designed to encourage market-based solutions to clean energy and energy efficiency; whereas the system benefit funds in Connecticut (e.g. the Connecticut Clean Energy Fund and Connecticut Energy Efficiency Fund) receive substantial resources from ratepayers to support programs and initiatives that create RECs for RPS compliance; whereas a properly functioning market is one that is transparent and competitive that prevents market power; whereas an RPS has the potential to support entrepreneurs in developing innovative new approaches to advancing clean energy and energy efficiency; whereas the private sector has the potential to deliver a total cost of saved energy or total cost of produced energy lower than the system benefit funds;

Earth Markets makes the following recommendation:

Recommendation #3 **–** establish a cap of 25% on the number of RECs that can be registered on the NEPOOL GIS and sold into the Class I and Class III RPS in any given year by the Connecticut Clean Energy Fund and Connecticut Energy Efficiency Fund respectively.

- **Increase the Class III RPS** – whereas the Class I, II, and III RPS policies collectively cost ratepayers approximately $0.087 per kilowatt hour[1] times the annual RPS percentage; Whereas for each kilowatt hour reduced through the Class III RPS, between $0.13 to $0.19 per kilowatt hour is saved times the annual RPS percentage;[2]

Earth Markets makes the following recommendation:

Recommendation #4 **–** increase the Class III RPS to 20% by 2020 (see Table 1) to go head-to-head with the Class I RPS and to serve to reduce the overall RPS policy costs on ratepayers.

Table 1. Class III RPS Increase to 20% by 2020

Year	Estimated	Target	Estimated	Low – High	Low-High	Low – High

[1] Assumes Class I and III REC price at ACP of $55 and $31 respectively, and $1for a Class III REC.
[2] EIA 2010 for industrial and residential ratepayers respectively.

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	Electric Demand[3] (GWh)		Class III Requirement (MWh)[4]	Policy Cost in Total ($'s MM)	Policy Savings in Total[5] ($'s MM)	Policy Cost by Household ($'s)
2011	29,631	6.0%	1,777,860	17.8 – 55.1	240.6 – 356.0	5 – 17
2012	29,711	7.0%	2,079,770	20.8 – 64.5	287.0 – 424.8	6 – 20
2013	29,390	8.0%	2,351,200	23.5 – 72.9	331.0 – 490.0	7 – 22
2014	29,238	9.0%	2,631,420	26.3 – 81.6	377.8 – 559.2	8 – 25
2015	29,223	10.0%	2,922,300	29.2 – 90.6	428.0 – 633.4	9 – 28
2016	29,335	12.0%	3,520,200	35.2 – 109.1	525.9 – 778.3	11 – 34
2017	29,269	14.0%	4,097,660	41.0 – 127.0	624.4 – 924.1	13 – 39
2018	29,306	16.0%	4,688,960	46.9 – 145.4	728.8 – 1,078	14 – 45
2019	30,000	18.0%	5,400,000	54.0 – 167.4	856.0 – 1,267	16 – 50
2020	30,000	20.0%	6,000,000	60.0 – 186.0	970.2 – 1,436	18 – 56

- **Class III RPS Carve-Out for Residential Ratepayers** – whereas residential ratepayers receive a disproportionately lower benefit from the RPS policy as opposed to commercial and industrial ratepayers; whereas the Class III RPS has the potential to help support deeper energy efficiency measures in households (i.e. insulation, efficiency HVAC equipment, etc.); whereas states like Arizona have created distributed generation carve-outs for residential ratepayers;

Earth Markets makes the following recommendation:

Recommendation #5 **–** consideration should be given to a 50% carve-out for residential rate-payers under the Class III RPS to ensure that households are receiving more value from the RPS policy in comparison to commercial and industrial ratepayers.

- **Class I RPS Carve-Out for Distributed Generation** – whereas over 95 percent of RECs from renewable projects supporting the Class I RPS are being imported from outside of Connecticut (see Table 2); whereas there is a strong desire to see local economic development and jobs created in Connecticut through an RPS policy; whereas Connecticut has a manufacturing industry in fuel cells that could benefit from policies that support local development; whereas Connecticut should pursue a technology agnostic strategy for local clean energy development; whereas states like Arizona have created distributed generation carve-outs for residential ratepayers;

Earth Markets makes the following recommendation:

Recommendation #6 **–** consideration should be given to a carve-out of a to be determined amount in the Class I RPS for Connecticut sited projects involving eligible renewable resources.

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[3] CL&P and UI only

[4] Estimated electricity consumption based on "2009 Forecast of Loads and Resources" by the Connecticut Siting Council. Used 30,000 GWh for 2019 and 2020.

[5] Assumes low electricity price of $0.125/kWh (i.e. C&I) and high electricity price of $0.185/kWh with an inflation rate of 2% a year beginning in 2007

Table 2. Location of Generators Satisfying Connecticut's Class I RPS – Percent and Demand (MWh) for 2007-2008[6,7]

Resource Location	2007 Percent	2007 Demand	2008 Percent	2008 Demand
Connecticut	2.5	27,226	4.0	60,620
Maine	54.8	596,802	45.0	681,977
Massachusetts	3.7	40,295	5.0	75,775
New Hampshire	19.3	210,188	29.0	439,496
New York	6.4	69,700	5.0	75,775
Quebec	-	-	1.0	15,155
Rhode Island	10.2	111,084	6.0	90,930
Vermont	3.0	32,672	5.0	75,775
Other	0.2	2,178	-	-
Total	**100.1**	**1,090,144**	**100.0**	**1,515,505**

PRIMARY RPS OBJECTI VES

Earth Markets believes the primary objectives of an RPS policy are the following (order is of importance):

1. **Create a competitive marketplace for project development** – to create a market-based mechanism that attracts private sector investment to provide additional clean energy and energy efficiency resources beyond what the system benefit funds provide. It should be noted that the Connecticut Department of Public Utility Control in Docket No. 05-07-RE02 made the following decision that conflicts with an RPS being a policy vehicle to provide additional resources that are privately financed:

   > *"Further, the intent of the Class III RPS is to advance energy efficiency projects within the State of Connecticut and have money flow back to the C&LM fund for further investment."*

   Earth Markets believes that the intent of an RPS is not to provide additional sources of funding to the CEEF. If the legislature intended to provide additional funding to the CEEF, it would have increased the ratepayer surcharge for energy efficiency beyond 3 mills. Instead, it is Earth Markets opinion that an RPS is intended to encourage private sector investors to deliver least-cost energy efficiency through competitive and innovative approaches.

2. **Create an innovative financial mechanism that can be used to build new projects** – to ensure that clean energy and energy efficiency can compete economically against conventional sources of electricity generation, the use of a REC as an RPS compliance instrument creates an opportunity for financiers to invest in projects with the expectation

[6] Renewables within the jurisdictions of Delaware, Maryland, New Jersey, New York, and Pennsylvania are also eligible, provided that the DPUC determines that these states have an RPS comparable to Connecticut.

[7] Docket No. 08-09-15 (Annual Review of Connecticut Electric Suppliers' and Electric Distribution Companies' Compliance with Connecticut's Renewable Energy Portfolio Standards in the Year 2007), and Docket No. 09-10-09 (Annual Review of Connecticut Electric Suppliers' and Electric Distribution Companies' Compliance with Connecticut's Renewable Energy Portfolio Standards in the Year 2008).

of a return on investment. Ensuring that the RPS provides a tool for financiers to engage in long-term contracting or sale of RECs is clearly the intent of the RPS policy.

3. **Minimize ratepayer cost impacts** – to ensure that the RPS market is operating at a cost below the maximum alternative compliance payment (ACP), an RPS should seek to achieve its targets at no more than 80% of the maximum policy costs established by statute and regulations. The ACP establishes a policy cost ceiling that the Connecticut legislature is unwilling to expose the Connecticut ratepayer to.

4. **Support local economic development** – to help Connecticut achieve its economic development potential, an RPS should seek to maximize the siting and construction of projects in the state to create jobs.

5. **Provide equitable benefit to ratepayer classes paying for the RPS policy** – to share the benefits across ratepayer classes, an RPS should seek to support projects for residential, commercial, and industrial ratepayers in an equitable manner with respect to the costs they pay into the RPS.

POLICY STRATEGIES

There are several policy strategies that are in place, but not being implemented. If implemented, these policies could positively impact the clean energy and energy efficiency market. The following are a set of policies "on the books" that need to be implemented:

- **Long-Term Contracting** - Section 71(1) of Public Act 07-242 provides a mechanism for the electric distribution companies to procure RECs through a long-term contracting mechanism for not more than 15 years. Realizing the benefits that long-term contracting represents, could provide a useful tool to support new development in Connecticut and the region.

- **Utility Bill Financing** – Section 14(4) provides an opportunity for financing of comprehensive residential energy efficiency measures through the electric and gas bills.

It is important to acknowledge that the passage of public policy doesn't ensure that the outcomes policy-makers seek are being achieved. The successful implementation of those policies is what's important. Implementing the innovative policies we have should be a strategy the state pursues.

IDEAL ENERGY POLICY FOR CONNECTICUT

There are other policy tools beyond an RPS policy that Connecticut might consider to advance clean energy and energy efficiency. Here are a few for consideration:

- **Project 150 for energy efficiency** – through a competitive RFP, Connecticut could identify energy efficiency projects across ratepayer classes that would get financed in a similar manner to Project 150 for clean energy. The most cost competitive and innovative projects would be approved and funding for the projects would be rate-based.

- **Tax breaks for companies that finance clean energy and energy efficiency for its employees** – helping companies provide benefits to their employees in support of clean energy and energy efficiency, could increase the scale at which investments can be made. For example, Yale University is exploring a community carbon fund that would finance local clean energy and energy efficiency projects delivering economic savings to participants in exchange for the carbon offset value resulting from those projects that would be applied to the university's greenhouse gas emissions reduction strategy. If the university, like a company or small business, were to offer a sustainability benefit program to provide funding to its employees to improve the efficiency of their home in exchange for the carbon offset, then more investment could come into the clean energy and energy efficiency market.

- **Encourage the state pension fund managers to finance local clean energy and energy efficiency projects** – given the portfolio approach and long-term nature of pension fund management for state employees, encouraging the treasurer to invest in local clean energy and energy efficiency projects would bring a significant amount of capital into the marketplace.

Please call me at (203) 258-2550 if you require any additional information. Earth Markets looks forward to participating in this docket.

Respectfully Submitted,

Kerry E. O'Neill
President

Bryan T. Garcia
Chief Community Officer

ROBERT FROMER
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April 18, 2011

SENT VIA E-MAIL TO: gdeans@cerc.com

Connecticut Energy Advisory Board
c/o CERC
805 Brook Street, Building 4
Rocky Hill, CT 06067

Re: Comments concerning Roundtable discussion on Connecticut Renewable Portfolio Standard policy objectives

Dear Board Members:

The Connecticut Energy Advisory Board ("CEAB") provided attendees to the Roundtable discussion - held on April 11, 2011 at the headquarters of the Department of Environmental Protection - an opportunity to further discuss the key issues.

QUESTIONS POSED

1. What primary Renewable Portfolio Standard ("RPS") objectives should Connecticut focus on and commit to over the next 5 to 10 years? In addition, rank these objectives in order of priority?

2. How should CEAB define its approach to renewables policy to make it most attractive and rewarding to market participants? Suggestions offered at the Roundtable discussion included:

   a. continuing the RPS (with modifications as desired);

   b. an RPS-plus strategy involving additional components beyond the RPS; or

   c. a completely new approach that is not an RPS?

3. Describe your "ideal" energy policy for Connecticut:

   a. Would it be an RPS (as described in question 2 above)?

   b. Would it involve tiers or carve-outs?

c. How would you take into account the regional RPS market?

d. What would be the best financing mechanism for renewable projects?

4. In addition, provide any other comments or suggestions that you would like to share with the Sub-committee?

BACKGROUND

"Want of foresight, unwillingness to act when acting would be simple and effective, lack of clear thinking, confusion of counsel until the emergency comes, until self-preservation strikes its jarring gong – these are the features which constitute the endless repetition of history." Winston Churchill

The Regional Greenhouse Gas Initiative ("RGGI or Initiative") is a regional effort initiated by the New England states in the Northeastern United States and Eastern Canadian provinces to reduce greenhouse gas emissions. A parallel effort to reduce emissions in the Northeast is the New England Governors/Eastern Canadian Premiers Climate Change Action Plan, which calls for a reduction in greenhouse gas emissions to 10% below 1990 levels by 2019. States participating in RGGI seek to reduce indirectly reduce electricity use and demand by addressing carbon emissions.

The RGGI program includes coal-fired, oil-fired, and gas fired electric generating units that are located in any of the signatory states and that have a capacity of at least 25 megawatts. Under RGGI, between 2009 and 2014, CO_2 emissions from the power sector will be capped at 188 million short tons per year, approximately 4% above the annual average regional emissions during the period 2000-2004. Then, from 2015 and 2018, the cap will be reduced by 2.5 percent per year, resulting in the overall reduction of 10 percent from the power sector by 2019.

Theoretically, policies in the Initiative that reduce electricity demand will likely reduce demand for CO_2 allowances and reduce allowance prices, and thereby reduce the generation-cost differential imposed on RGGI-affected generation units relative to generation units that are not subject to the RGGI cap. To the degree that overall electricity demand in the RGGI region is reduced, the demand for electricity generation not subject to the RGGI cap, and related emissions, should also be reduced.

The Renewable Portfolio Standard ("RPS") and Renewable Energy Credits ("REC") derive from the global effort to "decarbonize" the U.S. electricity sector. For more than a decade, debate over a national renewable energy requirement has been mired in congressional deadlock. More than twenty-five proposals for this so- called federal RPS have been introduced on Capitol Hill, but not one has passed both chambers. Words have been harsh. Opponents of the measure have called it everything from "a new energy tax" to "a huge wealth transfer," from "an unneeded subsidy" to "a major policy blunder." Proponents, by contrast, have been effusive on multiple fronts. In the RPS, they see the United States' energy future as a law that will create jobs, save consumers money, reduce pollution, reduce the cost of capital, and increase our energy security and enhance the reliability of the electricity grid. Both sides' positions thus staked, the result has been predictable: an "ossified" stalemate, a "long congressional deep freeze."

The federal debate is the result of massive state action. Since 1983, more than two-thirds of the country - thirty-six states - have adopted their own RPS laws that require electric utilities to obtain a certain percentage of the energy they sell from renewable resources. This burgeoning trend has led some to deem state RPS's the "epitome of state action in the absence of strong federal support for renewable energy." Indeed, those opposed to a national RPS charge that state efforts represent a regulatory "race to the top" because of federal action.

State governments have adopted a "Balkanized" substitute approach to U.S. energy and climate policy. It is not yet clear, however, whether state energy policy portfolios can generate results in a similar magnitude or manner to their presumed carbon mitigation potential. Results of recent studies reveal that state policy portfolios have modest to minimal carbon mitigation effects in the long run if surrounding states do not adopt similar portfolios as well. The difference in decarbonization potential between isolated state policies and larger, more coordinated policy efforts is due in large part to carbon leakage, which is the export of carbon intensive fossil fuel-based electricity across state lines. Results, also, confirm that a carbon price of $50/metric ton CO_2 can generate substantial carbon savings. Although both policy options - an energy policy portfolio and a carbon price - are effective strategies at currently reducing carbon emissions, neither is as effective alone as when the two strategies are combined.

SOME PERTINENT KEY FACTS

During the Roundtable #3 discussions, Representative Vicky Nardello stated that the required twenty (20) [sic] percent of electric power generation from renewable energy to meet demand by the year 2020 was an arbitrary number selected without benefit of any analysis.

Additionally, Senator John Fonfara stated during the Roundtable #3 discussions that renewable generation comprises less than one percent of total power generation in Connecticut. He, further, stated that it was a narrow sector. And, according to the senator, Connected generates a small amount of renewable power and most renewable electricity received in Connecticut is generated out of state.

Attorney Joseph Rosenthal, legal counsel to the Office of Consumer Counsel, added that the standard was not 20% by 2020 but, rather, 40% of capacity by that time period.

All Roundtable discussions concerned the supply of renewable power without any consideration of demand-side conservation to offset RGGI credit allowances. And, other than my comments, no discussion ensued considering the required energy investment needed over the life cycle of renewable from cradle to grave. Phylipsen, G.J.M., E.A. Alsema, Summary *Environmental life-cycle assessment of multicrystalline silicon solar cell modules*, Department of Science, Technology and Society, Utrecht University, Utrecht (no. 95057)[1].

The Connecticut RPS requires utilities to provide 27 percent of electricity generation from renewables by 2020.[2] Connecticut's RPS requires each electric supplier and each electric distribution company to obtain at least 23 percent of its retail power from renewable energy by January 1, 2020 and to obtain at least 4 percent of its retail supply by using combined heat and power systems and energy efficiency by 2010.[3]

The population of Connecticut is 3.5 million people as against 6.5 billion worldwide constituting ½ of 1% of the world's population. For 2009, the United States produced about 6,000 million metric tons of CO_2 while Connecticut produced approximately 45[4] million metric tons or about 0.8% - a negligible amount.

Total energy consumption = population x per capita consumption. Each factor must decrease for the total to decrease; otherwise, consumption grows at some rate.

The economic model in this state and country is growth based on the false assumptions that natural resources are unlimited and they are not capital rather than steady state economics or economic contraction, which are political third rails

The electric grid serves as a master antenna to the electro-magnetic fields generated by solar eruptions, which induce large amperages capable of massive destruction to electrical and electronic equipment and societal disruptions.

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[1] Available on the Internet at: nws.chem.uu.nl/publica/95057.htm.
[2] Connecticut Department of Public Utility Control, *Connecticut Renewable Portfolio Standards Overview.* Available on the Internet at: http://www.ct.gov/dpuc/cwp/view.asp?a=3354&q=415186 (last visited Mar. 5, 2010).
[3] Database of State Incentives for Renewables and Efficiency, Connecticut Incentives/Policies for Renewables & Efficiency. Available on the Internet at: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CT04R&re=1&ee=1.
[4] Available on the Internet at: www.ct.gov/dep/lib/.../2009_connecticut_ghg_inventory-2010-0127.pdf.

Moreover, the state lacks any guideline or criteria for the acceptable "Quality of Life" and "Quality of Living" as the underpinning for energy policy, planning and programs. *See* Consumption, Everyday Life & Sustainability funded by the European Science Foundation's TERM (Tackling Environmental Resource Management) Programme. (Available on the Internet at: http://www.comp.lancs.ac.uk/sociology/esf/index.htm). It is not enough to merely claim the need to grow the economy and jobs encouraging expanding population and necessitating increased energy consumption without first establishing the minimum and maximum acceptable standard of living.

Electrical-energy demand constitutes about a third of the total energy consumed in Connecticut; the remainder of energy demand is required for residential/commercial/industrial heating and cooling, public and private transportation and other desires / needs, which CEAB does not consider.

ANSWERS

1. THE PRIMARY RPS OBJECTIVES THAT SHOULD BECOME CONNECTICUT'S FOCUS AND COMMITMENT OVER THE NEXT 5 TO 10 YEARS.

Connecticut should abandon RPS and REC as a fool's game accomplishing little in net energy savings of fossil fuels and Green House Gas production relative to global decarbonization with far greater results achievable from a serious "War on Energy Waste." And, energy efficiency without consideration of "Jevon's Paradox," which links increased efficiency to increased consumption limits its intended goal of decreased demand.

A. RANKING OF OBJECTIVES IN ORDER OF PRIORITY?

To rank priorities, there must first exist an objective or subjective basis designed to determine the preferred renewable. No ranking standard exists.

