







Independent Study of Energy Policy Issues

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Executive Summary

Energy is the lifeblood of the economy, and all citizens in New Hampshire depend on energy to carry out their work and conduct their lives. As a northern New England state with cold winters, warm summers, and a rural and semi-rural landscape in most locations, the state's residents and visitors need space heat in the winter, cooling in the summer, and electricity and transportation fuels year round. As such, 10 to 50% of the income of many New Hampshire households goes to paying energy bills, and energy is a significant expense for businesses, industries, and government as well.

The importance of a reliable and affordable supply of energy to the economic well-being of New Hampshire and its citizens cannot be underestimated. In times of economic downturn, this becomes even more important as low income households and those living on fixed incomes find themselves making difficult choices between food, housing, heating, transportation, and medical care.

Presented in this report are the key findings and recommendations from the **New Hampshire Independent Study of Energy Policy Issues** conducted for the New Hampshire Public Utilities Commission (NH PUC) at the direction of the New Hampshire Legislature. The recommendations focus on the seven most important next steps (or actions) that would have a significant and lasting difference on energy efficiency and sustainable energy market development in New Hampshire:

- **Refocus and clarify the state's energy policy direction;**
- **Develop clearer regulatory guidance in support of the energy policy direction;**
- **Improve the regulatory process and modify performance incentives;**
- **Increase program coordination and further streamline administration;**
- **Use public policy, funding, and scaled program structures to attract and leverage private investment;**
- **Create a home for energy efficiency and sustainable energy implementation support and oversight in State Government; and**
- **Encourage State and Local Governments to lead by example.**

These recommendations and the research and assessment leading up to them are described in detail in the full report. The achievement of these objectives would enable New Hampshire to build upon and continue to enhance the solid foundation of energy efficiency and sustainable energy policies, programs, and initiatives already in the place in the state. In doing so, the state can achieve important energy, economic, and environmental benefits for New Hampshire citizens and the industries and businesses located in the state, as noted below.

2. The Economic Impacts of Energy Use and Supply in New Hampshire

According to the New Hampshire Office of Energy and Planning (NH OEP), New Hampshire citizens, businesses, and industries spent over $6 billion on energy in 2008.[1] Of this, $4.1 billion (or 68%) left the state immediately (and in many cases left the country) to pay for imported fossil and nuclear fuels.[2] This outflow of energy dollars serves as a drain on the state and national economy, and represents nearly 7% of New Hampshire's annual Gross Domestic Product (GDP). Of this, $2.3 billion was for gasoline, $1.6 billion for electricity, $1.4 billion for heating oil and other petroleum, $406 million for propane, $346 million for natural gas, and $22 million for biomass.[3] New Hampshire's current mix of energy supply is a dramatic departure from a century ago when the state was largely self-sufficient in energy supply, and residents and business owners had substantial control over their energy future.

New Hampshire residents and business owners could benefit significantly from additional investments in energy efficiency and sustainable energy that reduce (or stabilize) future energy bills, increase reliance on local energy resources, and stimulate the state economy. According to a study of energy efficiency opportunity in New Hampshire, if all households in the state were improved to the level of energy efficiency that is cost-effective (as defined for purposes of regulated energy efficiency programs), residents would save $309 million per year.[4] Cost-effective efficiency investments in commercial and industrial buildings could keep another $220 million per year in the state.[5] That money would continue to circulate in the local economy, and would have a multiplier effect of two to three times the initial energy savings.[6] While the investment to achieve such savings could be nearly $2 billion,[7] the savings would offset the investment in less than four years.