2. CEAB SHOULD DEFINE ITS RENEWABLES POLICY BASED ON GEOPOLITICAL ENERGY CONSIDERATIONS.

Few deny that production of fossil fuels have either peaked or plateaued or will shortly followed by decline. See latest production estimates at the International Energy Agency of the U.S. Department of Energy, Energy Information Agency for estimates of worldwide fossil fuel production. Best estimates are that geopolitically, the 25 million barrels per day that this country imports will lessen considerably in light of declining domestic production. The real issue is whether the efforts by the CEAB and other state agencies to reduce energy consumption and greenhouse gases will contribute any measureable time to extending the time to significant fossil fuel depletion, which substantially alters the energy wasteful American standard of living. In my opinion, I am pessimistic that it will not. The majority of Americans will not relinquish their desires for wealth, convenience and comfort. The time to have altered the course of history was after World War II before suburbia – the geography to nowhere. It is now the eleventh hour and 59 minutes – too little, too late and not enough fossil fuels.[12]

3. MY "IDEAL" ENERGY POLICIES FOR CONNECTICUT.

The Legislature should:

A. First establish standard-of-living guidelines for energy planning;
B. Consolidate all planning under energy planning including solid waste, non-electrical energy demand, state and municipal plans of conservation and development, health plans;
C. Require creation of a strategic master plan of conservation, i.e., a road map, followed by development planning;
D. Discourage population growth with tax disincentives;
E. Create a "War on Energy Waste" with participation by all citizens;
F. Create Municipal Energy Advisory Boards;
G. Create a Municipal Environmental Policy Act modeled on the Connecticut Environmental Policy Act;
H. Require Energy Profit Ratios using life cycle net energy analysis for all new plants generating greater than 5 Megawatts of power; and
I. Require net energy analysis for energy efficiency programs.

4. Other comments or suggestions for the Sub-committee.

Suggest that the Legislature appoint more persons with scientific and technical backgrounds who show up at meeting and demonstrate a willingness to work.

Seriously consider the above before discarding the thoughts, which is more likely than not.

Very truly yours,

Robert Fromer

Robert Fromer

End Notes

[1] FOR RELEASE AT 7:00 P.M. TUESDAY, MAY 14, 1957

Remarks Prepared by

Rear Admiral Hyman G. Rickover, USN
Chief, Naval Reactors Branch
Division of Reactor Development
U.S. Atomic Energy Commission
And
Assistant Chief of the Bureau of Ships for Nuclear Propulsion
Navy Department

For Delivery at a Banquet of the Annual Scientific Assembly of
the Minnesota State Medical Association
St. Paul, Minnesota

May 14, 1957

Energy Resources and Our Future

We live in what historians may some day call the Fossil Fuel Age. Today coal, oil, and natural gas supply 93% of the world's energy; waterpower accounts for only 1%; and the labor of men and domestic animals the remaining 6%. This is a startling reversal of corresponding figures for 1850 - only a century ago. Then fossil fuels supplied 5% of the world's energy, and men and animals 94%. **Five sixths of all the coal, oil, and gas consumed since the beginning of the Fossil Fuel Age has been burned up in the last 55 years.**

These fuels have been known to man for more than 3,000 years. In parts of China, coal was used for domestic heating and cooking, and natural gas for lighting as early as 1000 B.C. The Babylonians burned asphalt a thousand years earlier. But these early uses were sporadic and of no economic significance. Fossil fuels did not become a major source of energy until machines running on coal, gas, or oil were invented. Wood, for example, was the most important fuel until 1880 when it was replaced by coal; coal, in turn, has only recently been surpassed by oil in this country.

Once in full swing, fossil fuel consumption has accelerated at phenomenal rates. All the fossil fuels used before 1900 would not last five years at today's rates of consumption.

Nowhere are these rates higher and growing faster than in the United States. Our country, with only 6% of the world's population, uses one third of the world's total energy input; this proportion would be even greater except that we use energy more efficiently than other countries. Each American has at his disposal, each year, energy equivalent to that obtainable from eight tons of coal. This is six times the world's per capita energy consumption. Though not quite so spectacular, corresponding figures for other highly industrialized countries also show above average consumption figures. The United Kingdom, for example, uses more than three times as much energy as the world average.

With high energy consumption goes a high standard of living. Thus the enormous fossil energy which we in this country control feeds machines which make each of us master of an army of mechanical slaves. **Man's muscle power is rated at 35 watts continuously, or one-twentieth horsepower.** Machines therefore furnish every American industrial worker with energy equivalent to that of 244 men, while at least 2,000 men push his automobile along the road, and his family is supplied with 33 faithful household helpers. Each locomotive engineer controls energy equivalent to that of 100,000 men; each jet pilot of 700,000 men. Truly, the humblest American enjoys the services of more slaves than were once owned by the richest nobles, and lives better than most ancient kings. In retrospect, and despite wars, revolutions, and disasters, the hundred years just gone by may well seem like a Golden Age.

Whether this Golden Age will continue depends entirely upon our ability to keep energy supplies in balance with the needs of our growing population. Before I go into this question, let me review briefly the role of energy resources in the rise and fall of civilizations.

Possession of surplus energy is, of course, a requisite for any kind of civilization, for if man possesses merely the energy of his own muscles, he must expend all his strength - mental and physical - to obtain the bare necessities of life.

Surplus energy provides the material foundation for civilized living - a comfortable and tasteful home instead of a bare shelter; attractive clothing instead of mere covering to keep warm; appetizing food instead of anything that suffices to appease hunger. It provides the freedom from toil without which there can be no art, music, literature, or learning. There is no need to belabor the point. What lifted man - one of the weaker mammals - above the animal world was that he could devise, with his brain, ways to increase the energy at his disposal, and use the leisure so gained to cultivate his mind and spirit. Where man must rely solely on the energy of his own body, he can sustain only the most meager existence.

Man's first step on the ladder of civilization dates from his discovery of fire and his domestication of animals. With these energy resources he was able to build a pastoral culture. To move upward to an agricultural civilization he needed more energy. In the past this was found in the labor of dependent members of large patriarchal families, augmented by slaves obtained through purchase or as war booty. There are some backward communities, which to this day depend on this type of energy.

Slave labor was necessary for the city-states and the empires of antiquity; they frequently had slave populations larger than their free citizenry. As long as slaves were abundant and no moral censure attached to their ownership, incentives to search for alternative sources of energy were lacking; this may well have been the single most important reason why engineering advanced very little in ancient times.

A reduction of per capita energy consumption has always in the past led to a decline in civilization and a reversion to a more primitive way of life. For example, exhaustion of wood fuel is believed to have been the primary reason for the fall of the Mayan Civilization on this continent and of the decline of once flourishing civilizations in Asia. India and China once had large forests, as did much of the Middle East. Deforestation not only lessened the energy base but had a further disastrous effect: lacking plant cover, soil washed away, and with soil erosion the nutritional base was reduced as well.

Another cause of declining civilization comes with pressure of population on available land. A point is reached where the land can no longer support both the people and their domestic animals. Horses and mules disappear first. Finally even the versatile water buffalo is displaced by man who is two and one half times as efficient an energy converter as are draft animals. It must always be remembered that while domestic animals and agricultural machines increase productivity per man, maximum productivity per acre is achieved only by intensive manual cultivation.

It is a sobering thought that the impoverished people of Asia, who today seldom go to sleep with their hunger completely satisfied, were once far more civilized and lived much better than the people of the West. And, not so very long ago, either. It was the stories brought back by Marco Polo of the marvelous civilization in China, which turned Europe's eyes to the riches of the East, and induced adventurous sailors to brave the high seas in their small vessels searching for a direct route to the fabulous Orient. The "wealth of the Indies" is a phrase still used, but whatever wealth may be there it certainly is not evident in the life of the people today.

Asia failed to keep technological pace with the needs of her growing populations and sank into such poverty that in many places man has become again the primary source of energy, since other energy converters have become too expensive. This must be obvious to the most casual observer. What this means is quite simply a reversion to a more primitive stage of civilization with all that it implies for human dignity and happiness.

Anyone who has watched a sweating Chinese farm worker strain at his heavily laden wheelbarrow, creaking along a cobblestone road, or who has flinched as he drives past an endless procession of human beasts of burden moving to market in Java - the slender women bent under mountainous loads heaped on their heads - anyone who has seen statistics translated into flesh and bone, realizes the degradation of man's stature when his muscle power becomes the only energy source he can afford. Civilization must wither when human beings are so degraded.

Where slavery represented a major source of energy, its abolition had the immediate effect of reducing energy consumption. Thus when this time-honored institution came under moral censure by Christianity, civilization declined until other sources of energy could be found. Slavery is incompatible with Christian belief in the worth of the humblest individual as a child of God. As Christianity spread through the Roman Empire and masters freed their slaves - in obedience to the teaching of the Church - the energy base of Roman civilization crumbled. This, some historians believe, may have been a major factor in the decline of Rome and the temporary reversion to a more primitive way of life during the Dark Ages. Slavery gradually disappeared throughout the Western world, except in its milder form of serfdom. That it was revived a thousand years later merely shows **man's ability to stifle his conscience - at least for a while - when his economic needs are great.** Eventually, even the needs of overseas plantation economies did not suffice to keep alive a practice so deeply repugnant to Western man's deepest convictions.

It may well be that it was unwillingness to depend on slave labor for their energy needs which turned the minds of medieval Europeans to search for alternate sources of energy, thus sparking the **Power Revolution of the Middle Ages** which, in turn, paved the way for the Industrial Revolution of the 19th Century. When slavery disappeared in the West, engineering advanced. Men began to harness the power of nature by utilizing water and wind as energy sources. The sailing ship, in particular, which replaced the slave-driven galley of antiquity, was vastly improved by medieval shipbuilders and became the first machine enabling man to control large amounts of inanimate energy.

The next important high-energy converter used by Europeans was gunpowder - an energy source far superior to the muscular strength of the strongest bowman or lancer. With ships that could navigate the high seas and arms that could out fire any hand weapon, Europe was now powerful enough to preempt for herself the vast empty areas of the Western Hemisphere into which she poured her surplus populations to build new nations of European stock. With these ships and arms she also gained political control over populous areas in Africa and Asia from which she drew the raw materials needed to speed her industrialization, thus complementing her naval and military dominance with economic and commercial supremacy.

When a low-energy society comes in contact with a high-energy society, the advantage always lies with the latter. The Europeans not only achieved standards of living vastly higher than those of the rest of the world, but they did this while their population was growing at rates far surpassing those of other peoples. In fact, they doubled their share of total world population in the short span of three centuries. From one sixth in 1650, the people of European stock increased to almost one third of total world population by 1950.

Meanwhile much of the rest of the world did not even keep energy sources in balance with population growth. Per capita energy consumption actually diminished in large areas. It is this difference in energy consumption, which has resulted in an ever-widening gap between the one-third minority who live in high-energy countries and the two-thirds majority who live in low-energy areas.

These so-called underdeveloped countries are now finding it far more difficult to catch up with the fortunate minority than it was for Europe to initiate transition from low-energy to high-energy consumption. For one thing, their ratio of land to people is much less favorable; for another, they have no outlet for surplus populations to ease the transition since all the empty spaces have already been taken over by people of European stock.

Almost all of today's low-energy countries have a population density so great that it perpetuates dependence on intensive manual agriculture, which alone can yield barely enough food for their people. They do not have enough acreage, per capita, to justify using domestic animals or farm machinery, although better seeds, better soil management, and better hand tools could bring some improvement. A very large part of their working population must nevertheless remain on the land, and this limits the amount of surplus energy that can be produced. Most of these countries must choose between using this small energy surplus to raise their very low standard of living or postpone present rewards for the sake of future gain by investing the surplus in new industries. The choice is difficult because there is no guarantee that today's denial may not prove to have been in vain. This is so because of the rapidity with which public health measures have reduced mortality rates, resulting in population growth as high or even higher than that of the high-energy nations. Theirs is a bitter choice; it accounts for much of their anti-Western feeling and may well portend a prolonged period of world instability.

How closely energy consumption is related to standards of living may be illustrated by the example of India. Despite intelligent and sustained efforts made since independence, India's per capita income is still only 20 cents daily; her infant mortality is four times ours; and the life expectance of her people is less than one half that of the industrialized countries of the West. These are ultimate consequences of India's very low energy consumption: one-fourteenth of world average, one-eightieth of ours.

Ominous, too, is the fact that while world food production increased 9% in the six years from 1945-51, world population increased by 12%. Not only is world population increasing faster than world food production but unfortunately, increases in food production tend to occur in the already well-fed, high-energy countries rather than in the undernourished, low-energy countries where food is most lacking.

I think no further elaboration is needed to demonstrate the significance of energy resources for our own future. **Our civilization rests upon a technological base, which requires enormous quantities of fossil fuels.** What assurance do we then have that our energy needs will continue to be supplied by fossil fuels: The answer is - in the long run - none.

The earth is finite. Fossil fuels are not renewable. In this respect, our energy base differs from that of all earlier civilizations. They could have maintained their energy supply by careful cultivation. We cannot. Fuel that has been burned is gone forever. Fuel is even more evanescent than metals. Metals, too, are non-renewable resources threatened with ultimate extinction, but something can be salvaged from scrap. Fuel leaves no scrap and there is nothing man can do to rebuild exhausted fossil fuel reserves. They were created by solar energy 500 million years ago and took eons to grow to their present volume.

In the face of the basic fact that fossil fuel reserves are finite, the exact length of time these reserves will last is important in only one respect: the longer they last, the more time do we have, to invent ways of living off renewable or substitute energy sources and to adjust our economy to the vast changes which we can expect from such a shift.

Fossil fuels resemble capital in the bank. A prudent and responsible parent will use his capital sparingly in order to pass on to his children as much as possible of his inheritance. A selfish and irresponsible parent will squander it in riotous living and care not one whit how his offspring will fare.

Engineers whose work familiarizes them with energy statistics; far-seeing industrialists who know that energy is the principal factor which must enter into all planning for the future; responsible governments who realize that the well-being of their citizens and the political power of their countries depend on adequate energy supplies - all these have begun to be concerned about energy resources. In this country, especially, many studies have been made in the last few years, seeking to discover accurate information on fossil-fuel reserves and foreseeable fuel needs.

Statistics involving the human factor are, of course, never exact. The size of usable reserves depends on the ability of engineers to improve the efficiency of fuel extraction and use. It also depends on discovery of new methods to obtain energy from inferior resources at costs, which can be borne without unduly depressing the standard of living. Estimates of future needs, in turn, rely heavily on population figures, which must always allow for a large element of uncertainty, particularly as man reaches a point where he is more and more able to control his own way of life.

Current estimates of fossil fuel reserves vary to an astonishing degree. In part this is because the results differ greatly if cost of extraction is disregarded or if in calculating how long reserves will last, population growth is not taken into consideration; or, equally important, not enough weight is given to increased fuel consumption required to process inferior or substitute metals. We are rapidly approaching the time when exhaustion of better grade metals will force us to turn to poorer grades requiring in most cases greater expenditure of energy per unit of metal.

But the most significant distinction between optimistic and pessimistic fuel reserve statistics is that the optimists generally speak of the immediate future - the next twenty-five years or so - while the pessimists think in terms of a century from now. A century or even two is a short span in the history of a great people. It seems sensible to me to take a long view, even if this involves facing unpleasant facts.

For it is an unpleasant fact that according to our best estimates, total fossil fuel reserves recoverable at not over twice today's unit cost, are likely to run out at some time between the years 2000 and 2050, if present standards of living and population growth rates are taken into account. Oil and natural gas will disappear first, coal last. There will be coal left in the earth, of course. But it will be so difficult to mine that energy costs would rise to economically intolerable heights, so that it would then become necessary either to discover new energy sources or to lower standards of living drastically.

For more than one hundred years we have stoked ever growing numbers of machines with coal; for fifty years we have pumped gas and oil into our factories, cars, trucks, tractors, ships, planes, and homes without giving a thought to the future. Occasionally the voice of a Cassandra has been raised only to be quickly silenced when a lucky discovery revised estimates of our oil reserves upward, or a new coalfield was found in some remote spot. Fewer such lucky discoveries can be expected in the future, especially in industrialized countries where extensive mapping of resources has been done. Yet the popularizers of scientific news would have us believe that there is no cause for anxiety, that reserves will last thousands of years, and that before they run out science will have produced miracles. Our past history and security have given us the sentimental belief that the things we fear will never really happen - that everything turns out right in the end. But, prudent men will reject these tranquilizers and prefer to face the facts so that they can plan intelligently for the needs of their posterity.

Looking into the future, from the mid-20th Century, we cannot feel overly confident that present high standards of living will of a certainty continue through the next century and beyond. Fossil fuel costs will soon definitely begin to rise as the best and most accessible reserves are exhausted, and more effort will be required to obtain the same energy from remaining reserves. It is likely also that liquid fuel synthesized from coal will be more expensive. Can we feel certain that when economically recoverable fossil fuels are gone science will have learned how to maintain a high standard of living on renewable energy sources?

I believe it would be wise to assume that the principal renewable fuel sources which we can expect to tap before fossil reserves run out will supply only 7 to 15% of future energy needs. The five most important of these renewable sources are wood fuel, farm wastes, wind, water power, and solar heat.

Wood fuel and farm wastes are dubious as substitutes because of growing food requirements to be anticipated. Land is more likely to be used for food production than for tree crops; farm wastes may be more urgently needed to fertilize the soil than to fuel machines.

Wind and water power can furnish only a very small percentage of our energy needs. Moreover, as with solar energy, expensive structures would be required, making use of land and metals, which will also be in short supply. Nor would anything we know today justify putting too much reliance on solar energy though it will probably prove feasible for home heating in favorable localities and for cooking in hot countries, which lack wood, such as India.

More promising is the outlook for nuclear fuels. These are not, properly speaking, renewable energy sources, at least not in the present state of technology, but their capacity to "breed" and the very high energy output from small quantities of fissionable material, as well as the fact that such materials are relatively abundant, do seem to put nuclear fuels into a separate category from exhaustible fossil fuels. The disposal of radioactive wastes from nuclear power plants is, however, a problem which must be solved before there can be any widespread use of nuclear power.

Another limit in the use of nuclear power is that we do not know today how to employ it otherwise than in large units to produce electricity or to supply heating. Because of its inherent characteristics, nuclear fuel cannot be used directly in small machines, such as cars, trucks, or tractors. It is doubtful that it could in the foreseeable future furnish economical fuel for civilian airplanes or ships, except very large ones. Rather than nuclear locomotives, it might prove advantageous to move trains by electricity produced in nuclear central stations. We are only at the beginning of nuclear technology, so it is difficult to predict what we may expect.

Transportation - the lifeblood of all technically advanced civilizations - seems to be assured, once we have borne the initial high cost of electrifying railroads and replacing buses with streetcars or interurban electric trains. But, unless science can perform the miracle of synthesizing automobile fuel from some energy source as yet unknown or unless trolley wires power electric automobiles on all streets and highways, it will be wise to face up to the possibility of the ultimate disappearance of automobiles, trucks, buses, and tractors. Before all the oil is gone and hydrogenation of coal for synthetic liquid fuels has come to an end, the cost of automotive fuel may have risen to a point where private cars will be too expensive to run and public transportation again becomes a profitable business.

Today the automobile is the most uneconomical user of energy. Its efficiency is 5% compared with 23% for the Diesel-electric railway. It is the most ravenous devourer of fossil fuels, accounting for over half of the total oil consumption in this country. **And the oil we use in the United States in one year took nature about 14 million years to create.** Curiously, the automobile, which is the greatest single cause of the rapid exhaustion of oil reserves, may eventually be the first fuel consumer to suffer. Reduction in automotive use would necessitate an extraordinarily costly reorganization of the pattern of living in industrialized nations, particularly in the United States. It would seem prudent to bear this in mind in future planning of cities and industrial locations.

Our present known reserves of fissionable materials are many times as large as our net economically recoverable reserves of coal. A point will be reached before this century is over when fossil fuel costs will have risen high enough to make nuclear fuels economically competitive. Before that time comes we shall have to make great efforts to raise our entire body of engineering and scientific knowledge to a higher plateau. We must also induce many more young Americans to become metallurgical and nuclear engineers. Else we shall not have the knowledge or the people to build and run the nuclear power plants, which ultimately may have to furnish the major part of our energy needs. If we start to plan now, we may be able to achieve the requisite level of scientific and engineering knowledge before our fossil fuel reserves give out, but the margin of safety is not large. This is also based on the assumption that atomic war can be avoided and that population growth will not exceed that now calculated by demographic experts.