3. Current Energy Efficiency and Sustainable Energy Use in New Hampshire

The energy policies, programs, and initiatives developed thus far through the hard work, creativity, and initiative of the New Hampshire Legislature, the Executive Branch, state planners and regulators, utility managers, industry and business leaders, and an engaged citizenry have begun the process of increasing energy efficiency and sustainable energy use in the state, and provide a foundation for further progress towards meeting state energy policies and goals in the future. The accomplishments to date are many and include (among others):

- **More than a decade of experience offering energy efficiency and weatherization services** which help New Hampshire residents, businesses, and industries use energy more efficiently and reduce their energy costs as they do so. The provision of energy efficiency services to residences, businesses, and industries throughout New Hampshire has:

[1]Energy Information Administration, State Energy Data System, "Table ET2 Total End-Use Energy Price and Expenditure Estimates, 1970-2009, New Hampshire," http://www.eia.gov/state/seds/hf.jsp?incfile=sep_prices/tx/pr_tx_NH.html&mstate=New%20Hampshire.
[2] Based on portion of spending that leaves the state, drawing upon information from the New Hampshire Office of Energy and Planning, "2007 New Hampshire Energy Facts," http://www.nh.gov/oep/programs/energy/nhenergyfacts/2007/introduction.htm.
[3] Energy Information Administration, State Energy Data System, "Table ET2 Total End-Use Energy Price and Expenditure Estimates, 1970-2009, New Hampshire," http://www.eia.gov/state/seds/hf.jsp?incfile=sep_prices/tx/pr_tx_NH.html&mstate=New%20Hampshire.
[4] This represents energy savings of around 20%, as defined as cost-effective in the study *Additional Opportunities for Energy Efficiency in New Hampshire*, Final Report to the New Hampshire Public Utilities Commission, GDS Associates, Inc., 2009
[5] Ibid.
[6] Ibid.
[7] Based on estimated costs to obtain maximum achievable cost effective 2018 annual savings; *Additional Opportunities for Energy Efficiency in New Hampshire*, Final Report to the New Hampshire Public Utilities Commission, GDS Associates, Inc., 2009 (p.7)

- **Reduced electricity use by more than 70,000 MWh annually,** which is equivalent to approximately 0.6-0.8% of retail sales of electricity in New Hampshire, depending on the year;[8]

- **Reduced use of natural gas and other non-electric heating fuels** by 1,300,000 MMBtu in 2010;[9]

- **Provided $90 million worth of benefits annually** through electric and gas efficiency programs, including reduced energy bills, reduced capacity requirements; and other benefits;[10]

- **Provided new business opportunities** for energy efficiency and weatherization contractors, remodelers, and product suppliers in New Hampshire;

- **Helped reduce demand on the electrical grid** and offset or deferred the need for new generation capability and/or transmission and distribution upgrades; and

- **Helped preserve finite energy resources** (such as heating oil, natural gas, and propane) for future generations.

- **A long-lived tradition of using local, indigenous resources for energy** as evidenced first by the use of biomass for heating and hydropower for mechanical energy in the 18th, 19th, and 20th centuries, and then more recently for electricity production. This tradition is expanding to include use of the wind, sun, landfill gas, and other sustainable energy resources to produce energy. The use of sustainable, renewable energy in New Hampshire has:

  - **Resulted in 16% of total electricity use in the state,**[11] **and 10% of all energy inputs** coming from hydropower, biomass, solar electricity, solar space and water heating, wind energy, landfill gas, farm methane, and geothermal;[12]

  - Led to the **creation of new sustainable energy businesses;**

  - **Helped diversify the portfolio of energy sources** relied upon in the state, thereby addressing over reliance on any one energy source's pricing and availability in the future; and

  - **Continued the long-held respect for independence and self-sufficiency in New Hampshire** as more citizens take control of their energy use and supply by relying on local, in-state resources.

4. Current Employment Impacts of Energy Efficiency and Sustainable Energy

[8] Based on first year savings as reported in the 2008-2010 electric and gas annual efficiency program filings.
[9] Based on information in 2010 electric and gas annual efficiency program filings.
[10] Present value of total benefits as reported in Attachment D-G and Exhibit B of the 2011-2012 Core Electric Energy Efficiency and Natural Gas Efficiency Programs. Includes customer savings, avoided generation, transmission and distribution costs, quantifiable resource costs (e.g. water and electricity), and an adder for other non-quantified benefits (e.g. environmental and other benefits).
[11] New Hampshire Office of Energy and Planning, Energy Facts 2008; http://www.nh.gov/oep/programs/energy/nhenergyfacts/index.htm
[12] Share of gross renewable energy inputs of total gross energy input.

The energy efficiency and sustainable energy policies, programs, and initiatives developed thus far in New Hampshire also bring important employment benefits to the state including (among others):

- **The creation of new jobs in New Hampshire.** According to a national study of clean jobs (defined as the sector of the economy that produces goods and services with an environmental benefit), there were nearly 13,000 clean jobs in New Hampshire in 2010. These clean jobs represent about 2% of all jobs in the state. Of these, 5,000 jobs (or 40%) were energy efficiency and sustainable energy jobs, which represents just under 1% of New Hampshire's jobs.[13]

- **Faster growth in clean jobs in New Hampshire than in the nation overall**. The growth in clean jobs occurred at a faster rate in New Hampshire than in the nation overall. Between 2003 and 2010, clean jobs in New Hampshire grew by 5.3% annually, [14] compared with 3.4% for the nation overall.

- **Higher median wage for clean jobs in New Hampshire.** The median wage of clean jobs in New Hampshire is $40,773, which is higher than the average of $38,657 for all jobs in the state. On average, each New Hampshire clean job produces $14,449 in exports.[15]

- **A new way to address unemployment.** Research published at a national level forecasts that investments in the clean economy in New Hampshire could result in a net increase of about $650 million in investment revenue,[16] and an increase of 8,000 jobs, even after assuming a reduction in fossil fuel spending. The significance of this is substantial. For example, adding 8,000 jobs to the labor market in 2008 would have brought the state's unemployment rate down to 2.8% from its 2008 level of 3.8%.[17]

These accomplishments and their positive impacts on New Hampshire's economy and its citizenry provide an important foundation for further progress and success in stimulating even more energy efficiency and sustainable energy use in the future. In doing so, the state can achieve important energy, economic, and environmental benefits for New Hampshire citizens and the industries and businesses located in the state.

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[13] Data analysis of Brookings-Battelle Clean Economy data available at http://www.brookings.edu/metro/clean_economy, Energy & Resource Efficiency include: Appliances, Battery Technologies, Energy-saving Building Materials, Green Architecture and Construction Services, HVAC and Building Control Systems, Lighting, Professional Energy Services, Public Mass Transit; Renewable Energy includes: Biofuels/Biomass, Hydropower, Renewable Energy Services, Solar Photovoltaic, Solar Thermal. No data was provided for New Hampshire for geothermal, waste to energy, wave/ocean power, and wind power.

[14] Sizing the Clean Economy, The Clean Economy in the State of New Hampshire, Brookings-Battelle Brookings-Battelle Clean Economy Database, http://www.brookings.edu/~/media/Files/Programs/Metro/clean_economy/clean_economy_profiles/states/33.pdf

[15] Ibid.

[16] Based on New Hampshire's share of a total of $150 billion in clean energy investments estimated annually across the country in a report by Robert Pollin, professor of economics and co-director of the Political Economy Research Institute at the University of Massachusetts-Amherst, James Heintz, associate research professor and associate director for Political Economy Research Institurte (PERI), Heidi Garrett-Peltier, PERI research fellow, http://images2.americanprogress.org/CAP/2009/06/factsheets/peri_nh.pdf

[17] Robert Pollin, professor of economics and co-director of the Political Economy Research Institute at the University of Massachusetts-Amherst, James Heintz, associate research professor and associate director for Political Economy Research Institurte (PERI), Heidi Garrett-Peltier, PERI research fellow, http://images2.americanprogress.org/CAP/2009/06/factsheets/peri_nh.pdf

Chapter 1: Why an Independent Study of Energy Policy Issues?