War, of course, cancels all man's expectations. Even growing world tension just short of war could have far-reaching effects. In this country it might, on the one hand, lead to greater conservation of domestic fuels, to increased oil imports, and to acceleration in scientific research, which might turn up unexpected new energy sources. On the other hand, the resulting armaments race would deplete metal reserves more rapidly, hastening the day when inferior metals must be utilized with consequent greater expenditure of energy. Underdeveloped nations with fossil fuel deposits might be coerced into withholding them from the free world or they may decide to retain them for their own future use. The effect on Europe, which depends on coal and oil imports, would be disastrous and we would have to share our own supplies or lose our allies.

Barring atomic war or unexpected changes in the population curve, we can count on an increase in world population from two and one half billion today to four billion in the year 2000; six to eight billion by 2050. The United States is expected to quadruple its population during the 20th Century from 75 million in 1900 to 300 million in 2000 - and to reach at least 375 million in 2050. This would almost exactly equal India's present population, which she supports on just a little under half of our land area.
It is an awesome thing to contemplate a graph of world population growth from prehistoric times - tens of thousands of years ago - to the day after tomorrow - let us say the year 2000 A.D. If we visualize the population curve as a road, which starts at sea level and rises in proportion as world population increases, we should see it stretching endlessly, almost level, for 99% of the time that man has inhabited the earth. In 6000 B.C., when recorded history begins, the road is running at a height of about 70 feet above sea level, which corresponds to a population of 10 million. Seven thousand years later - in 1000 A.D. - the road has reached an elevation of 1,600 feet; the gradation now becomes steeper, and 600 years later the road is 2,900 feet high. During the short span of the next 400 years from 1600 to 2000 - it suddenly turns sharply upward at an almost perpendicular inclination and goes straight up to an elevation of 29,000 feet - the height of Mt. Everest, the world's tallest mountain.

In the 8,000 years from the beginning of history to the year 2000 A.D. world population will have grown from 10 million to 4 billion, with 90% of that growth taking place during the last 5% of that period, in 400 years. It took the first 3,000 years of recorded history to accomplish the first doubling of population, 100 years for the last doubling, but the next doubling will require only 50 years. Calculations give us the astonishing estimate that one out of every 20 human beings born into this world is alive today.

The rapidity of population growth has not given us enough time to readjust our thinking. Not much more than a century ago our country the very spot on which I now stand was a wilderness in which a pioneer could find complete freedom from men and from government. If things became too crowded - if he saw his neighbor's chimney smoke - he could, and often did, pack up and move west. We began life in 1776 as a nation of less than four million people - spread over a vast continent - with seemingly inexhaustible riches of nature all about**. We conserved what was scarce - human labor - and squandered what seemed abundant - natural resources - and we are still doing the same today.**

Much of the wilderness which nurtured what is most dynamic in the American character has now been buried under cities, factories and suburban developments where each picture window looks out on nothing more inspiring than the neighbor's back yard with the smoke of his fire in the wire basket clearly visible.

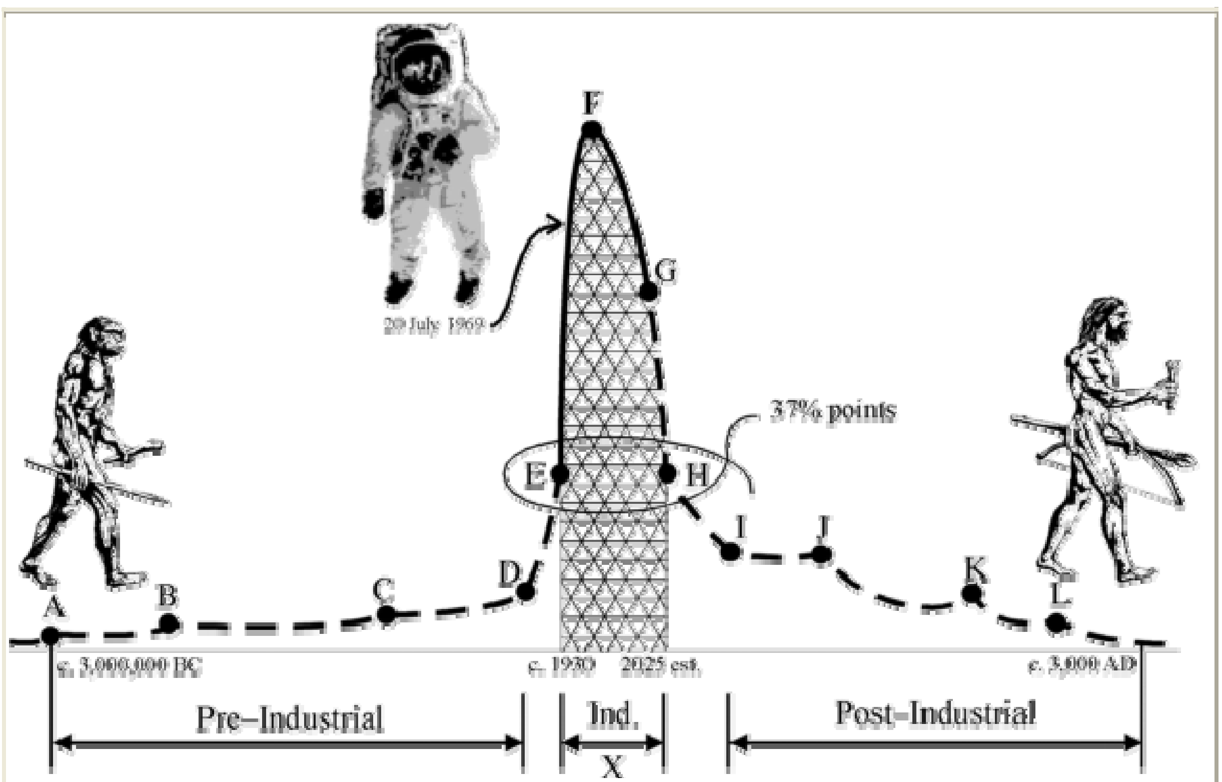
Life in crowded communities cannot be the same as life on the frontier. We are no longer free, as was the pioneer - to work for our own immediate needs regardless of the future. We are no longer as independent of men and of government as were Americans two or three generations ago. **An ever larger share of what we earn must go to solve problems caused by crowded living** - bigger governments; bigger city, state, and federal budgets to pay for more public services. Merely to supply us with enough water and to carry away our waste products becomes more difficult and expansive daily. More laws and law enforcement agencies are needed to regulate human relations in urban industrial communities and on crowded highways than in the America of Thomas Jefferson.

Certainly no one likes taxes, but we must become reconciled to larger taxes in the larger America of tomorrow.

I suggest that this is a good time to think soberly about our responsibilities to our descendents - those who will ring out the Fossil Fuel Age. Our greatest responsibility, as parents and as citizens, is to give America's youngsters the best possible education. We need the best teachers and enough of them to prepare our young people for a future immeasurably more complex than the present, and calling for ever larger numbers of competent and highly trained men and women. This means that we must not delay building more schools, colleges, and playgrounds. It means that we must reconcile ourselves to continuing higher taxes to build up and maintain at decent salaries a greatly enlarged corps of much better trained teachers, even at the cost of denying ourselves such momentary pleasures as buying a bigger new car, or a TV set, or household gadget. We should find - I believe - that these small self-denials would be far more than offset by the benefits they would buy for tomorrow's America. We might even - if we wanted - give a break to these youngsters by cutting fuel and metal consumption a little here and there so as to provide a safer margin for the necessary adjustments, which eventually must be made in a world without fossil fuels.

One final thought I should like to leave with you. High-energy consumption has always been a prerequisite of political power. The tendency is for political power to be concentrated in an ever-smaller number of countries. Ultimately, the nation, which control - the largest energy resources will become dominant. If we give thought to the problem of energy resources, if we act wisely and in time to conserve what we have and prepare well for necessary future changes, we shall insure this dominant position for our own country.

[2] **Figure 1. The Olduvai Theory of Industrial Civilization**



1. Pre Industrial Phase [c. 3 000 000 BC to 1765]

- A - Tool making (c. 3 000 000 BC)
- B - Fire used (c. 1 000 000 BC)

- C - Neolithic agricultural revolution (c. 8 000 BC)
- D - Watts steam engine of 1765 Industrial Phase (1930-2025)

2. Industrial Phase [1930 to 2025, estimated]

- E - Per capita energy-use 37% of peak value
- F - Peak energy-use
- G - Present energy-use
- H - Per capita energy-use 37% of peak value

3. Post Industrial Phase [c. 2100 and beyond]

- J, K, and L = Recurring future attempts at industrialization fail.
  Other scenarios are possible.

[Note 5: In Figure 1, it may be helpful to think of the curve as *income per person per year in dollars.* Or, perhaps, as *material standard of* living. Better yet, just remember the little cartoon folks.]

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April 26, 2011

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Re: April 11, 2011 RPS Roundtable – Supplemental Comments

Ladies and Gentlemen:

We attended the CEAB Roundtable on April 11th with pleasure. The event highlighted the different points of view and approaches of the stakeholders, indicating that "where you stand" on renewable energy policy certainly depends on "where you sit". GE Energy Financial Services makes electric power investments on behalf of GE across a wide spectrum of technologies and seeks to provide both debt financing and equity capital for power projects. In evaluating renewable investments, we include any "renewable energy credits" or similar tradable instruments in our assessment, based on historical prices and our view of the likely market price for those instruments in the future. Among other investments we have pursued, we have recently completed development of a natural gas-fired power facility in Oxford, Connecticut and seek other attractive power investments in the state, as they become available.

State energy policies affect every constituent and, because power facilities are often among the largest public works projects in a state, developing a policy which finds widespread support can be daunting. We appreciate the difficult task which the CEAB and others in Connecticut are engaged in, balancing competing goals to establish effective, reasonably-priced programs. In our view, Connecticut's goals in promulgating a total renewable portfolio standard of "27% by 2020" should be to **improve environmental quality** in the state and **reduce Connecticut's contribution to greenhouse gas emissions**, while **acknowledging Connecticut's limited available renewable resources and load profile**, and using this opportunity to **increase in-state economic opportunity and taxes**. To achieve these goals, policy makers should consider the following:

SOLAR DISTRIBUTED GENERATION - Connecticut regulators should evaluate the potential for distributed solar generation, co-located with commercial or residential load.

Engagement with ratepayers to explain the value of renewable resources, energy efficient appliances and smart meters is a good way to raise awareness of policy goals and the program will create installation and maintenance jobs in the state. The program can be funded through incentives paid for by a *modest* system benefit charge. The size and scope of the program will need to be limited, though to reflect the cost impact of solar generation in Connecticut. Assessing an unlimited system benefit charge unfairly creates winners (who get paid) and losers (who pay), from a similarly-situated group of ratepayers. Issuance of a new class of solar RECs, which could attract interest from private parties based on their value in a regional trading market, could mitigate costs (or increase the size) of the program, by allowing the market to correctly set the price paid for renewable attributes, rather than solely setting the price administratively. For example, New Jersey is currently funding all solar incentives through a solar REC program. By running competitive auctions for SRECs generated over a multi-year period, some New Jersey utilities have significantly reduced their costs to acquire solar capacity. However, without multi-year contracts, SREC prices are likely to be quite volatile (especially since decreasing costs to install solar generation will reduce the need for a REC subsidy for the newest projects). As some of the participants mentioned, very volatile pricing leads to valuation at the lowest end of the price range. To the extent possible, any new solar REC program should work to achieve reciprocity with other states' renewable portfolio standards to provide as large a potential market as possible.

RENEWABLE ENERGY ZONES AND OUT-OF-STATE RESOURCES – While acknowledging that Connecticut's potential for siting high quality renewable resources may be limited, the state can identify niche areas where the availability for renewable power (especially wind) is relatively high. Even 2-3 MW projects will take advantage of economies of scale to reduce overall costs. Special streamlined permitting procedures in these areas can also reduce costs by increasing the likelihood that a developer can get a project built in a reasonable timeframe. Connecticut should also consider the relative costs and benefits of acquiring renewable power regionally, where the renewable resources are greater and cost to construct may be less. This strategy may be advantageous even after considering transmission upgrade costs imposed on Connecticut ratepayers.

Proposed projects, wherever sited, must have a level of revenue certainty to recoup capital costs before they can be funded and financed. Reliance on market mechanisms to fund these projects is a fantasy, especially in the case of intermittent resources, like wind and solar, which are not suited to access capacity markets that require verifiable production on demand, regardless of whether the wind is blowing or the sun is shining. Revenue payments can be assured through a power purchase agreement with one of Connecticut's electric distribution companies. The longer the contract term, the more advantageous financing the project can access, reducing costs. A regulatory request for proposals evaluated based on well-articulated goals will assure that the resources most likely to meet those goals are rewarded with a contract. As Connecticut has a strong retail choice program, its EDCs are concerned that these contract costs might become stranded as load selects other providers. Therefore, the costs of these contracts should either be spread across all ratepayers through a system benefit charge or be imposed on all electricity providers, based on an annual calculation of load served during the term of the contract.

An alternative to a PPA is a feed-in tariff (FIT), where the long term revenues are specified by the state. The Ontario FIT program is a good example of how to get rapid development of the desired resource. In Ontario, developers apply for FIT under a program which includes expedited permitting. The province then determines its development priorities, based on where developed sites exist and its projected electric needs. Developers are assured of a guaranteed payment for 20 years for sites that meet the specified criteria. Developers are encouraged to develop sites in advance of need, awaiting a time when their projects are deemed necessary and can be reimbursed certain development expenses if that date never arrives. Projects developed under the Ontario FIT program are readily financed and have the advantage of allocating the costs of renewable power over all ratepayers. A local content requirement was included in the program to provide incentive for new manufacturing jobs. However, we point out that setting a flat tariff rate reduces the state's ability to target the resources it wants and may raise costs overall, as the price offered may result in a windfall to one project while falling short for another.[1] In addition, European experience with FIT programs has shown that tariffs may need to be adjusted frequently as the cost and performance of available technologies changes, imposing significant administrative costs and creating significant uncertainty for developers.

ADDITIONAL NATURAL GAS – After assessing Connecticut's potential to add reasonably-priced in-state and regional Class I resources in light of resource availability and load requirements, policy makers should readjust the contribution that new natural gas-fired generation can make to satisfying the overall "27% by 2020" goal. This year, President Obama reformulated his proposal for a "clean energy standard" to include half of the capacity of efficient natural gas resources, acknowledging that non-fossil alternatives remain both expensive and intermittent and that recent domestic natural gas discoveries will enable sustained low fuel prices. By displacing oil and inefficient gas plants in the state, a new natural gas resource will significantly reduce emissions of NOx, SOx and greenhouse gases. Such a plant can take advantage of existing pipeline and transmission line infrastructure and can be sited near load to reduce ratepayer electricity costs. A centrally located, utility-scale plant will create hundreds of jobs and property and sales tax revenues. In order to implement this suggestion, the Class III portion of the existing RPS program would be revised to add natural gas-fired resources having enumerated characteristics, such as the ability to reduce existing emissions by a certain percentage. The amount of new natural gas-fired generation would be determined based on the "27% by 2020" goal and the availability of reasonably-priced Class I resources, but should not be less than 500-600 MW, to take advantage of economies of scale for such projects. As is the case with renewable resources, developers of these new assets will require revenue certainty for a period of at

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[1] Note that there are restrictions on the type of FIT program which can be mandated by any state without conflicting with federal preemption over wholesale electric rates. The Federal Energy Regulatory Commission recently clarified that FIT prices based on utility "avoided cost" could be used by a state to set rates.

least 10 years, though longer contracts can materially reduce overall costs by optimizing financing. An RFP run by a state regulatory agency which specifies the desired criteria will assure that the most appropriate resources are selected.

As with non-fossil fueled projects, a Class III-specific REC program can reduce the cost of a PPA. However, because of the magnitude of the capital costs required to complete a utility-scale natural gas-fired power facility, additional conservatism in valuing such RECs will likely prevail and regulatory support such as a floor price, may be necessary.

As many Roundtable participants commented, Connecticut has followed the national trend to regularly recast its clean energy goals and policies. Because power projects of any kind have long development timelines and require very meaningful capital commitments, uncertainty about regulatory follow-through can be challenging for developers and investors. However, complexity of the subject should not be an excuse for regulatory inaction. Instead, Connecticut should take a hard look at its options, given its natural resources and ratepayer requirements, and choose policies that reflect those facts.

We appreciate the opportunity to provide our thoughts on this matter and would be happy to elaborate on the points made in this letter at your convenience.

Very truly yours,

Amy Fisher, Managing Director

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Beyond the Renewable Portfolio Standard:

CT Can Create a Pathway to Renewable Energy & Jobs

The implementation of a Renewable Portfolio Standard was a bold step forward at the time the legislature passed it. It remains a formidable challenge, and one that various energy sector representatives at the CEAB conference interpreted differently and/or would like to see amended in a variety of ways. The conflicting views, including mutually incompatible and contradictory statements expressed within several individuals' own remarks, highlights the astuteness of the CEAB in calling for the conference. The frustration of the current situation was best stated by DPUC Chairman Kevin Del Gobbo, who said quite simply, "Look, tell us what to do and we'll do it."

There are ways to make the RPS more workable, and to give Chairman Del Gobbo a clearer instruction manual on what the state wants & expects in regards to the RPS. Many good ideas were offered by the participants, who sincerely want the RPS to work, and can contribute to its success.

But the advancement of renewable energy technology, reduction of fossil fuels for power, and creation of good jobs in the process are goals that transcend the RPS. Connecticut should have as its goal not simply the attainment of 20% renewable (of any description) by 2020. Our state is not only capable of attaining that goal, but of reframing the state's energy mission, and leading the nation in creating a pathway away from depletable energy and its related pollution and green house effects, to a clean, sustainable and renewable economy that develops innovative green technologies, creates jobs in the process, improves public health & global security, and ultimately lowers energy costs even while making its production greener and more clean.

These steps bring us beyond the modest confines of the RPS, to a "global" view of energy, conservation and efficiency and renewables that represent the same type of bold initiative that originally adopting the RSP required. For purposes of this paper we describe it as "the Pathway."

Several steps should be immediately considered as ways to initiate our journey down this pathway. They include:

1. Energy policy, including measurement of our progress away from dangerous, health damaging, fossil sources, should be encouraged, funded as possible and needed, based on the state's entire energy usage, not just electric power provided through the grid. Innovations in transportation, for instance, or major efficiency or conservation efforts that can achieve reductions in energy usage must be acknowledged, and funded based on the size and significance of their contribution. Further, the energy replacing or conserving features of technologies

and products we create here should be evaluated on their ability and feasibility to enter world markets after manufacture in CT.

2. Connecticut's Pathway Project should prioritize goals and attributes of energy projects (in the broadest definition of what constitutes an 'energy project') by considering how much fossil fuel it replaces, how clean the new technology itself is, and how many direct or indirect jobs it helps support directly or indirectly. Priority should be given to projects that have the potential to lower rather than raise the cost of new energy.

3. The number of permanent and temporary jobs a project creates in CT and the contribution a project makes towards increasing the economic competitiveness of manufacturing in CT should both be considered top criteria for funding projects and be given every opportunity to be developed within CT, including solid university research and non-profit support, state financing and rapid deployment of funds to prevent project migration to other states. Funding should be available not only for power generation, but for efficiency, conservation, non-grid efforts of a significant nature, and transportation energy savings as well.

   Examples might include: the use of cleaner, less expensive fuels to clean up distributed generation emissions, to achieving lower emissions and higher efficiency levels than grid power, enabling lower cost distributed generation and CHP operation 24/7/365 without increased pollution or significant degrading of equipment performance.