1.1. Introduction

Energy is the lifeblood of the economy, and the importance of a reliable and affordable supply of energy to the economic well-being of New Hampshire and its citizens has long been understood by public and private sector leaders in the state. As a result, New Hampshire has a long history of policy, legislative, and regulatory initiatives that address future energy use and supply, and that seek to improve the efficiency of energy use in the state and increase reliance on local, sustainable energy resources. Much has been accomplished already through the careful thought, hard work, creativity, and initiative of the New Hampshire Legislature, the Executive Branch, state planners and regulators, utility managers, industry and business leaders, and engaged citizens including (among others):

- **Numerous policy initiatives** that articulate in various ways New Hampshire's intent to move toward greater energy efficiency and sustainable energy development and use in the future;

- **More than a decade of experience offering energy efficiency and weatherization services** that help New Hampshire residents, businesses, and industries use energy more efficiently and reduce their energy costs as they do so; and

- **A long-lived tradition of using local, indigenous resources for energy**, as evidenced first by the use of biomass for heating and hydropower for mechanical energy and then more recently for electricity production. This tradition is expanding to also include use of the wind, sun, landfill gas, and other sustainable energy resources to produce energy.

Presented below is information that explains the history of and context for this report including the:

- **New Hampshire legislation** that led to this study;

- **Energy use and expenditures** in New Hampshire (which helps establish the context for this study);

- **Employment impacts of energy efficiency and sustainable energy use** in New Hampshire (which provides further context for this study);

- The **methodology and approach used** for this study, including stakeholder outreach and engagement; and

- The **organization of this report** which summarizes the major focus of each Chapter. Subsequent Chapters then address the substantive areas of research and assessment completed for this study.

1.2. The New Hampshire Legislation That Led to this Study

The ongoing interest in energy efficiency and sustainable energy in New Hampshire led the Legislature to pass a bill in 2010 (referred to as "SB 323") which directed the New Hampshire Public Utilities Commission (PUC) to:

"…Contract for an independent study, through means of a non-adjudicative investigation utilizing a broad collaborative process, regarding legislative, regulatory, and market-based policy options, to address the following issues:

- **Comprehensive review and analysis of energy efficiency, conservation, demand response, and sustainable energy programs and incentives…and recommendations for possible improvements to maximize their effectiveness and increase coordination;**
- **The appropriate role of regulated energy utilities, providers of energy and energy efficiency, and others … to achieve the state's energy efficiency potential for all fuels…;**
- **The effectiveness and sustainability of all funds available to stimulate investments in EE and clean energy to advance the state's energy goals…;**
- **Policy changes that may be necessary…to achieve the state's EE and SE goals and to create the most cost-effective delivery systems to ensure optimum use of state funds, initiatives, and programs…"[1]**

This report is the result of the nine-month study conducted in response to this legislation. Results of the study provide an independent, third party assessment of key energy policy issues, programs, and funding mechanisms in New Hampshire, and recommendations for enhancements in the future. Results of the study can help inform future priorities and activities of the Legislature, the Executive Branch, other state entities, utilities, private industries, and a wide variety of stakeholders working to achieve state energy efficiency, sustainable energy, and greenhouse gas emissions goals.

Stakeholder Outreach and Engagement in the Study

This study was designed to include extensive stakeholder outreach and to utilize input from a wide variety of New Hampshire citizens. Examples of the types of stakeholders engaged in the study include:

- **Policy makers, legislators, and regulators** involved in energy efficiency and sustainable energy initiatives in New Hampshire;
- **Electric and gas utility program managers and administrators, state personnel, and non-profit organization leaders and staff** involved in the design and delivery of energy efficiency, weatherization assistance, and sustainable energy programs;
- **Contractors, installers, vendors, fuel dealers, and other trade allies** involved in the provision of energy efficiency, weatherization assistance, and sustainable energy products and services;
- **Bankers and Energy Service Company (ESCO) representatives** involved in energy loan, finance, and performance contracting programs; and
- **Ratepayers and the general citizenry** (through use of an electronic survey.

Overall, personal interviews were completed with more than 50 stakeholders throughout the state (most of which were conducted in person), program offerings from more than 25 State, regional, and local agencies and organizations were reviewed and assessed, and more than 750 citizens responded to an online survey about energy issues. Insights and perspectives from this outreach informed the research and analysis done for the study, and the policy options and program design and implementation enhancements recommended by the study team.

[1] Chapter 335 of the NH laws of 2010 (Senate Bill 323).