4. Projects that dramatically increase efficiencies, and thereby materially reduce the amount of fossil fuel used, even if not renewable, should be given consideration alongside totally green technologies -- with both judged by how much fossil fuel is "displaced," the cost of the economically feasibility of technology that achieves this, and the jobs that result.

5. Measurement of energy in this approach should be done by British Thermal Units or BTU's, a measure that can be used to universally compare energy outcomes. One could re-convert gross energy savings into "Ungallons" and Unbarrels" of petroleum to provide the most easily recognizable popular measure of fuel consumption known to the general public.

6. Success (or lack thereof) for this expanded effort would be measured broadly,

7. To restate what is universally known but perhaps at times forgotten: projects and technologies, whatever the field, that help Connecticut replace significant volumes of oil with efficiency and/or domestically produced clean renewables deserve the highest funding and policy priorities because:

   a) Combustion of oil for energy is the major single contributor to air, water, and particulate pollution, with costly public health consequences;

   b) Oil price instability disrupts the state, US and world economies and prosperity;

c) US dependency on insecure foreign oil supplies are an increasing threat to US national and homeland security.

d) Insecure oil supplies will remain the most likely cause of future wars.

e) Insecure energy supplies make sustained prosperity impossible.

8. Based on the same imperatives, give projects and technologies that replace oil with lower priced, cleaner fuels without impairing the performance of the oil consuming equipment the second highest priority.

   Example: A project that converts engines or other petroleum equipment to lower cost, cleaner natural gas, hydrogen or hydrogen boosted fuels while reducing pollution emissions without materially diminishing efficiency or performance.

9. Finally, the third highest funding and policy priority should go to projects, technologies or equipment that cleanly reduce consumption of other depletable energy resources, lowering emissions while not impairing equipment performance.

Set Asides and Other Considerations:

1. Set aside a portion of available funds for projects and technologies that achieve any of the following:

   a) Substantial increases in the density of safe energy storage, including hydrogen, to enable continual availability of intermittent sources of renewable energy and other purposes.

   b) Increases in the efficiency of storing and retrieving energy including renewables.

   c) Safe, efficient, renewable energy transportation by any mode of transportation.

   d) Economically feasible storage of low cost, off-peak, electric power, for use of same during peak power periods.

   e) Technologies and/or equipment that open large fuel and energy markets to clean renewable energy. Examples: opening existing internal combustion engines to clean renewable fuels or hydrogen boosting natural or landfill gasses. Opening large energy markets to clean renewables creates market pull for renewable energy or fuels attracting badly needed capital investment to grow renewable fuel production.

   f) Development of economically feasible, new lighter weight, longer lasting, stronger or higher conductivity, materials produced with low energy inputs to advance sustainability.

2. Set funding and policy priorities within these groups in accordance with the degree to which a project's performance achieves its purposes and the purposes of the pathway goals.

Funding for a Brighter Future.

Whatever the parameters of a CT Pathway to a sustainable, renewable energy future, those outlined above and/or others adopted by policy makers, this multi-year initiative would be costly, exceeding what could reasonably be expected in public funding from the legislature, state bonds or rate-payer financing, although all those sources of funds could and should be utilized as feasible.

The State of Connecticut should consider utilizing a major source of oil consumption and dangerous emissions – the interstate highway system – as a source for funding a transition to a cleaner and more efficient energy future and assure the public that the funds will be used exclusively for that purpose with a constitutional amendment regarding the use of such funds. These funds would come from collection of an Energy Independence and Job Creating Toll of $1.00 where major highways enter the State to net funds dedicated to the Pathway goals. To further encourage public support for such an initiative, these steps are recommended:

1. Provide a low cost annual pass for daily interstate commuters.
2. Provide literature to toll payers that explain the program and encourages them to contribute additional funds.
3. As the program grows, have electronic signs announcing the number of "Ungallons" of energy CT equipment has produced to date showing toll payers whet they are getting from the toll.
4. Ensure the dedication of the funds to energy efficiency, conservation and renewable energy programs, especially those that sustain or create jobs.

Conclusion

The CEAB's conference proved both the interest in and the difficulty surrounding any adjustments to the RPS. Our conclusion is that a major reason for this conflict is the inadequacy of the RPS to fully address CT's needs to drastically reduce fossil fuel consumption, pollution, and greenhouse gas production, and that opportunities to do so exist beyond the confines of the RPS.

We would therefore recommend a more global analysis and response, focused on the state's overall consumption of fossil fuels, both for power generation and other uses, including transportation. By expanding the parameters to include the full-range of technologies, processes and products generating the profound negative effects associated with fossil fuel, we can then work on a coordinated, prioritized effort to impact any and all these problem areas.

In doing so, Connecticut can indeed chart a "Pathway" to a clean, sustainable, energy future, generating jobs both in these fields, and by working to ensure that clean energy is also affordable energy that expands our manufacturing base.

Submitted by,

John W. Harrity [electronic signature]
Director
GrowJobsCT

Bill Garrett [electronic signature]
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American Hydrogen Association

April 25, 2011

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April 21, 2011

Mr. Timothy Cole
Vice Chair
Connecticut Energy Advisory Board
c/o CERC
805 Brook Street, Building 4
Rocky Hill, CT 06067

VIA EMAIL AND FEDERAL EXPRESS

RE: Joint Comments of the Connecticut CHP Developers on Connecticut's RPS Policy Objectives

Dear Mr. Cole:

Enclosed are the Comments on behalf of the Connecticut CHP Developers on Connecticut's RPS Policy Objectives.

If you have any questions or require additional information, please contact us. We appreciate your consideration of our concerns. Thank you.

Very truly yours,

McNEES WALLACE & NURICK LLC

By Susan E. Bruce

SEB:mas
Enclosure
c: Mr. James S. Schneider, Kimberly-Clark Corporation (via email)
Mr. Daniel J. Donovan, NuPower LLC (via email)

BEFORE THE
CONNECTICUT ENERGY ADVISORY BOARD

Joint Comments of the

Connecticut CHP Developers

on

Connecticut's RPS Policy Objectives

April 21, 2011

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Introduction

More than a decade ago, Connecticut first established its Renewable Portfolio Standards ("RPS"). Since that time, Connecticut's RPS policy has evolved to stay abreast of changes in the renewable energy market. Under current RPS requirements, the State's electricity suppliers must serve a certain percentage of their retail load from qualifying renewable energy resources. In promulgating an RPS policy, Connecticut sought to promote the deployment of certain environmentally preferred resources in the region, as well as foster energy independence through direct customer investment in distributed generation resources and energy efficiency.

Connecticut's RPS policy initially recognized only two types of qualifying renewable resources: Class I, which includes energy derived from solar and wind power, fuel cells, and landfill methane gas; and Class II, which includes trash-to-energy facilities, as well as certain biomass and run-of-the-river hydropower facilities. With the passage of Public Act Nos. 05-01 ("Act 05-01") and 07-242 ("Act 07-242"), Connecticut expanded its RPS policy by adding Class III resources to the list of qualifying renewable resources and imposing upon the State's suppliers corresponding minimum purchase obligations. Class III includes distributed generation resources using Combined Heat and Power ("CHP") technology and conservation and load management ("C&LM") resources.

In 2006, the Department of Public Utility Control ("DPUC") established the framework for implementing Connecticut's then newly promulgated Class III RPS. Over the past five years, Connecticut has experienced great success with the deployment of numerous Class III resources throughout the State. More recently, however, the supply of Class III Renewable Energy Credits ("RECs") has quickly and significantly outpaced demand. This and other issues related to Connecticut's RPS have prompted the Connecticut Energy Advisory Board ("CEAB") to spearhead a comprehensive study of Connecticut's RPS, including the Class III program and the development of viable alternatives to ensure Connecticut attracts and retains the categories of resources embedded in the RPS at the lowest cost to Connecticut ratepayers.

Kimberly-Clark Corporation ("K-C") and NuPower LLC (together, "CHP Developers") recognize that important and complicated issues are embedded in the State's RPS requirement and thus appreciate the CEAB's leadership in investigating these issues and engaging policy makers, market participants, and other interested stakeholders in this process. As developers of distributed generation resources utilizing CHP technology, CHP Developers have invested significant capital throughout the State, and welcome the opportunity to provide comments that will inform the CEAB's Study as it pertains to Class III resources.

The recent flood of Class III RECs threatens the continued success of Connecticut's Class III program and realization of underlying policy objectives. To address the oversupply of Class III RECs, targeted changes to the existing Class III market structure are necessary. The existing Class III market structure is not sustainable to support Connecticut's Class III policy objectives.

An approach that is narrowly tailored to remedy the supply-demand imbalance in the Class III market structure is most likely to minimize market uncertainty and avoid a chilling effect on Class III investments.[1] While supportive of CEAB's study of Class III issues and the identification of modifications to enhance the long-term success of the Class III market, CHP Developers firmly believe that immediate near-term relief is equally necessary. This is particularly important to address the challenges faced by CHP resources that were encouraged by Act 05-01 and have relied upon the Class III program to support continued operations in Connecticut.

The purpose of these Comments is to identify the limitations of the current Class III program and provide guidelines for meaningful reform to realize the policy objectives underlying Connecticut's Class III RPS, including the development and retention of CHP resources.

<u>Connecticut's Class III Policy</u>

Act 05-01 established Connecticut's Class III RPS by classifying CHP-based generation units and C&LM projects as Class III resources and creating incentives to spur investment in Class III resources. These incentives include the Class III trading platform, along with other incentives, such as monetary grants, natural gas delivery charge waivers, and standby charge waivers. Act 05-01's creation of a new class of qualifying renewable energy resources and offering of

[1] *See* Bob Grace, Sustainable Energy Advantage, LLC, *Webinar: Connecticut's RPS Policy Report: A Common Starting Point* (Apr. 4, 2011) at 28, *available at* www.ctenergy.com (hereinafter, "RPS Policy Report") (noting that unstable political or regulatory support results in a perception that investments are at-risk).

incentives to support investment in, and operation of, Class III resources suggests that Connecticut's Class III program was designed to advance the development and retention of environmentally preferred resources in Connecticut, namely, distributed generation resources using CHP technology and C&LM resources. In doing so, a primary focus of lawmakers was to mitigate ratepayers' energy costs. Both types of Class III resources are cost-effective means for Connecticut to meet its environmental goals and, at the same time, support Connecticut businesses that seek to reduce their energy costs and remain in the State. In considering appropriate market reforms, it is important to remember the policy goals underlying Connecticut's Class III RPS program and ensure that proposed changes advance these goals.

In Act 05-01, the General Assembly set forth various incentives, including the Class III REC trading program, designed to stimulate the development of Class III resources as a means of mitigating energy costs for Connecticut ratepayers. By promoting Class III renewable energy sources, Connecticut sought to encourage investment in the State's energy infrastructure, thereby improving the efficiency of electricity production, avoiding more costly investment in conventional generation, and placing downward pressure on energy costs in the State.[2]

Also implicit in Connecticut's Class III program is the intention to promote economic development in the State. Unlike Class I and Class II resources, Class III resources must be located within Connecticut. Due to this geographic requirement, Class III resources positively and directly impact Connecticut's economic development by attracting capital investment, creating and maintaining jobs, and providing energy cost management opportunities to retain business and industry. To date, approximately 221.5 MW of Class III CHP generating resources alone are located in Connecticut,[3] compared to only 4% of Class I resources.[4] Thus, the Class III program has a particularly positive impact on Connecticut's economy.

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[2] The higher efficiency of CHP translates into lower operating costs, reduced emissions of all pollutants, increased reliability and power quality, reduced grid congestion, and avoided distribution losses. *See* U.S. Environmental Protection Agency, Combined Heat and Power Partnership, *Efficiency Benefits* at www.epa.gov/chp/basic/efficiency.html.

[3] *See* Connecticut Department of Public Utility Control, *Listing of Approved and Pending Declaratory Rulings and Applications*, at http://www.ct.gov/dpuc/cwp/view.asp?a=3354&q=415186.

[4] *See* RPS Policy Report at 58.

The Class III program supporting CHP-based renewable resources, in addition with other incentives made available by Act 05-01, further promotes economic development in Connecticut. The opportunity to invest in CHP-based generation resources has enabled many energy-intensive Connecticut businesses to remain in the State, despite the fact that Connecticut's energy costs are among the highest in the nation. CHP-based generation resources provide an important energy cost management tool for energy-intensive Connecticut businesses, which improve energy efficiency, reduce the overall cost of doing business, bolster competitiveness, and promote job retention and creation.[5]

The Class III program, particularly with respect to CHP resources, serves as an important economic development tool for the State. Any changes to the Class III program must be consistent with the legislative intent inherent in Act 05-01 to promote Connecticut's economy through Class III resource development.

Class III Market Mechanics

Under Connecticut's Class III RPS, electricity providers must obtain a minimum percentage of their retail load using renewable energy from Class III energy sources. The Class III requirement began at 2% of non-municipal load in 2008, increased to 3% in 2009, and leveled off at 4% for 2010 and beyond. The General Assembly established a Class III trading platform to provide these environmentally favored resources with a stable revenue stream to offset their initial capital investment and support their ongoing operation.

The Class III trading platform is a price-setting mechanism that establishes prices using a combination of elements that are market-like and others that are administratively determined to achieve particular policy objectives. Demand is artificially set by a function of a percentage of load and artificial price floors. The administratively determined elements of the Class III platform recognize that the market alone does not support investment in Class III resources, particularly capital-intensive CHP resources. The administratively determined aspects of the Class III market are designed to achieve pre-determined policy objectives while replicating

[5] *See* Jamie Howland & Derek Murrow, Environmental Northeast, and Lisa Petraglia & Tyler Comings, Economic Development Research Group, Inc., *Energy Efficiency: Engine of Economic Growth*, p. 4, *at* http://www.env-ne.org/public/resources/pdf/ENE_EnergyEfficiencyEngineofEconomicGrowth_FINAL.pdf (Oct. 2009).

market-like pricing outcomes. To the extent that the Class III trading platform is not achieving the intended policy goals, then active administrative intervention – not a *laissez faire* approach – is necessary. Public policy fails if there is no recognition that the administratively determined program is not achieving intended objectives. Other states have recognized that shortcomings in administratively determined markets require legislative solutions and have adjusted their RPS over time.

Importantly, the Class III "market" includes administratively determined safeguards, such as a price floor of 1¢ per kilowatt-hour, that ensure stable revenue streams necessary to encourage development of new, and support the ongoing operation of existing, Class III resources. Lawmakers' foresight in including the price floor has prevented current Class III REC prices from completely collapsing. To provide continued assurances to investors in Class III resources, a price floor, or a mechanism that achieves similar goals of revenue support, must be retained.

The Growing Class III Imbalance in Connecticut

A serious supply-demand imbalance has emerged in the administrative program supporting Class III RECs that undermines Connecticut's energy independence and economic development objectives. In 2010, the yearly supply for Class III credits far exceeded the statutory demand.

2010 Estimated Demand for Class III Credits = 1.2 million RECs

2010 Actual Class III Supply = 1.9 million RECs

700,000 Excess RECs Generated in 2010[6]

Of the 1.9 million Class III RECs, 66% (or approximately 1.2 million) were produced by C&LM programs and the remaining 34% (or approximately 700,000) were produced by CHP resources.[7] Thus, in 2010, CHP resources generated only a small fraction of Class III RECs; C&LM programs created the vast majority. An explosion in the number of C&LM projects in the

[6] *See generally* NEPOOL Generator Information System, GIS Certificate Statistics at http://www.nepoolgis.com.

[7] *Id.*

State appears to be a key driver in the emerging imbalance between supply and demand for Class III RECs.

- **Enhancement of the C&LM Program**

The Class III program imbalance coincides with the DPUC's implementation of Act 07-242, which clarified various aspects of the ratepayer-supported, utility-administered C&LM programs. In the ensuing years, Connecticut has experienced a significant increase in Class III credits. As a result, prices for Class III RECs have plummeted from a monthly average of nearly 2.5¢/kWh in early 2009 to $1¢/kWh today, if they can be sold at all.[8] Thus, the flood of Class III RECs from the utilities' C&LM programs has depressed the value of Class III credits to the extent a willing buyer exists.

- **Failure To Increase Class III RPS Requirements**

The negative impact of the expanded Class III definition has been compounded by the fact that the Class III RPS requirement, which already was significantly lower than the Class I and II requirements, was not increased to accommodate the additional resources. The Class III requirement began in 2008 at 2% of non-municipal load, increased to 3% in 2009, and leveled off at only 4% of non-municipal load for 2010 and beyond. By contrast, the Class I RPS requirements for 2010-2020 span from 7% up to 20% of non-municipal load. With no annual statutory increase in the RPS requirement as with other resource classes, a serious oversupply condition exists now and will only increase in the future as C&LM projects continue to create Class III credits.

<u>Dangers of a Saturated Class III REC Market</u>

The Class III market provides an important source of revenue for Class III resources, particularly those utilizing CHP technology, to offset project development costs and support ongoing operations. The flood of Class III RECs has significantly depressed market prices, resulting in Class III RECs selling at the statutory floor price or remaining unsold. A weakened or seriously compromised Class III trading market undermines the General Assembly's intent to create a

[8] RPS Policy Report at 56.

stable revenue stream for Class III RECs, as demonstrated by the statutorily mandated one-cent-per-kilowatt-hour floor on Class III REC prices.[9] Saturation of the Class III market chills investment in new Class III resources for both CHP and C&LM projects. Consequently, steps must be taken to effectuate the General Assembly's intent to create a stable revenue stream for Class III RECs as a way to encourage the development and/or operation of independently funded Class III resources, particularly with respect to CHP resources. Absent action to correct the supply-demand imbalance, Connecticut will not attract new Class III resources and risks retaining existing ones.

The current Class III market conditions may have a disproportionate impact on the development and operation of CHP resources (as opposed to C&LM resources) because of the different capital requirements for these resources. Many C&LM projects require an upfront capital investment to cover the cost of installing energy efficiency and conservation measures and minimal funding for ongoing operations. By contrast, CHP resources represent "iron in the ground" and demand significantly higher capital investment to bring such a project on-line as well as to continue operations. Moreover, the higher level of capital investment makes CHP developers more sensitive to long-term revenue predictability.[10] Due to the capital-intensive nature of CHP resources, incentives offered under Act 05-01, including the Class III trading program, are crucial to the continued investment in Class III resources and realization of the public benefits produced by these resources.[11]

Unlike CHP resources, C&LM projects receive financing from Connecticut's C&LM Fund. The customers of Connecticut's electric distribution companies contribute to the C&LM Fund through a surcharge on their electric bills. As a result, C&LM projects receive financing produced by the C&LM surcharge, in addition to the revenues generated by Class III RECs.

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[9] *See* Public Act No. 07-242, § 42(a).

[10] *See* RPS Policy Report at 62.

[11] Dragoljub Kosanovic, *et al.*, *The Influence of Distributed Energy Resources on the Hourly Clearing Price of Electricity for an Industrial in a Restructured Market, p. 4 available at* http://files.harc.edu/Sites/GulfCoastCHP/Publications/InfluenceDistributedEnergyResources.pdf (finding that all components of locational marginal price – energy, congestion, and marginal losses – improve when a CHP unit is installed on the grid).

Consequently, C&LM projects may be better insulated from the crash in Class III REC prices due to the additional revenue stream provided by the C&LM Fund, although C&LM projects require significantly less capital investment than their fellow Class III resources.

CHP Developers' concerns about the Class III price collapse and not being able to sell the credits to support continued economic operation are not unfounded. By way of illustration, K-C was encouraged by Act 05-01 to develop and construct a 35 MW CHP system, which qualifies as a Class III resource, at K-C's New Milford Mill. In assessing whether to develop the CHP project, K-C weighed the capital costs of the project and the cost of purchasing natural gas to fuel the CHP unit against the potential revenue streams, including sales of Class III RECs, that could assist in defraying a portion of K-C's capital investment and ongoing operating costs.

Based on the projected annual production of approximately 200,000 RECs and an average price of $25 per MWh, K-C's cost-benefit analysis assumed $5 million would be available for this purpose. The collapse of Class III REC prices to $10 per MWh has resulted in a dramatically reduced revenue stream of $2 million, assuming that K-C's Class III RECs can be sold at all. The devaluation of Class III REC prices has significantly increased K-C's costs to operate its CHP and extended its payback period. Other Connecticut businesses, including the CHP Developers, that invested in CHP, encouraged by the Class III program, are similarly adversely affected.

As a result, the oversupply of Class III RECs and the corresponding price deflation, if left uncorrected, is likely to deter new investment in CHP resources and negatively impact the Connecticut businesses that relied upon a predictable and stable Class III market to justify their investment in Connecticut CHP resources. The increased costs of CHP operation also jeopardize businesses' ability to invest in their core business, contrary to Act 05-01's objectives. To the extent that the Class III program was devised to support energy-intensive Connecticut businesses' ability to remain competitive, if not attract economic expansion for those Connecticut businesses investing in CHP, its collapse means that Act 05-01's and the General Assembly's positive economic development goal is frustrated.

Thus, the Class III program oversupply and the imbalance between C&LM and CHP resources within the Class III program are vital economic development issues for CHP developers that relied upon the Class III program to support their investment in CHP as a tool to control energy costs and remain competitive in the State. In addressing the oversupply of Class III RECs, it is important to protect the interests of these CHP resources who were among the first to navigate Connecticut's then fledgling Class III program and now find themselves exposed to the unintended consequences of the success, particularly with respect to C&LM projects, of the Class III program.

Suggestions for Class III Market Reform

To date, Connecticut has successfully deployed its Class III program to achieve these public interest objectives, but this program is threatened by an inundation of C&LM resources. Immediate action to correct the Class III supply-demand balance and modify certain other administrative rules is essential for Connecticut to continue to attract and retain CHP and C&LM resources in the State. Absent a robust Class III market, Connecticut risks not attracting new Class III resources as well as not retaining existing Class III resources. Such an outcome directly contravenes the clear legislative mandate to foster the development and continued operation of Class III resources within the State. Furthermore, failure to encourage Class III resources also fails to serve the public interest by depriving Connecticut ratepayers of an important cost management tool and thus limiting the opportunity to procure renewable energy in a cost-effective manner.

Because the Class III trading platform is a hybrid of market principles and administrative intervention, pure market principles alone cannot be reasonably relied upon to correct the existing and growing oversupply of Class III RECs. Current policy has stimulated the supply of Class III RECs, particularly from C&LM resources, without making corresponding adjustments to the demand side of the equation. Given that supply and demand for Class III RECs are created by legislative fiat, a *laissez faire* approach would merely result in a deepening imbalance. Legislative reform is necessary to restore supply-demand balance in the Class III market. Absent reform, Connecticut jeopardizes its ability to attract and retain Class III resources, which may have harmful economic development impacts

Many approaches may appropriately address the issues caused by the Class III imbalance, and CHP Developers respectfully suggest the CEAB consider the following:

1. Update the current Class III RPS

    a. Immediately increase the Class III RPS requirements in order to promote a healthier balance between supply and demand in the Class III market.[12]

        - *Increasing RPS requirements would result in a corresponding increase in demand for Class III RECs and more reasonable trading pricing for Class III RECs.*

    b. Continue to gradually increase Class III RPS requirements beyond 2013 in parallel with Class I RPS requirements.

        - *Encouraging reductions in retail load by promoting Class III resources, particularly baseload CHP units, reduces the amount of energy that must be procured from higher-priced Class I and Class II resources. This outcome facilitates cost-effective procurement of renewable energy supply and comports with Connecticut's policy of mitigating energy costs for Connecticut ratepayers.*

    c. Ensure a level playing field by reviewing and making consistent the measurement and verification ("M&V") protocols applied to all Class III resources.

        - *Whereas energy savings claimed by CHP resources must be independently verified (i.e., evidenced by an affidavit from an independent licensed engineer) no parallel requirement appears to apply to C&LM resources. In fact, it is unclear whether C&LM resources are subject to any type of third-party verification process.*

    d. Increase the Alternative Compliance Payment ("ACP") that each provider of electricity must pay if it is deficient in meeting its Class III RPS requirements in order to promote supply-demand equilibrium in the Class III market.

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[12] CHP Developers support interim increases of 6% for 2012 and 8% for 2013, as proposed in Raised Bill No. 1081, *An Act Concerning Class III Renewable Energy Credits.*

- *Despite the growth in the supply of Class III RECs and changing market conditions, the ACP has not been adjusted to reflect current market conditions since it was originally established.*

2. Impose a cap on the number of RECs that may be earned by ratepayer-funded C&LM projects based on differences in M&V methods for CHP and C&LM resources. This would narrow the gap between supply and demand for Class III RECs by providing a meaningful check on the Class III REC surplus. Alternatively, divide Class III RECs into separate sub-classes for CHP and C&LM resources to allow for comparable treatment of similarly situated resources.

3. Sunset C&LM projects' ability to earn RECs after two years due to the different M&V standards to account for the different M&V standards between C&LM projects and CHP resources as determined by the Department of Public Utility Control.

4. Establish a graduated pricing scheme for Class III RECs based on useful life of a generating resource. Under this scenario, Class III RECs may be valued at X cents in Year 1, and be subject to a pre-determined adjustment over the course of its useful life, which considers factors such as investment level, energy savings, and economic development, among others.

CHP Developers are amenable to considering other options to solve the dilemma posed by the success of the Class III program to date.

Conclusion

CHP Developers commend the CEAB's leadership in the investigation of Class III market issues and exploration of viable solutions to correct the supply-demand imbalance. As discussed herein, it is vitally important that the State act to address these Class III market conditions and the negative effects of such conditions, particularly with respect to attracting new Connecticut projects and retaining existing CHP projects that contribute significantly to the State's economy. We appreciate the Committee's dedicated efforts to promote Connecticut's energy independence and develop innovative approaches to support economic growth in the State, while simultaneously supporting the State's environmental goals.

STATE OF CONNECTICUT

CONNECTICUT ENERGY ADVISORY BOARD

RE: POST-SEMINAR RENEWABLE	:	
PORTFOLIO STANDARD	:	
POLICY QUESTIONS	:	APRIL 21, 2011

OFFICE OF CONSUMER COUNSEL'S RESPONSES TO POST-SEMINAR POLICY QUESTIONS POSED

The Office of Consumer Counsel ("OCC") hereby submits its responses to the questions posed following the April 11, 2011 Seminar.

1. **What do you see as the primary RPS objectives Connecticut should focus on and commit to over the next 5 to 10 years? In addition, please rank these objectives in order of priority.**

Connecticut should focus on its renewable energy objectives rather than something called "renewable portfolio standard" or "RPS" objectives. RPS requirements are one tool that can be used to reach Connecticut's renewable energy objectives, but they have not proven to be an effective tool for building new, local renewable energy capacity.

Connecticut should decide (i) what premiums, over the projected price of ordinary power, it is willing to pay for new, renewable energy capacity; and then (ii) develop either request for proposal ("RFP") processes or feed-in tariffs that will lead to the "purchase" of such capacity. It is possible that the premiums just mentioned could legitimately be different for different types of renewables. For example, there perhaps could be a different premium for baseload renewables that use fuel (fuel cells, biomass) than for intermittent renewables (wind, solar) that do not use fuel. The size of the premiums is a policy choice that would balance ratepayer costs against the environmental, economic development, and other benefits of renewable energy.

Feed-in tariffs should be used, in OCC's view, only for small projects (perhaps 5 megawatts and under) where the administrative burden of performing active rate regulation is unwarranted. For larger projects, Connecticut should develop renewable energy capacity using RFP processes and the long-term "contract for differences" structure developed by the Department of Public Utility Control pursuant to Connecticut General Statutes § 16-243u. Such processes have led to the financing and development of new, efficient peaking capacity in Middletown, Devon, and New Haven. The financing for the peaking plants occurred during what was perhaps the worst financing environment since the Great Depression because of the excellent contractual design. Under this structure, renewable energy plants would have a strong opportunity to earn a reasonable rate of return, but ratepayers would be protected from paying for excessive profits that can occur at times due to market rule design flaws or unexpected occurrences. Conversely, the renewable energy plants would be protected from a sudden loss of expected revenues, and this protection benefits the project, ratepayers, and financiers by avoiding payments to insure against undue risks.

As an aside, OCC notes that feed-in tariffs, if used, could and arguably should be structured as contracts for differences as well, to avoid running afoul of FERC's exclusive jurisdiction over wholesale power rates. Contracts for differences are financial contracts that do not lead to the direct sale or purchase of power.

Since such renewable energy contracts or tariff arrangements would be entered into as a matter of state public policy and on behalf of all ratepayers, the costs and benefits of such contracts/tariffs should be designed to flow equitably to all Connecticut ratepayers through a non-bypassable charge on ratepayer bills.

Now, some might say that this approach of promoting renewable energy projects that fit under a certain premium level is a way of not building renewable energy at all. OCC has a different view. The premiums can be set at high or low levels and adjusted to reflect the circumstances. If a premium of X fails to yield significant renewable energy and fossil fuel pricing were to increase in unexpected ways, the premium could be change to 1.5X and a new RFP process held to develop projects that might come under that premium. Moreover, an analysis of the costs of new renewable energy projects should not ignore the potential price suppression benefits of renewable energy on regional markets. For example, a wind project may look significantly more expensive than a natural gas project on a capital cost per megawatt basis, but the wind project, since it does not use fuel, might bid as a price taker in the energy market and possibly avoid the dispatch of a plant with expensive fuel costs, thereby mitigating the market clearing price. Such factors are not at all easy to quantify but conservative estimates of these effects can be used.

In addition to request for proposals for large renewable projects and feed-in tariffs for small renewable projects, OCC would also support in principle the continuation of pilot projects for new technologies.

As to the list of benefits of completing renewable energy projects, such benefits would include economic development, air quality, power reliability, and promotion of new and sustainable technologies. The hedge benefits of renewables (building renewables as a hedge against fossil fuel prices) have declined of late due to the stabilization of natural gas supply and pricing, but the hedge benefits may still exist on a long-term basis. OCC does not have a firm preference as to which of these benefits should get priority, but OCC has a special interest on behalf of its ratepayers in replacing old, inefficient power plants with new, efficient and cleaner plants.

2. How should we define our approach to renewables policy to make it most attractive and rewarding to market participants?

In terms of building new capacity, OCC is fairly certain, based on its experience to date, that the regional markets coupled with the RPS requirements will <u>not</u> lead to the construction of renewable energy plants where needed, when needed, particularly if "where needed" is interpreted to include Connecticut. One flaw of the ISO New England energy markets is the flaw that environmental externalities are ignored. Without taking externalities into account, the ISO New England markets, even if they worked perfectly, might only lead to natural gas plants being built and financed. The Regional Greenhouse Gas Initiative and RPS requirements have not been able to overcome this flaw, and renewable energy credit ("REC") income has proven too volatile in price to lead to effective financing and project development, in most cases. Thus, we are seeing and will see (most) renewable energy plants built if and only if they have a long-term power purchase agreement. Under such a ratepayer backstop, which OCC accepts (see # 1, above), the value of RECs is not actually leading to project development (the power purchase agreement is doing that), so REC value should come back to the ratepayers.

In other words, under a long-term contract approach, ratepayers are indeed taking on a good deal of the risk of project development and financing, so income streams that are risky or volatile should also be shifted to ratepayers, leaving the project with more stable (and appropriately limited) sources of income.

More generally, though, if RECs are indeed not going to lead to project development, what is their use? They may have little use other than as support for projects that exist today and that rely on REC value to stay in business. If RPS policy is changed significantly, then we should look at a "grandfathering" program to be fair to existing resources.

For most renewable developers, we believe that a long-term contract (for large projects) or a feed-in tariff (for smaller projects) would be very attractive if structured well. With effective regulation such approaches would lead to: (i) renewable projects being built on the ground, not just on paper; (ii) fair compensation for the plant (if well-operated); and (iii) fair costs for the ratepayers.

3. Please describe your "ideal" (renewable) energy policy in Connecticut.

OCC has described one effective policy approach above in the answers to the above two questions. More generally, we should embrace science and abandon "policy by slogan." "20% by 2020" is a slogan. The level was selected, as far as OCC is aware, without the rigorous analysis that is now a hallmark of Connecticut electricity decision-making processes, including the integrated resource planning process and the request for proposal process that led to the aforementioned peaking plants. Under OCC's recommended approach, you basically build renewable energy projects that are priced under selected cost premiums and decline to build projects that are above the premiums. Connecticut should indeed want to build renewable energy at some costs, but not at all costs.

Moreover, we should acknowledge the limited benefits to Connecticut of renewable energy projects to our North and East. OCC fears that the cost of building transmission lines to renewable energy projects well to our north and east will lead to a large flow of dollars out of Connecticut. Connecticut would share in any reduction of global carbon emissions of such projects but there would be little or no direct benefits to Connecticut's air quality from such projects. Ideally, if Connecticut's dollars are going to support out-of-state renewable energy projects, it would be better for such projects to replace some coal capacity to our west and south, as the prevailing winds come from those directions.[1]

In OCC's view, the RPS approach ideally would be replaced with the "acceptable premium" approach outlined above. The RPS is simply not likely to lead to projects where we would like them or when we would like them, provides no assurance of project development and provides only limited protection against excessive costs. RECs and RPS were a valiant effort to create a market and let the "invisible hand of the market" pick projects. However, we can better harness the benefits of competition by conducting "request for proposal" processes for long-term contracts. In either the REC approach or the RFP approach, the demand is manufactured, so there is no loss in theoretical validity from the RFP approach. What you gain from the RFP approach is greater certainty of project development and better cost containment for ratepayers. This in turn could help Connecticut achieve the critical energy goal of a more diversified portfolio without material increases to the price of power.

4. In addition, please provide any other comments or suggestions that you would like to share with the Committee.

OCC appreciates the opportunity to provide these comments and looks forward to contributing to further discussions on the CEAB RPS Review Subcommittee.

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[1] Prior versions of the RPS statute allowed renewable sources in Pennsylvania, New Jersey, Maryland and other nearby states to count as Class I (without requiring that the energy be actually delivered to New England). To the extent that the change in the statute will lead to Maine projects rather than Pennsylvania projects, for example, that may prove not to be in Connecticut's best interest from an air quality perspective.

Respectfully submitted,

OFFICE OF
CONSUMER COUNSEL

By: [signature]
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Comments of RENEW to the Connecticut Energy Advisory Board RPS Sub-committee following the April 11, 2011, Roundtable Discussion on Connecticut RPS Policy Objectives

Overview

Renewable Energy New England, Inc., RENEW, is a non-profit association uniting the renewable energy industry and environmental interest groups whose mission involves coordinating the ideas and resources of its members with the goal of increasing sustainable renewable energy generation in New England which has abundant renewable energy resources. RENEW's membership is comprised of the American Wind Energy Association, Conservation Law Foundation, First Wind Energy LLC, Horizon Wind Energy LLC, Iberdrola Renewables, Inc., Union of Concerned Scientists and Vestas American Wind Technology, Inc.

RENEW's membership currently includes several large-scale wind project developers. While these comments reflect a considerable amount of their experiences, RENEW believes that other renewable resources, like solar, have an important role to play in helping the state meet its renewable energy goals. The comments expressed herein represent the views of RENEW and not necessarily those of any particular member of RENEW.

RENEW takes the following positions on Connecticut's Renewable Portfolio Standard ("RPS"): (1) the current RPS targets are attainable in a cost-effective manner and, with respect to renewable generation, should not be changed; (2) the definition of a Class I resource should not be modified as it promotes the most sustainable forms of renewable generation resources; and (3) requiring the electric distribution utilities ("EDCs") to enter into long term contracts with renewable energy developers for RECs, energy and capacity will ensure the most renewable resources are developed at the least cost.

With the states of Connecticut and Massachusetts representing the overwhelming amount of New England load, their RPS policies send a strong signal to investors that they should develop in our region. Weakening the RPS requirements will be interpreted by many as Connecticut turning its back on the RPS and its original objectives.

The Benefits of Renewable Energy

New England has the ability to fulfill its renewable energy goals from resources within its borders. According to the 2009 New England Governors' Renewable Energy Blueprint, "There is a vast quantity of commercial-scale and advanced untapped renewable resources in the New England region; this includes more than ten thousand 10,000 MW of on-shore and off-shore wind power potential. Even if developed at conservative levels, there are ample renewable resources to enable New England to meet renewable energy goals and to reduce reliance on carbon-emitting generation." We still have nine years to develop these resources to meet the 2020 RPS goals and we can do so in a cost-effective manner.

Large scale wind energy is an affordable resource with upfront capital costs comparable to new coal or nuclear power plants, even before accounting for all environmental externalities. The benefits of wind energy, which include its relatively low cost, potential to reduce wholesale electricity prices, local and regional economic development, and incomparable environmental sustainability, make it a preferable resource for diversifying our electricity system.

What will it take for Connecticut to meet cost effectively its 2020 RPS goal without changing the definition of a Class I resource or lowering the target percentage? For one, stable and consistent state energy policy, including siting laws and RPS targets, are instrumental to achieving compliance by providing developers and investors with the confidence to build renewable generation in Connecticut and throughout New England. Second, support for large renewable energy projects should be accomplished by requiring the EDCs to enter into long term contracts with them for their energy, RECs and capacity, using competitive solicitations. For smaller utility scale renewable projects a feed-in tariff designed to provide long term payments is a more appropriate mechanism as it standardizes and simplifies contracting and regulatory approval requirements that might otherwise constitute large impediments to small developers. RENEW recognizes that some resources that can benefit from long term contracting, like solar, cannot compete economically with wind and may require a carve-out to enable them to compete. Any additional support for emerging technologies like solar should protect ratepayers by being set at the lowest cost possible and decline over time in proportion to the increasing cost effectiveness of the resource.

Connecticut has over 3,000 MW of aging generation capacity, including coal and oil, nearing the end of its useful life of which most or all is likely to be retired by 2020. The State has an opportunity now to transition to new more efficient and cleaner gas and renewable resources. With gas the preferred fuel choice in New England as the best approach to satisfy state and federal environmental requirements, adding more renewable energy ensures the system is not completely dependent on gas. The electricity system should consist of a portfolio of resources. Over dependence on any one or two forms can leave ratepayers susceptible to fuel price shocks and volatility. Since renewable resources like wind energy do not have any fuel costs, they have the potential to help stabilize prices over the long-run. Moreover, during peak winter months, generation diversity can also provide a reliability benefit by ensuring sufficient gas is able to meet the twin demands of space heating and electric generation.

Priority: Low Cost

RENEW is sympathetic to the concerns for protecting consumers from unreasonable compliance costs relating to the RPS. While the 2010 Connecticut Integrated Resource Plan ("IRP") stated that New England needs to add approximately 4,800 MW of new renewable generation to meet its collective 2020 Class I renewable energy targets, RENEW believes we can meet the region's RPS goals in a cost-effective manner without changing the definition of Class I resources.

First, the concern over the cost of RPS compliance arises in large part out of the estimates provided by the EDCs for the 2010 IRP. As Sustainable Energy Advantage explained in its presentation on April 4, 2011, given in conjunction with the CAEB's comprehensive review of Connecticut's RPS, compliance cost estimates have been "materially overstated."

Second, on-shore wind projects are already economically competitive for energy. Massachusetts utility NSTAR recently entered into long term fixed price contracts to buy electricity from two RENEW members to help it meet the requirements of the Massachusetts RPS. NSTAR will buy power from locations in Massachusetts, Maine, and New Hampshire. The costs for Energy, RECs and capacity under the contracts are lower than the forecasted market price for all years of the contract. Independent sources estimate the cost at less than 10 cents per kWh. And well before the 2020 deadline we are likely to see cost-competitive, off-shore wind power, with the potential for jobs in southeastern Connecticut, come to Connecticut, Rhode Island and Massachusetts from the waters beyond Block Island.