1.3. Energy Consumption and Expenditures in New Hampshire

The portion of New Hampshire's primary energy consumption supplied by each energy source in 2008 is presented in Figure 1.1. (below).[2] The figure includes both fuels consumed directly in the state as well as energy used to produce electricity consumed in the state. As shown in the figure, New Hampshire relied on a diverse set of resources for its energy supply. Nuclear energy accounted for 23% of the total primary energy needed to meet the state's energy needs in 2008, gasoline accounted for 21%, natural gas accounted for 18%, fuel oil accounted for 12%, coal accounted for 9%, biomass accounted for 5%, hydropower accounted for 4%, propane accounted for 3%, other petroleum accounted for 2%,[3] and ethanol, solar, and wind each accounted for less than 1%.

The portion of New Hampshire's energy expenditures that was used to pay for each energy source in 2008 is presented in Figure 1.2. (below). The figure includes energy expenditures for fuels consumed directly in the state and energy expenditures for electricity used in the state (a portion of which is generated out of state). The figure includes both energy expenditures for transportation and for other energy requirements (such as electricity use in the state, building heating, etc.). As shown in the figure, gasoline accounted for 38% of total energy expenditures in New Hampshire in 2008, electricity accounted

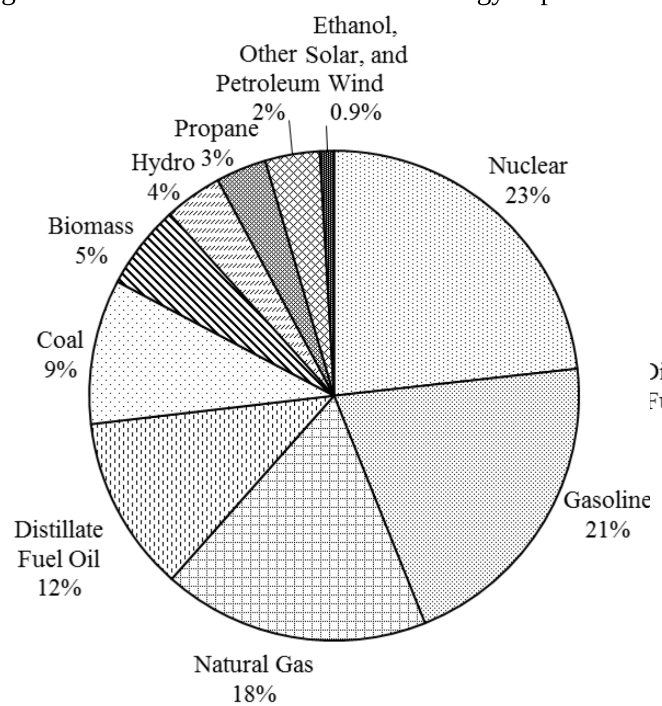

Figure 1.1 New Hampshire Primary Energy Consumption in 2008

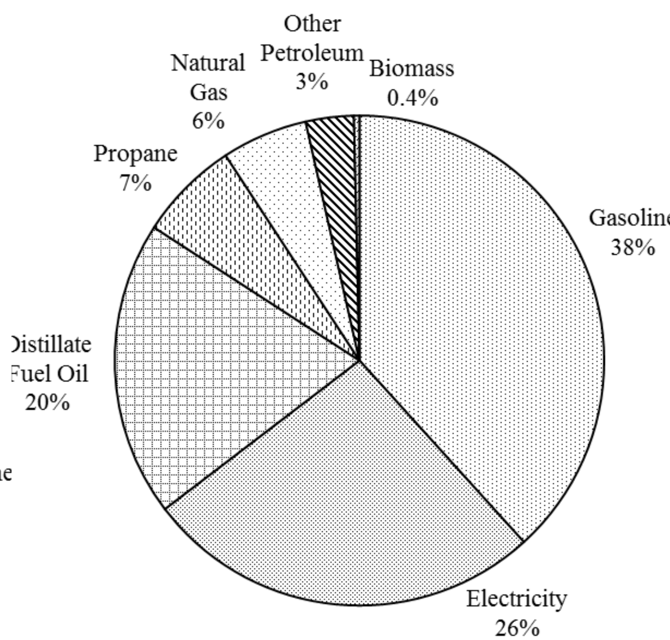

Figure 1.2 New Hampshire Energy Expenditures in 2008

for 26%, fuel oil accounted for 20%, propane accounted for 7%, natural gas accounted for 6%, other petroleum accounted for 3%,[4] and biomass accounted for less than 1%[5]. When apportioned by end use