Third, renewable energy projects can also reduce wholesale electricity prices. Competitive wholesale electricity markets, like any other commodity market, set prices based on the most expensive resource necessary to meet demand. With wind energy having little operational costs and no fuel costs, it is among the cheapest resources to run. It can reduce wholesale prices by making it unnecessary to dispatch more expensive resources with higher operational and fuel costs. A 2010 ISO New England report prepared by GE showed that 20 percent wind energy penetration in New England could reduce the average annual Locational Marginal Price in the region by up to $11 MWh depending on the location of the wind plant.

The most ambitious targets in the RPS are for Class I resources in order to facilitate the development of *sustainable* renewable *generation* resources that would not be built without the support of RECs. While it may be tempting to modify the definition of Class I resources to allow for large hydroelectric facilities to be included, to do so would actually waste ratepayer money. As NSTAR and Northeast Utilities, who are looking to facilitate the importation of Canadian hydroelectric power through their Northern Pass transmission project, recently pointed out in the Massachusetts proceeding on their merger, the RPS was designed to "support the development of renewable generation that is unable to compete on price with conventional generation. Large-scale hydroelectricity is not viewed as needing these types of subsidies because it may be the lowest cost source of clean power available." Giving large hydroelectric resources ratepayer REC money not only unnecessarily enriches those resources but it undermines the primary goal of the RPS: the support of *sustainable* renewable energy development. The redirecting of rivers and flooding of vast amounts of land that comes with building large hydroelectric projects has significant negative environmental impacts. It harms fish, displaces native peoples, releases mercury into the environment, and for years after the flooding even releases carbon dioxide. Another short cut to meeting the Class I would be move energy efficiency into the Class I category. This change would be counterproductive. The attainment of robust energy efficiency targets is as worthy a goal from an economic and environmental perspective as building renewable generation. However, counting energy efficiency as a Class I resource will simply depress Class I RECs and make it more difficult to finance renewable generation projects. With energy efficiency projects having a substantially lower cost structure, it will, to the detriment of ratepayers, provide those projects with access to higher REC prices than is available in its current Class III category and necessary to support those projects. The most effective and proven tools for advancing energy efficiency are direct public and private investment in those resources through efforts like the award-winning Connecticut utility programs and zero or low interest loans to ratepayers to enable efficiency improvements. Instead of weakening renewable energy investment and creating a false "competition" between complementary resources by adding efficiency to Class I these proven and powerful tools should be forcefully deployed to foster energy efficiency and conservation.

For Connecticut to achieve the most economic path to meet its RPS objectives by the year 2020 RENEW believes the state's top priority should be to support the development of sustainable renewable projects by requiring the EDCs to offer feed-in tariffs for smaller projects and to enter into long term contracts with large scale renewable energy developers for energy, RECs and capacity through a competitive solicitation to achieve the lowest cost for ratepayers. A guaranteed contract or tariff rate with a creditworthy counterparty provides developers with access to financing or lower cost financing because lenders see the project as less risky. Long-term contracts are one way for buyers such as EDCs to soften future price increases by locking in costs today's historically low gas and REC prices. These contracts would in turn encourage developers to make investments in Connecticut and New England presently, instead of waiting for REC and gas prices to rise over time as RPS obligations increase.

Prior to the passage of Public Act 98-28- Connecticut's electric restructuring law-investments in electricity generation were made by vertically integrated utilities and paid for through a regulatory approved rate-of-return set by the Department of Public Utility Control. Most power plants in Connecticut recovered their capital costs through this mechanism. As a result, virtually every single power plant in operation today had its capital costs guaranteed either by ratepayers or through a federal mandate.

Electricity competition has, however, never properly addressed revenues necessary to promote new investments in the electricity sector. Any new power plant, to achieve revenue adequacy, whether it is a wind farm, a new coal or new nuclear power plant will need to generate revenue above the current wholesale market price of electricity. This is because existing power plants only need a wholesale electricity price high enough to cover their operating costs, while new investments must account for both their operating costs and capital costs. As a result, investments in new technologies cannot properly be evaluated simply by comparing their "costs" to the wholesale price of electricity. Rather, it is important to assess all the benefits a new technology provides for ratepayers.

The legislature recognized this issue when it adopted Public Act 07-242, *An Act Concerning Electricity And Energy Efficiency*, which modified the state's electric competition model to allow for competitive cost of service generation development to lower peak energy prices. Insufficient peaking generation was causing higher customer costs and the need to operate old and more polluting units at peak times. The legislature recognized that the market was not able to get generation built without direct ratepayer support. While the legislative goals of the 2007 were met, RENEW believes that, generally, a competitive solicitation for long term contracts betters serves the economic interests of ratepayers. Unlike under the cost of service model the developer must adhere to the terms of the RFP and cannot assess ratepayers for cost overruns.

Although renewable energy projects will cause ratepayers to pay a premium above the wholesale cost of energy – as they would for any new power plants investment – these same rate-payers receive numerous benefits for doing so. Only renewable energy resources like wind and solar can guarantee a long term (over 10 years) fixed price. Fossil fuel plants, by contrast, will not take the risk of guaranteeing a fixed price due to uncertainty around energy commodity prices or, at best, must adjust their pricing under any long-term agreement to account for future long-term fuel price risk in the form of a significant premium.

* * *

RENEW believes Massachusetts' renewable energy policies can serve as a model for Connecticut as it seeks to create an "ideal" energy policy. Section 83 of the Massachusetts Green Communities Act ("GCA") has been successful at securing large quantities of renewable energy using long term contracts for energy and RECs. Under Section 83, each EDC must solicit proposals from renewable energy developers at least twice during a five year period for RECs and/or energy. If reasonable proposals are received, the ECDs must enter into contracts with developers that are 10 to 15 years in length. RENEW believes that this is the best process for developing renewable energy projects larger than at least one megawatt. By using an RFP the EDC can eliminate projects already constructed or that did not need a long term contract to secure financing.

The CGA protects the EDCs from financial risk through a combination of financial incentives and a cap on contract volume. The CGA allows the EDCs to receive annual remuneration equal to four percent of the annual payments under each contract to compensate the EDCs for the financial obligations incurred for accepting the contracts. Each EDC may cap contract volumes at three percent of total demand from its distribution customers and reject proposals from developers that might place an unreasonable burden on the EDC's balance sheet.

Beyond the abundant health and environmental benefits of renewable energy, the criteria the EDCs use to select contracts must ensure that projects benefit ratepayers by increasing electric system reliability, reducing peak load demands and being cost-effective. Where possible the accepted proposals must provide economic development benefits for the Commonwealth.

While only one of the three contracts NSTAR awarded will go to a project built in Massachusetts, there are economic benefits to consumers even if a project is not built in the state. NSTAR had originally conducted a solicitation, later withdrawn, for renewable energy resources located only in Massachusetts. The final RFP that was not limited to in-state resources resulted in the weighted average price of the projects being about 40 percent lower than the in-state only solicitation. This reduction represents a savings of $139 million to its ratepayers. While the development of power plants can produce new temporary construction jobs, the gains can be lost if higher electricity prices force business to relocate out of state. Lower energy prices in themselves can help retain or create new jobs.

The NSTAR RFP demonstrated that a solicitation for long-term renewable contracts will provide the most competition and therefore the lowest prices. According to NSTAR, the EDC received proposals for 74 projects totaling 2,513 MW or 7.5 million MWh while all but seven of the bids complied with the eligibility and threshold requirements it set. The cost of energy and RECs was lower than the market forecast under each of the three contracts with savings ranging from $15 million to $139 million.

Thank you for the opportunity to offer RENEW's views on Connecticut's RPS.

Sincerely,

Francis Pullaro
Executive Director

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April 20, 2011

Tim Cole, Vice Chair
CT Energy Advisory Board
805 Brook Street, Building 4
Rocky Hill, CT 06067

RE: CT RPS Policy

Dear Tim,

Thank you for allowing me to participate in the CEAB RPS roundtable discussions on 4/11/11. Per your request I am pleased to offer the following comments.

From my perspective as a project developer, owner and operator the primary problems with the RPS are:

1) price is volatile thus it cannot be relied on. Need a revenue stream that we can show to the bank as being reliable.

2) price is too low, Class I is currently only $13 (1.3 cents/kWh), Class II is virtually $0.

3) most CT Class I REC’s are generated out of state which means CT ratepayers are paying for out of state projects.

4) administering the qualification, accounting, purchase and sale of REC’s is burdensome, particularly for small projects.

Simply put I believe that the primary RPS objective should be to restructure the system so that project developers have a consistent, reliable and substantial revenue stream. Ideally this would be as follows:

-Consistent – the price should not vary more than 20%
-Reliable – the price should be guaranteed for 15 years
-Substantial – the price should be at least 3 cents/kWh
-Simple – make qualification and administration easy

In addition it would be good to somehow structure things so that Class I REC’s are generated primarily in CT.

I realize this is a simplistic approach but one idea is to abandon the RPS structure in favor of a fund that provides a fixed $/kWh payment to renewable projects for X years. This could be administered through our existing CT Clean Energy Fund. The fund would need to be structured so it is protected from the routine raiding that sometimes occurs during times of state budget crunches.

We need only look as far as our friends in Canada to model a successful program. Canada is now 60% renewable and they are expanding at an enviously fast rate. I recommend that we consider replicating one or both of the following programs:

1) *“Canada’s Ecoenergy for Renewable Power Program”,* (do a google search of these words), provides fixed $/kWh payments for 10 years. $1.48 is being invested.

2) *“Ontario Canada Feed In Tariff”* (do a google search of these words), Labeled as north America’s first Comprehensive guaranteed pricing structure for renewable energy. This FIT has resulted in 2,600 MW of renewables currently under contract or with contract offers. It provides fixed payments ranging from 10 to 80 cents/kWh depending on the technology.

To promote local jobs the Ontario FIT has specific requirements for domestic content requirements which stipulate which equipment and activities must be from Ontario. There has been opposition on this based on trade agreements but the requirements still stand.

In terms of pricing and incentives we do not believe that there should be a wide disparity in the amounts provided to the various technologies. We also believe that there is a limit and renewables should not be promoted “at any cost”. No renewable should be paid an incentive as high as 8 cents/kWh. We also don’t think, for example, that PV deserves more incentives than other technologies. All Connecticut renewables provide common benefits; displacement of fossil fuels and local jobs.

Although this is a bit out of the realm here I’m going to mention it anyway; the current Connecticut regulations regarding CCEF funding requires hydro projects to obtain qualification from the so called Low Impact Hydro Institute (LIHI). This is a burdensome and unfair process that projects are being forced to comply with in order to receive any CCEF funding. We should eliminate this requirement to be consistent with Class I requirements. LIHI is a group of private individuals that have devised a system that they believe determines if a project is low impact or not. It is too “litmus test type” and it does not balance the positive benefits that all projects provide. In addition the LIHI qualification process is burdensome because it requires a significant amount of paperwork and has an initial and on going fees that amount to thousands of dollars even for very small projects.

In terms of policy I would like to see renewables promoted to the maximum practical extent and I would like our state agencies to be required to properly balance all of the positive direct and indirect benefits of projects (eg socio economic and environmental) when formulating opinions and comments on proposed projects.

Thank you for the opportunity to comment.

Duncan Broatch
President

cc: Gretchen Deans, CEAB

Appendix B: **Submitted Stakeholder Comments on the Draft Review of Connecticut Renewable Portfolio Standards Report**

The following Stakeholders submitted written comments to the Connecticut Energy Advisory Board on the Draft Review of Connecticut Renewable Portfolio Standards Report. Their full comments follow.

Boralex, Inc.

Connecticut Department of Transportation

Connecticut Fund for the Environment

Connecticut Light & Power

Connecticut Resources Recovery Authority

Environment Northeast

Local Government Coalition for Renewable Energy

McNees Wallace & Nurick LLC (on behalf of Kimberly-Clark)

Renewable Energy New England (Renew)

BORALEX

June 17, 2011

CEAB
c/o Gretchen Deans
805 Brook Street, Building 4
Rocky Hill, CT 06067
gdeans@cerc.com

RE: Comments of Boralex on the draft Review of Connecticut's Renewable Portfolio Standards

Thank you for the opportunity to comment on the draft review of RPS policy in Connecticut. We will begin with a few general comments and then dive into a few specifics in the order in which they are presented in the paper.

General Comments

First, your hard work is appreciated in this process. The task before you is large, complicated, and involves many stakeholders. This draft review is a major step forward in addressing the issues at hand in Connecticut. One of the main points of your review is that there should be additional research and analysis to determine if alternative mechanisms could truly improve upon the existing RPS. We agree that foundational studies are necessary so that policymakers understand the consequences of the renewable energy decisions they face. We also agree with the idea to include a formal review cycle so that the newest research can be incorporated in a transparent and predictable manner.

Specific Comments

Findings and Recommendations:

1. The characterisation of biomass as a "non-renewable technology" is incorrect. Perhaps this was an oversight in the drafting of this finding or a simple case of misleading wording in the text. But, to be clear, every single state RPS defines biomass as a renewable resource. Entities such as the Environmental Protection Agency, the Department of Energy, the Green-e Energy National Standard, and many others refer to biomass unambiguously as renewable. We believe

that in an important document such as this RPS review, the first finding should be careful not to accidentally mischaracterize renewable technologies.

11. We believe that there is a reason that a majority of states have initiated a multi-tier RPS. In particular, solar, wind, and advanced biomass would simply be overwhelmed by large scale hydro and municipal solid waste projects. The result of a 1-tier RPS would be a very different portfolio of assets with very little room for growth and innovation in the future.

16. We agree strongly with this finding that a portfolio approach of some long term contracts and short term "spot market" RECs is likely to be an efficient way to share risks and benefits of going-forward investments to meet the RPS.

Recommendation B: We generally agree with this recommendation, particularly the point that alternative approaches need to be fully studied first. However, we would amend the recommendation slightly to point out that any direct comparison between a new approach and the existing RPS needs to take into account the uncertainty of the new program and the wariness incurred by the renewable industry due to a change in course.

Recommendation C: We agree that any process for review and potential change should be well-planned and transparent. The program should not be changed in a haphazard process, but rather through a rational analytical process with ample time for all parties to plan and make investment decisions.

27. While this is a general document, we would like to take a brief moment to specifically point out that some out-of-state projects do in fact bring material economic benefit to Connecticut. Biomass facilities can and do contract with Connecticut enterprises for fuel and logistical services. Other cases such as in-state companies with out-of-state wind resources certainly exist.

28. It is not clear that this impact on electricity rates would be true once we take into account the reduction in wholesale prices that occur due to zero or low marginal price generation in the bid stack.

39. Continuing from our comments to finding #28, we agree with the finding that the introduction of low and zero marginal cost generation may lower wholesale energy prices. In fact, we would argue that these facilities not only "may" but "do" lower wholesale energy prices. There is also a reference in this finding to the work of Dr. Felder regarding the potential of capacity costs and RECs to be higher as a result of an RPS. Without having had the ability to read the source material, we find it very difficult to understand how the existence of an RPS could have an effect on REC prices. It appears to be untrue by definition. It is also unclear to us how capacity prices could be increased as a result of extra capacity inserted into the system by renewable generators. Perhaps it would be helpful to add additional information about this source study to explain this counter-intuitive result. Alternatively, the language could be eliminated from this finding.

Economic Impact Analysis

Generally, we agree with the approach of analyzing multiple scenarios against a baseline case (here, called "Comparison Scenario"). The one specific confusion we have in this analysis is with respect to the Flat RPS scenario. If the Comparison Scenario establishes the price of RECs to be $0, then a Flat RPS scenario shouldn't have a deflationary impact on electricity prices over time. In other words, a flat demand for a $0 product doesn't cost less than an increasing demand for a $0 product. Furthermore, in agreement with finding #39, a flat amount of RECs would mean that there are fewer zero or low marginal cost facilities in the generator stack, meaning that wholesale power prices would actually be higher in a market of Flat RPS with $0 RECs. This should impact your results in table 15, where the signs of all categories in year 2020 should be reversed.

This result from the Flat RPS case is part of a general comment that this analysis section uses a Comparison Scenario with an ongoing volume of RECs at $0. This is fine, but please keep in mind that doing so prevents the analysis from taking into consideration the price-reducing impact of zero and low marginal cost renewable generators on the wholesale power market.

A small item to point out is on table 5. The high and low cases for Class I RECs show a price of $11.00. Considering that the 2011 market is open for trading for another 12 months, it may be helpful to provide a range of cases similar to that of 2012. We agree that prices are generally a moving target, but please keep in mind current pricing for 2011 Class I RECs is above the $11.00 mark, so this report may not want to give the false impression that $11 is the high end of where 2011 pricing could go.

Overall, we agree with the conclusions of the analysis section on page 34, that the impact on electricity prices is very small under all scenarios. We also agree that further study to take into account the environmental/public health benefits and energy security benefits of an RPS should be made into order to provide decision makers with a full set of information.

Thank you again for the opportunity to comment on this comprehensive draft. Please feel free to contact me at nathan.hebel@boralex.com if you have any further questions.

Sincerely,

Nathan Hebel
Boralex, Inc.

Subject: Fw: Renewable Portfolio Standards (RPS) Comments from Connecticut DOT
From: gdeans@cerc.com
Date: Fri, 17 Jun 2011 17:17:45 -0400
To: "Jaclyn Trzaska" <secora@rci.rutgers.edu>, david.goldberg@ctcleanenergy.com, ffelder@rutgers.edu, "Joel Gordes" <gordesj@comcast.net>, kathryn.boucher@ct.gov, "'Nancy Mantell'" <nlhm051943@aol.com>, "'Shankar N. Chandramowli'" <shankarc@eden.rutgers.edu>, "Tim Cole" <tim@westwindconsulting.net>, "'Tracy Babbidge'" <tracy.babbidge@ct.gov>

----- Forwarded by Gretchen Deans/CERC on 06/17/2011 05:16 PM -----

"Hanley, Richard C" <Richard.Hanley@ct.gov>

06/17/2011 04:11 PM

To
"gdeans@cerc.com" <gdeans@cerc.com>

cc
"Chandran, Ravi V" <Ravi.Chandran@ct.gov>

Subject
Renewable Portfolio Standards (RPS) Comments from Connecticut DOT

Gretchen:

Comments from Connecticut DOT on the RPS Standards Review Findings follow:

1. Transportation-related needs are not addressed by the RPS. Transportation-related activities use over 1% of all the electrical power now generated in the state. Street lights take the majority of this power, while both traffic signals and the operations on the Metro-North electrified railroad are public-safety related issues. If the RPS is to fully evaluate power solutions, it should acknowledge an understanding and need of the consumers of power;
2. The topic of “Energy Security” should be removed from the report and discussed in its component parts. In all areas, the terminology of “Resource Adequacy”, dealing with the availability of fuels, and “Infrastructure Security”, dealing with the availability and security of the transmission and distribution infrastructure, should be utilized. This is especially relevant to transportation-related energy needs. A report written by the CT Academy of Science and Engineering entitled “A Study of the Feasibility of Utilizing Fuel Cells to Generate Power for the New Haven Rail Line” would be a good starting point to understand why certain types of generation capacity, such as fuel cells, provide a balance between local generation, infrastructure security, and transmission reliability;
3. Carve-outs for renewable energy sources should be prioritized. The highest priority carve-out should be going to those that provide economic benefit to Connecticut economic development. Carve-outs should also address the operational needs of the power consumers and electrical grid. For example, if consumers charge electric vehicles at night, is the full benefit of daytime-based

solar being recognized in the carve-out?

4. Economic development and growth factors of renewable energy sources should be addressed with more emphasis and veracity. The RPS is a powerful tool to influence the course for renewable power sources in Connecticut. Renewable power sources, however, that do not provide economic benefit, rate reduction or electric grid reliability enhancement should not be subsidized to an equivalent level for those that do;

5. The priority of energy efficiency should be tempered with the renewables that may benefit from less efficiency. For example, if energy-efficient windows are being installed in homes that traditionally purchase power from other than Class 1 renewables, would efficiency money be better spent on efficiency projects that may not achieve as high a level of savings but benefit Connecticut economically? High efficiency projects that reduce money being spent for out-of-state power may not yield a better return than lower efficiency projects that keep money in-state;

6. The RPS does not always account for consumers of power where policy, rather than price, should be the determining factor. The State of CT may purchase power from the lowest bidder while its agencies are espousing renewable energy, economic development or infrastructure security. Should the RPS have guidelines for certain agencies to “lead by example”, since without that leadership it can be harder to convince others to take on the same policy? A good example of this shown in one of the public comment letters received from “Earth Markets”; and

7. A process for the RPS should be established for quantitatively evaluating and reacting to disruptive factors to the RPS (new technology, fuels, industry or consumer behaviors). Change happens quickly, and benefits and/or threats to the RPS and its goals should be more easily analyzed and incorporated than requiring a full rewrite of the RPS. A good example is the rapidly expanding need for overnight and off-site charging of electric vehicles.

If you should have any questions, please contact me.

Thank you,
Rick

Richard C. Hanley, P.E.
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Connecticut Fund for the Environment

Save the Sound®
A program of
Connecticut Fund for the Environment

June 17, 2011

Connecticut Energy Advisory Board
c/o Gretchen Deans
CERC
805 Brook Street, Bldg. 4
Rocky Hill, CT 06067

Connecticut Fund for the Environment thanks you for the opportunity to comment on the draft Renewable Portfolio Standards Review findings published on June 6, 2011. Connecticut Fund for the Environment ("CFE") is Connecticut's non-profit environmental advocate with over 5,700 members statewide. For over thirty years, CFE has fought to protect and preserve Connecticut's health and environment.

Pursuant to Connecticut General Statutes Section 16-245a, Connecticut's Renewable Portfolio Standard ("RPS") requires each electric supplier and each electric distribution company to obtain an increasing minimum percentage of their retail load from renewable sources. By January 1, 2020, at least 23 percent of the retail load must come from renewable energy, with 20 percent being supplied from "Class I" renewable energy sources, as defined in Connecticut General Statutes Section 16-1 (a)(26), and an additional three percent coming from either 'Class I" or "Class II" renewable energy sources, as defined in Connecticut General Statutes Section 16-1 (a)(27). An additional four percent of the total retail load must be supplied by "Class III" sources, which are essentially efficiency measures.

The purpose of the "Class I" category is to encourage the development and deployment of the cleanest, least polluting energy sources. The current definition of "Class I renewable energy source" includes solar, wind, fuel cells, landfill methane, ocean thermal, wave and tidal power, run-of-the-river hydropower and certain limited sustainable biomass operations (subject to strict emissions limits). CFE believes that it is important to maintain stability and consistency in the statutory definitions of renewable energy resources in the state.

CFE observes that the statutory definition of Class I resources has become a political football that, on a nearly annual basis, some pet project attempts to expand in order to reap the benefits of the REC market. The definitions pertaining to "Class I" and "Class II" renewable resources were first adopted in 1998. They have subsequently been amended five times: in 2001, 2003, 2006, 2007 and 2008.[1] Several other unsuccessful attempts have been made, on nearly an annual basis, to expand the "Class I" definition to include resources already covered in either the "Class II" or "Class III" categories. Such lack of consistency undermines the goals of the Renewable Portfolio Standard and runs the risk of limiting investment in the development of renewable energy generation.

Accordingly, CFE urges that the current categories of Class I and Class II sources be maintained in their current form and that any contemplated change occur only after a thorough review and analysis of the relative benefits and disadvantages that such a change would have on the development of a healthy, thriving renewable energy market in Connecticut.

Second, CFE agrees with the comments made by many of the stakeholders during the initial round of input into the draft RPS review that the Class III RPS requirements should be increased to better balance our reliance on supply and demand side resources to achieve the goals of the RPS. As it currently stands, the Class III RPS requirement levels off at 4 percent in 2010 and remains stagnant at that level through 2020. CFE recommends that the Class III RPS be increased to 6 percent in 2012, 7 percent in 2013, 8 percent in 2014, and increase by 2 percent annually thereafter. As an energy efficiency resource, increasing the Class III requirements will reduce the overall electricity load that needs to be covered by more expensive Class I generation resources.

Moreover, increasing the deployment of energy efficiency in the state will also yield significant ancillary economic benefits. For every dollar invested in energy efficiency, consumers save four dollars, money that can be spent in other areas of the economy. Efficiency investments can also

[1] The "Class III" renewable energy source was added during the June 2005 Special Session (the category was later amended in 2007 to delete "renewable" from the category title).

bring down the costs to consumers of deploying renewable technologies, since the capacity of the systems they need to install can be reduced accordingly.

Thank you for the opportunity to comment.

Charles J. Rothenberger
Staff Attorney

CL&P COMMENTS TO CEAB'S REPORT ON RPS
06/16/2011

The Connecticut Light and Power Company ("CL&P") recognizes the efforts by the Connecticut Energy Advisory Board ("CEAB") to conduct a review of the state's Renewable Portfolio Standard ("RPS"). Overall CL&P supports the recommendations from CEAB as part of its June 6th report and we believe that Connecticut's energy policy should promote the supply and delivery of reliable and affordable clean energy. CL&P specifically supports CEAB's recommendations to further assess if different approaches besides RPS can be developed to better achieve those goals.

As indicated in our prior comments, CL&P believes that it is appropriate for the state to review RPS programs and to establish goals that are sized correctly to meet clearly defined and broadly accepted objectives. Such an assessment should consider the possibility of establishing a clean energy standard and whether a target of 20% renewables by 2020 is a proper clean energy target for the state. As described in the new energy legislation recently enacted by the General Assembly, the CEAB has the opportunity to influence the state's programs surrounding RPS and clean energy through its consultation role with the DEEP on the development of an Integrated Resource Plan and a comprehensive energy plan. CL&P looks forward to the opportunity to have a significant role in the development of these plans.

Implementation of the approved legislation will determine in large part whether Connecticut is able to strike the proper balance between different policy objectives as it relates to clean energy. CL&P believes these objectives are (ranked in order of priority): 1) impact to customer rates; 2) impact on carbon emissions; 3) impact to local economic development from new clean energy project jobs and 4) impact to overall economic activity due to higher rates.

CL&P believes that the impact of clean energy on customer rates and the economy needs to be a priority for any clean energy policy or program. We are pleased to see that the new legislation calls for a study that requires DEEP to analyze options to minimize costs to electric ratepayers of procuring renewables under RPS. We continue to recommend that the approach to clean energy should focus on ensuring that the most cost-effective projects are completed first. CL&P believes that this approach would lead to priority funding for energy efficiency and conservation and load management projects.

CL&P also wants to re-emphasize that it should be understood that New England and Connecticut's mix of power generation resources, as structured now, produce the second lowest carbon emission intensity of any region in the U.S. Also, the active regional market for renewable energy credits, coupled with generous federal subsidy programs such as the Investment Tax Credit and Production Tax Credit, have been effective to date in bringing qualified renewable generation to the New England market. Finally, even though Connecticut has very limited in-state renewable potential, Connecticut also has the most aggressive RPS goals in New England. The bottom line is that Connecticut and the New England region are already well positioned in the U.S. as leaders in clean energy. The CEAB recommendations can be used to position Connecticut as an innovator in clean energy.

We also want to take the opportunity to provide some more detailed technical comments in a few areas where we feel further clarification is required.

Page 12 of the report states that large-scale, out-of-state hydro and/or wind projects require long-term financing which shifts technological obsolescence to ratepayers. CL&P believes this statement is overly broad and not necessarily applicable to all hydro or wind projects, and in fact, each project will have its own characteristics. An example of a project without this characteristic is the Northern Pass transmission project that CL&P and Northeast Utilities are working in collaboration with Hydro Quebec ("HQ"), to bring hydro power from Canada to New England. In this particular case, the cost of the transmission line will be borne by HQ, and there are no transmission costs or technological risks borne by Connecticut ratepayers.

On page 11 the report explains the impact of a solar RPS carve-out. It indicates that a solar carve-out might result in higher bill impacts than a generic RPS, but if the carve-out results in in-state economic expenditures, it may be positive to the overall state's economy. CL&P wants to reiterate that it is important to analyze the two effects together. Higher bills lead to reduced disposable income which leads to reduced economic activity. Our analysis indicates that the impact of such reduced economic activity is greater than the relatively small economic development potential of solar during its construction phase.

CL&P welcomes the opportunity to further collaborate with CEAB and the state in developing approaches and mechanisms to help Connecticut meet its clean energy goals.

CONNECTICUT RESOURCES RECOVERY AUTHORITY

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Via email (gdeans@cerc.com) and (FED EX 797214597776)

June 16, 2011

Connecticut Energy Advisory Board
c/o Ms. Gretchen Deans
CERC
805 Brook Street, Bldg. 4
Rocky Hill, CT 06067

RE: Draft *Review of Connecticut's Renewable Portfolio Standards*

Dear Ms. Deans:

CRRA hereby submits its comments to the above referenced Review (the "Review") prepared for the Connecticut Energy Advisory Board ("CEAB").

CRRA urges CEAB to include in the final version of the Review, a recommendation that policymakers consider elevating Waste to Energy ("WTE") facilities from Class II to Class I.

This elevation would go far to alleviate many of the issues with the current RPS noted in the Review. For example, Connecticut's current RPS requirement of 20% Class I power by 2020 will likely be impossible to meet with in-state Class I resources, due to Connecticut's poor wind potential. In fact, it is estimated that under the current RPS, only 26% of the 2020 Class I requirement will be met with in-state resources.[1] Additionally, to the extent renewable resources are located out-of-state, Connecticut ratepayers bear the RPS costs of these resources but do not receive the direct economic benefit of expenditures for these resources; e.g., operation and maintenance expenditures.[2]

Connecticut's WTE facilities (currently classified as Class II resources) provide several important benefits to Connecticut. In addition to reducing the volume of municipal solid waste ("MSW") requiring land disposal by approximately 90%, WTE facilities use discarded trash as fuel to generate electricity, replacing the precious fossil fuels that would otherwise be burned to generate the electricity that these facilities provide. In fact, approximately 2.2 million tons per year of MSW is combusted at the six privately- and publicly-owned resource WTE facilities located in Connecticut, collectively providing a capacity of approximately 165 megawatts of electricity, or about 2% of the State's

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[1] CEAB *2010 Comprehensive Plan for the Procurement of Energy Resources*, Review at 39.

[2] Review at 17.

generating capacity. On an annual basis, these WTE facilities provide the electric needs of approximately 150,000 households.

If Connecticut WTE facilities were elevated from Class II to Class I, there would be several additional benefits to Connecticut. First, the value of electricity generated at these WTE facilities would increase, thereby enabling corresponding reductions to the tipping fees charged by these facilities.[3] An increase in the value of WTE-generated electricity could also lead to the construction of additional WTE facilities in Connecticut, providing significant additional benefits. First, additional Connecticut WTE facilities would support Connecticut's stated policy goal of a preference for in-state disposal of MSW, a goal that cannot be achieved with current in-state WTE capacity, even if MSW recycling rates increase dramatically.[4] Second, the construction of additional Connecticut WTE facilities would result in both short-term (construction and installation) and long-term (operation and maintenance) expenditures, thus providing both immediate and lasting economic benefits. Finally, these benefits would attach to both publicly- and privately- owned WTE facilities.

These benefits have recently been acknowledged by at least one other Northeast state. On May 17, 2011, Maryland Governor Martin O'Malley announced that he would sign into law Senate Bill 690, elevating Maryland WTE facilities from Tier 2 to Tier 1.[5]

For all of the above reasons, CRRA requests that the final version of the Review include a recommendation that WTE facilities be considered for inclusion in Class I resources. Thank you for your consideration of these comments.

Very truly yours,

Peter W. Egan
Director of Operations and Environmental Affairs

Cc: Dan Esty, Commissioner, CTDEP
Jesse Stratton, CTDEP
Jonathan Bilmes, BRRFOC
Vincent Langone, Wheelabrator
Cheryl Thibeault, Covanta
Jerry Tyminski, SCRRA

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[3] In written comments to the CEAB appended to the Review ("Covanta Comments"), Covanta Energy Corporation noted that at that time, Class I RECs were priced at $12.75, while Class II RECs were priced at 55 cents. Covanta Comments at 2.

[4] In its amended 2006 State Solid Waste Management Plan (the "State Plan"), the Connecticut DEP estimates that even if MSW recycling increases to 49 percent by FY2024, there will be an in-state MSW disposal capacity shortfall of 471,000 tons at that time. State Plan at ES-5.

[5] Maryland Tier 1 and Tier 2 renewable resources are equivalent to Connecticut's Class I and Class II renewable resources. *See, Md. PUBLIC UTILITIES Code Ann. § 7-701.*

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June 17, 2011

VIA E-MAIL
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ENE Comments on the Connecticut Energy Advisory Board's
Draft Renewable Portfolio Standards Review

Dear Ms. Deans,

ENE (Environment Northeast) respectfully submits these comments in response to the Connecticut Energy Advisory Board's (the "CEAB's") draft Renewable Portfolio Standard Review (the "RPS Review").

The CEAB has initiated a valuable process and produced a document that will certainly inform discussions related to renewable energy development and state policy goals. In general, the methodology used in the RPS Review does a good job identifying the drivers and benefits of investing in renewable energy. The RPS Review appropriately acknowledges the importance of energy efficiency and draws material links between efficiency and renewables development. Going forward, ENE supports additional, more detailed analysis of the macroeconomic impacts – including environmental and social benefits – of developing state and regional renewable resources.

Role of Energy Efficiency

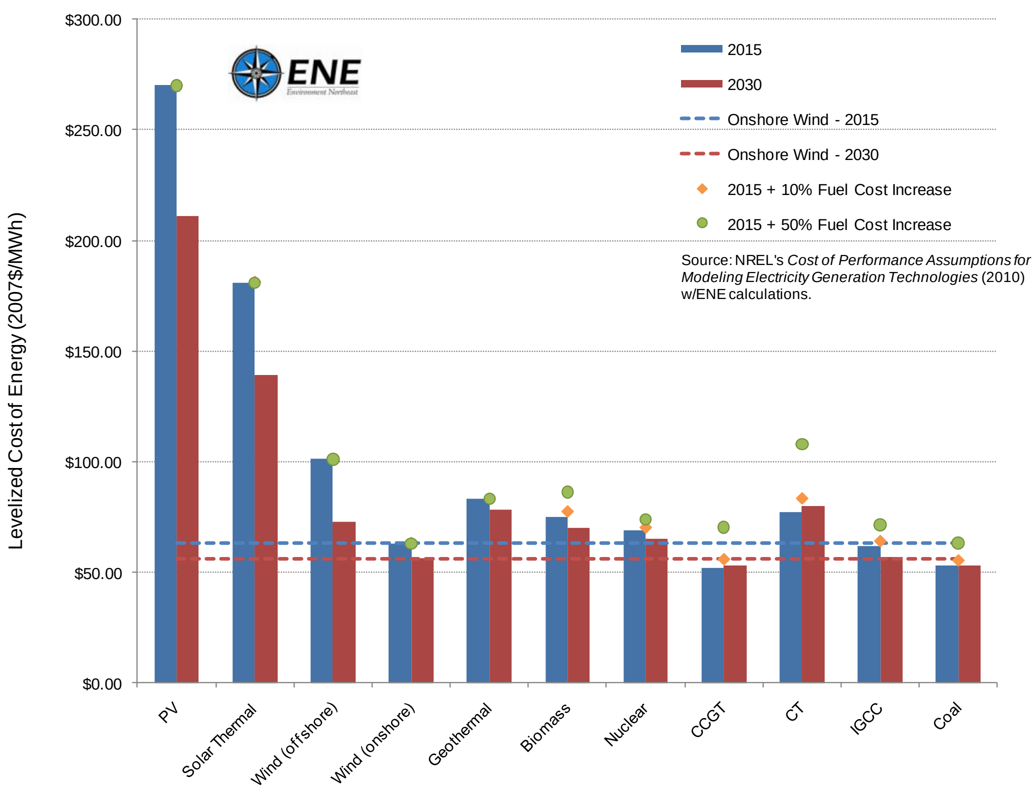
The RPS Review highlights the importance of investing in all cost-effective energy efficiency and its potential to help meet Connecticut's economic, environmental and public health, and energy security goals. ENE supports the notion that ramping up investment in all cost-effective energy efficiency will reduce demand and the RPS requirement (as a percentage of load), thus lowering the cost of the RPS program. Further, energy efficiency is a Non-Transmission Alternative ("NTA") that can reduce transmission and distribution system upgrade costs and, if efficiency programs are strategically located, free up capacity on existing lines for renewable energy projects.

The cost-effective energy efficiency potential in Connecticut is much greater than what could be captured as Class III resources. Since the economic, environmental, and social benefits of investing in all cost-effective efficiency are so significant,[1] ENE recommends that the CEAB continue to promote all-fuel energy efficiency as an overarching state policy priority.

General Comments – Renewable Energy

The environmental and economic benefits of renewable energy are numerous and well documented. In addition to reducing greenhouse gas emissions and creating direct and indirect economic benefits, renewable energy can protect consumers against volatile energy prices and strengthen the competitiveness of local business and industry. The cost of energy from renewable technologies continues to decline and while conventional technologies are impacted by rising fuel costs, increasing the supply of renewable energy in Connecticut's energy portfolio will help hedge against rising fossil fuel and carbon costs (see Figure 1).

Figure 1: Levelized Cost of Energy (LCOE) from various electricity generation technologies in 2015 and 2030 and possible impact of a 10% and 50% increase in fuel costs relative to 2015 baseline.[2]



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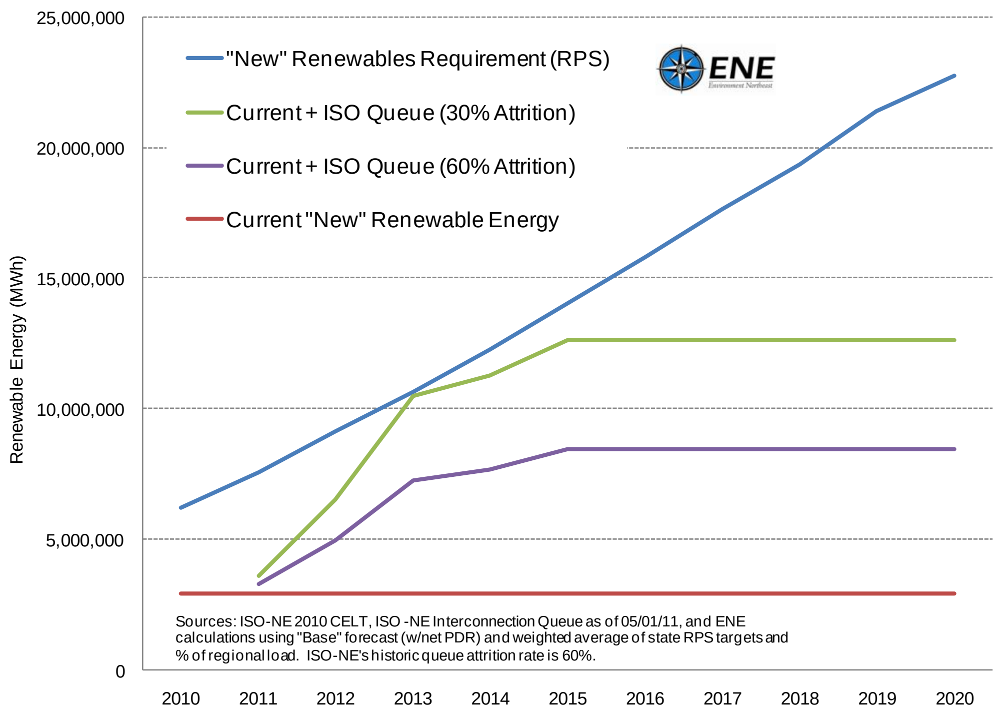
[1] Howland, J., D. Murrow (2009). *Energy Efficiency: Engine of Economic Growth*. Available on-line at: http://env-ne.org/public/resources/pdf/ENE_EnergyEfficiencyEngineofEconomicGrowth_FINAL.pdf

[2] Tidball, R., J. Bluestein, N. Rodriguez, S. Knoke (2010). *Cost and Performance Assumptions for Modeling Electricity Generation Technologies*. NREL/SR-6A20-48595. Available on-line at: http://www.nrel.gov/docs/fy11osti/48595.pdf. ENE figure presents mean LCOE, as projected by six data sets and analyzed by NREL. ENE data points for 2015+10% and 2015+50% reference mean impact of fuel costs – percentage change from 2015 baseline – from pp 89-90.

Connecticut should seek to meet its RPS requirements with regional resources while attempting to maximize in-state resources that fall within reasonable cost parameters. While there are sufficient Class I resources currently in the ISO-NE interconnection queue, it should not be assumed that financing will materialize and all the projects will be developed. In fact, the historic ISO-NE queue attrition rate is approximately 60 percent and developers and decision-makers continue to call for complementary measures to reduce risk and the cost of capital.

Figure 2: New England renewable energy requirements versus amount of qualified, in-region resources – available and proposed[3]



ENE does not believe that Connecticut can or should take on an increased financial responsibility for achieving the RPS as it does not have the resources and such action is not consistent with current law. To maximize renewable resource development – and the associated benefits – New England states should promote long-term contracting for renewables through either a state's utilities or as part of a regional procurement process. While ENE acknowledges that some utilities have concerns with long-term contracting, we believe this approach is the best option for achieving states' RPS targets and keeping costs down for consumers.

Long-term contracting for capacity, energy, and environmental attributes should be integrated with the concept of a regional renewables (and transmission) planning and procurement process, as envisioned by the New England Governors. These elements are important to the RPS

[3] In its 2009 and 2010 RSP reports, ISO-NE uses three attrition rates – 40%, 60%, and 80% - to assess possible cumulative electric energy from new renewable projects in the ISO queue. In its 2008 RSP, ISO-NE states that the historic attrition rate in the ISO-NE queue has been 60% (pp 50-51). In this analysis, ENE used the mid-range attrition rate of 60% and a more optimistic rate of 30%.

Review and should be included as key clean energy strategy and assessed accordingly. ENE re-asserts its recommendations related to regional renewable planning, procurement, and contracting, which were initially submitted to the CEAB in response to the 2010 IRP:[4]

- The state should continue to engage with other states on the development of a regional renewable energy planning and procurement process.

- In addition to its review of the RPS pursuant to Section 129 of SB 1243, Department of Energy and Environmental Protection ("DEEP") should initiate a general policy docket to investigate the changes that would be needed to allow Connecticut to participate in a regional renewable energy procurement process.

- This docket would likely identify issues such as:

    - Potential need to separate some of the renewables contracting from the current 3 month-3 year standard offer contracts.
    - Development of recommendations on contract terms and maximum pricing (building on the IRP modeling).
    - A model for what entities should be required to participate in the contracting, who takes the power, how contracts are paid for, etc. – for example: Load Distribution Company ("LDC") contracts for a portion of standard offer requirements over a 10 year period, contracts for energy and RECs, establishment of a cap on contract costs by energy type, retain RECs for compliance, resell energy into the spot market, costs would be built into generation/energy rates.
    - Ways to incent the utilities to negotiate for low cost contracts and address balance sheet concerns – i.e., LDCs could keep a small fraction of any savings coming back to consumers due to the difference in the contracted price for energy versus what they are able to resell energy for in the spot market (a shared savings approach).
    - The docket would be used to inform Connecticut regulators and the regional discussion, going forward.

Macroeconomic Modeling

ENE supports more detailed analysis of the macroeconomic impacts – including environmental and social benefits – of developing state and regional renewable resources. Macroeconomic modeling assesses the impacts to the wider economy from reduced or increased energy costs. To better understand the true costs and benefits of a renewable energy development strategy, and thus its ability to meet state economic, environmental and public health, and energy security goals, modeling should account for structural changes (business competitiveness, population

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[4] See ENE's comments to the CEAB submitted on January 25, 2010: http://www.ctenergy.org/pdf/ENEFIX.pdf

flows) that result from changing energy costs. Further, the environmental benefits should be assigned an appropriate monetary value and be included in the modeling.

It should be noted that the majority of the benefits from energy efficiency programs are from the associated energy savings, not from the energy efficiency implementation work. The following table – which is also included in the RPS Review on page 44 – summarizes findings from ENE's macroeconomic study. For example, the modeling demonstrated that 12 percent of the increase in GSP associated with electric efficiency resulted from efficiency spending while 88% of the GSP increase was the result of energy savings reinvested in the local economy.[5] These results emphasize the importance of using macroeconomic modeling to evaluate alternative scenarios rather than relying on simple jobs or other multipliers that only include the impacts of efficiency or renewable implementation, not the resulting changes in energy costs.

Table 1: Summary of New England Economic Impacts

	Electric	Natural Gas	Unregulated Fuels
Total Efficiency Program Costs ($Billions)	16.8	4.1	6.3
Increase in GSP ($Billions)	99.4	30.6	53.1
Maximum annual GSP Increase ($Billions)	5.6	1.8	2.9
Percent of GSP Increase Resulting from Efficiency Spending	12%	11%	9%
Percent of GSP Increase Resulting from Energy Savings	88%	89%	91%
Dollars of GSP Increase per $1 of Program Spending	5.9	7.4	8.5
Increase in Employment (Job Years)	767,011	207,924	417,061
Maximum annual Employment Increase (Jobs)	43,193	12,907	24,036
Percent of Employment Increase from Efficiency Spending	16%	15%	12%
Percent of Employment Increase from Energy Savings	84%	85%	88%
Job-Years per $Million of Program Spending	46	50	66

Considering the short period for review and comment, ENE will limit its submission to the above. Given more time, ENE would have liked to address issues such as: a regular review process; technologies and standards within the class structure; ratepayer vs. developer risk; etc. We look forward to future opportunities to offer input on these important issues.

Thank you for your consideration of these comments.

Respectfully submitted,

Joyce E. Kung
Staff Counsel

[5] Howland, J., D. Murrow (2009). *Energy Efficiency: Engine of Economic Growth*. Pp 4, 28-29. Available on-line at: http://env-ne.org/public/resources/pdf/ENE_EnergyEfficiencyEngineofEconomicGrowth_FINAL.pdf

Barron County Waste-to-Energy and Recycling Facility (Almena, Wisconsin)

Bristol Resource Recovery Facility Operating Committee (Bristol, Connecticut)

City of Ames, Iowa

Ecomaine (Portland, Maine)

City of Harrisburg, Pennsylvania

City and County of Honolulu, Hawaii

City of Huntsville Solid Waste Disposal Authority (Huntsville, Alabama)

County Sanitation Districts of Los Angeles County (Whittier, California)

Kent County, Michigan

Lancaster County Solid Waste Management Authority (Lancaster, Pennsylvania)

Marion County, Oregon

Mid-Maine Waste Action Corp. (Auburn, Maine)

Northeast Maryland Waste Disposal Authority (Baltimore, Maryland)

Pollution Control Financing Authority of Camden County (Pennsauken, New Jersey)

Spokane Regional Solid Waste System (Spokane, Washington)

Wasatch Integrated Waste Management District (Layton, Utah)

York County Solid Waste Authority (York, Pennsylvania)

** In coordination with the U.S. Conference of Mayors/ Municipal Waste Management Association*

LOCAL GOVERNMENT COALITION FOR RENEWABLE ENERGY

June 17, 2011

Connecticut Energy Advisory Board
c/o Gretchen K. Deans, Connecticut Economic Resource Center, Inc.
805 Brook Street, Building 4
Rocky Hill, Connecticut 06067

Re: Waste-to-Energy and Review of Connecticut's RPS

Dear Ms. Deans:

This letter, which responds to the Board's request for comments concerning its June 6, 2011 Draft Renewable Portfolio Standards Review findings, is written on behalf of a broad-based coalition of local governments and special purpose authorities, the Local Government Coalition for Renewable Energy. Working in coordination with the U.S. Conference of Mayors/Municipal Waste Management Association, the Coalition is actively engaged in various WTE-related legislative and regulatory matters (I am the Executive Director of the Solid Waste Disposal Authority of Huntsville, Alabama, and serve as the informal chairperson for the Coalition). The Coalition's members (and the communities we serve) own modern, state of the art waste-to-energy (WTE) facilities, which are a key source of renewable energy for the United States. We invested in WTE technology for one reason – ***it is the responsible thing to do from an energy and environmental perspective***, and that is the context in which the Coalition strongly recommends modifying Connecticut's RPS to categorize WTE as a Class I energy resource. Given those energy and environmental benefits, it is not a coincidence that just last month the state of Maryland took that precise action – under very similar circumstances – and elevated WTE to a Tier 1 energy source under the Maryland RPS.

It bears emphasis that in at least one critical respect WTE is different from every other renewable and clean energy source. That is because waste management is an essential requirement of all societies. After maximizing waste minimization, recycling and composting efforts, the remaining municipal solid waste either can be sent to landfills for disposal or combusted at WTE facilities to produce clean, renewable energy. Landfilling adds to environmental problems including greenhouse gas emissions (GHGs) and contributes very little to our energy supply. From virtually every environmental and energy perspective WTE is the preferred choice for management of municipal waste. In fact, USEPA's analysis shows that WTE yields the best results (compared to landfills) on numerous bases, including maximum energy recovery and lower GHG and criteria pollutant emissions. In that regard, attached is a short (4-page) briefing paper summarizing the significant benefits of WTE. The appendix that accompanies the briefing paper includes peer-reviewed scientific analyses, as well as the views of independent public policy forums. As the briefing paper demonstrates, WTE is a significant potential source of renewable energy that:

- Produces clean, baseload (i.e., "24/7") energy with very low emissions – as USEPA emphasizes, the level of emissions control achieved by modern WTE facilities, which reflects Maximum Achievable Control Technology, "has been outstanding," and is the basis for USEPA's recognition of WTE as a renewable energy source that "produce[s]…electricity with less environmental impact than almost any other source of electricity.");
- Recovers 10 times the energy (electric power) from municipal waste in comparison to methane recovery-reuse from landfilled waste;
- Uses energy where it is generated, i.e., "distributed" generation, which reduces the environmental impact and cost of transporting both waste and energy;
- Complements rather than competes with recycling – WTE communities outperform non-WTE communities in recycling, with recycling rates that are typically at least 5 percentage points above the national average;
- Substantially reduces greenhouse gas emissions by (a) displacing electric power generation from fossil fuels, (b) avoiding methane emissions from landfill disposal of municipal waste, and (c) facilitating post-combustion recovery and reuse of ferrous and non-ferrous metals; and
- Finally, given these facts, it is not surprising that The Nature Conservancy ranks WTE as one of the most environmentally protective alternative energy sources.

In short, the very substantial renewable energy and environmental benefits of WTE provide compelling justification for changing Connecticut's RPS to categorize WTE as a Class I energy source.

As a final point in this regard, we would be remiss in failing to note an irony of the Connecticut RPS's current format, which is the fact that a WTE-reliant community, if it had instead chosen less costly and environmentally less protective landfilling, would already be eligible for Class I status. Needless to say, there is no viable public policy basis for failing to provide at least equal encouragement to the environmentally preferred and forward-thinking local government action reflected in WTE investment, which can be accomplished by elevating WTE to Class I status under the Connecticut RPS.

If you have any questions, please do not hesitate to call me (256-880-6054) or our counsel (Scott DuBoff and Matt Schneider, at 202-965-7880).

Sincerely,

John R. "Doc" Holladay

cc: Coalition Members

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June 17, 2011

Connecticut Energy Advisory Board
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805 Brook Street, Building 4
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VIA EMAIL

RE: Kimberly-Clark Corporation's Response to Draft RPS Study

Dear Ms. Deans:

Kimberly-Clark Corporation ("K-C") submits these Comments in response to the draft study entitled "A Review of Connecticut's Renewable Portfolio Standards" ("Draft RPS Study" or "Study") prepared by The Center for Energy, Economic, and Environmental Policy and the Rutgers Economic Advisory Service, for the Connecticut Energy Advisory Board ("CEAB"), which was issued on June 6, 2011. K-C commends the CEAB's considered approach to exploring the challenging issues confronting Connecticut's Renewable Portfolio Standards ("RPS") programs. As a developer of a distributed generation resource utilizing Combined Heat and Power ("CHP") technology and sizeable employer in the State, K-C has invested significant capital in Connecticut, and welcomes the opportunity to provide further comments to inform the CEAB's investigation into Connecticut RPS matters, particularly as it pertains to Class III resources.

K-C supports the Draft RPS Study's recommendation that "more analysis be undertaken to quantify the various RPS benefits in the future." *See* Study at 34. As noted in the Draft RPS Study, Connecticut's RPS is comprised of Class I, Class II and Class III renewable resources. Although these renewable resources are united under Connecticut's RPS policy umbrella, the Draft RPS Study indirectly recognizes that each class is unique. Whereas most Class I and Class II resources are located outside of Connecticut, all Class III resources are located within Connecticut. *See id.* at 17. Consequently, Class III resources, particularly resources using CHP technology, provide significant economic benefits because "installation, operation and maintenance costs are expended within the state," resulting in "economic activity, including employment." *Id.* at 18. Furthermore, unlike other RPS resources, Class III resources are expected to reduce electricity prices in Connecticut. *Id.* at 23. Thus, in light of these differences, K-C supports the Draft RPS Study's recommendation to further analyze and quantify the various RPS benefits. In doing so, K-C encourages the Final RPS Study to distinguish with more specificity the benefits, economic and otherwise, provided by each class of RPS resources. In

K-C's view, this information would be helpful for decisionmakers as they consider strategies to reduce energy prices and advance economic development in Connecticut.

Furthermore, although the Draft RPS Report recognizes that Class III resources include both customer-sited CHP resources and conservation and load management ("C&LM") programs, there is little discussion regarding the wide range of resources within the Class III category. *Id.* at 6. As discussed in K-C's Comments, an explosion in the number of C&LM projects in the State appears to be a key driver in the emerging imbalance between supply and demand for Class III Renewable Energy Credits ("RECs"). *See* K-C Comments at 6-7. As a result, the flood of Class III RECs from the utilities' C&LM programs has depressed the value of Class III credits to the extent a willing buyer exists, and threatens to chill investment in new Class III resources for both CHP and C&LM projects. The current Class III market conditions may have a disproportionate impact on the development and operation of CHP resources (as opposed to C&LM resources) because of the different capital requirements for these resources. To this end, K-C recommends that the Final RPS Study address the ramifications of Connecticut's RPS for capital-intensive CHP development and retention of CHP and related jobs in Connecticut.

K-C also supports the Draft RPS Study's recommendation that Connecticut should have a formal ongoing RPS review and evaluation cycle. *See* Study at 4. More than a decade ago, Connecticut first established its RPS policy. Since that time, Connecticut's RPS policy has evolved to stay abreast of changes in the renewable energy market. To serve ratepayers for another decade, it is imperative that Connecticut's RPS continue to adapt to market changes. A formal review and evaluation cycle would provide law makers, regulators and interested market participants with a vehicle to address necessary market changes, such as the growing over-supply of Class III RECs. To this end, K-C encourages the CEAB to implement promptly this recommendation.

Finally, while recommending the CEAB conduct additional studies to address various RPS matters, the Draft RPS Study is silent on the time frame for conducting such studies. To this end, K-C respectfully submits the Final RPS Study should clarify that any studies on urgent issues should be conducted on an expedited basis. In K-C's view, the Class III REC imbalance is a highly time-sensitive issue. As set forth in K-C's Comments, the oversupply of Class III RECs and the corresponding price deflation, if left uncorrected, is likely to deter new investment in CHP resources and negatively impact Connecticut businesses, such as K-C, that relied upon a predictable and stable Class III market to justify their investment in Connecticut CHP resources. *See* K-C Comments at 9. Accordingly, to avoid or minimize the negative impacts on Connecticut's economy, studies concerning the Class III imbalance should be conducted and their results translated into action on an expedited basis.

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Thank you for your attention to this important matter. If you have any questions or need additional information, please contact us at your convenience. Thank you.

Very truly yours,

McNEES WALLACE & NURICK LLC

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June 17, 2011

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Ms. Deans:

RENEW submits the following comments in response to the CAEB's draft Renewable Portfolio Standards Review ("Review").[1]

The Review provides an assessment of many of the studies from around the country that address RPS policies. RENEW requests that ISO New England's final "New England Wind Integration Study" ("NEWIS") released in December 2010 be included in the Review.[2] The NEWIS assesses the effects of large-scale wind penetration in New England providing valuable information on the interaction between wind resource development, wholesale electricity prices, regional transmission expansion, reliability, and air emissions.

The NEWIS examined scenarios with 2.5 percent to 24 percent of the region's energy coming from wind. It found New England would be capable of operating reliably at these wind penetrations and explained the additional transmission and market mechanisms necessary to maintain the existing flexible generation at various levels of wind penetration. The NEWIS also provided information on average annual energy price reductions in the region at various levels of wind energy penetration. RENEW believes that the NEWIS can address many of the issues raised in paragraphs 38 (air emissions) and 39 (price suppression) in the Findings and Recommendations ("F&R") sections of the Review.

RENEW requests that in paragraph 11 of the F&R (competition between the RPS classes) there should be some discussion as to why no state has created direct competition between renewable energy technologies and energy efficiency. Here the Review should point out that the two are complimentary approaches- one addresses demand and the other supply- and therefore have been kept apart. Counting energy efficiency as a Class I resource will simply depress Class I RECs

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[1] RENEW's membership is comprised of the American Wind Energy Association, Conservation Law Foundation, First Wind Energy, LLC, Horizon Wind Energy LLC, Iberdrola Renewables, Inc., Union of Concerned Scientists and Vestas American Wind Technology, Inc. The comments expressed herein represent the views of RENEW and not necessarily those of any particular member of RENEW.

[2] See http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/reports/2010/index.html

and make it more difficult to finance renewable generation projects. With energy efficiency projects having a substantially lower cost structure, it will, to the detriment of ratepayers, provide those projects with access to higher REC prices than is available in its current Class III category and is necessary to support those projects. The most effective and proven tools for advancing energy efficiency are direct public and private investment in those resources. Instead of weakening renewable energy investment and creating a false “competition” between complementary resources, policymakers have chosen to keep them in separate classes.

In section D of the F&R (Economic Impact of the RPS) it addresses the “one-time” economic benefits of any given project and how most large renewable energy projects are located outside the state and therefore provide no in-state economic benefits. While Connecticut’s renewable energy resources are not as robust as those found in other parts of the region, RENEW believes this section of the Review should give consideration to how in-state renewable energy developers, such as Noble Environmental Power based in Essex, Conn., employ hundreds in support of developing projects in and out of the state. As demonstrated by the fact that Massachusetts’ renewable energy policy is supporting one of the Noble projects in that state, the Review should point out that the economic benefits of renewable energy development are not confined to the states where projects are actually built and supported. Just as a large wind energy project in Massachusetts can suppress energy prices across the entire New England energy market the same project may also have been built using engineers, lawyers and accountants at the developer’s office in Connecticut. This section should better convey these types of complexities found in the regional energy market and economy.

Thank you for the opportunity to comment on the draft of the Review.

Sincerely,

Francis E. Pullaro

Francis Pullaro
Executive Director