[2] Energy Information Administration, State Energy Data System, "Table CT2 Primary Energy Consumption Estimates, 1960-2009, New Hampshire," http://www.eia.gov/state/seds/sep_use/total/pdf/use_NH.pdf
[3] Including jet fuel, residual fuel oil, asphalt oil, lubricants, and other petroleum derived products.
[4] Including jet fuel, residual fuel oil, asphalt oil, lubricants, and other petroleum derived products.
[5] Energy Information Administration, State Energy Data System, "Table ET2 Total End-Use Energy Price and Expenditure Estimates, 1970-2009, New Hampshire," http://www.eia.gov/state/seds/hf.jsp?incfile=sep_prices/tx/pr_tx_NH.html&mstate=New%20Hampshire

sector, residential energy use accounted for 30% of energy expenditures in 2008, commercial and industrial (C&I) energy use accounted for 30%, and transportation accounted for 40%.[6]

According to the New Hampshire Office of Energy and Planning (NH OEP), New Hampshire citizens, businesses, and industries spent over $6 billion on energy in 2008.[7] Of this, $4.1 billion (or 68%) left the state immediately (and in many cases left the country) to pay for imported fossil and nuclear fuels.[8] This outflow of energy dollars serves as a drain on the state and national economy, and represents nearly 7% of New Hampshire's annual Gross Domestic Product (GDP). Of this, $2.3 billion was for gasoline, $1.6 billion was for electricity, $1.4 billion was for heating oil and other petroleum, $406 million for propane, $346 million for natural gas, and $22 million for biomass.[9]

New Hampshire residents and business owners could benefit substantially from additional investments in energy efficiency and sustainable energy that reduce (or stabilize) future energy bills, increase reliance on local energy resources, and stimulate the state economy. According to a study of energy efficiency opportunity in New Hampshire, if all households in the state were improved to the highest level of cost-effective energy efficiency, residents would save $309 million per year.[10] Efficiency investments in commercial and industrial buildings could keep another $220 million per year in the state.[11] That money would continue to circulate in the local economy, and would have a multiplier effect of two to three times the initial energy savings.[12] While the investment to achieve such savings could be nearly $2 billion, the savings would offset the investment in less than four years.

1.4. Energy Efficiency and Sustainable Energy Use in New Hampshire

As discussed in more detail in subsequent Chapters, the more than a decade of experience offering energy efficiency and weatherization services in New Hampshire has:

- **Reduced electricity use by more than 70,000 MWh annually,** which is equivalent to approximately 0.6 to 0.8% of retail sales of electricity (depending on the year);[13]

- **Reduced use of natural gas and other non-electric heating fuels** by 1,300,000 MMBtu in 2010;[14]

- **Provided $90 million worth of benefits annually** through electric and gas efficiency programs, including reduced energy bills and reduced capacity requirements;[15]

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[6] Energy Information Administration, State Energy Data System, "Table F28 Total Energy Price, Consumption, and Expenditure Estimates, 2009," http://www.eia.gov/state/seds/hf.jsp?incfile=sep_fuel/html/fuel_te.html

[7] New Hampshire Office of Energy and Planning, "2007 New Hampshire Energy Facts," http://www.nh.gov/oep/programs/energy/nhenergyfacts/2007/introduction.htm.

[8] Based on portion of spending that leaves the state, drawing upon information from the New Hampshire Office of Energy and Planning, "2007 New Hampshire Energy Facts," http://www.nh.gov/oep/programs/energy/nhenergyfacts/2007/introduction.htm.

[9] Energy Information Administration, State Energy Data System, "Table ET2 Total End-Use Energy Price and Expenditure Estimates, 1970-2009, New Hampshire," http://www.eia.gov/state/seds/hf.jsp?incfile=sep_prices/tx/pr_tx_NH.html&mstate=New%20Hampshire.

[10] This represents energy savings of around 20%, as defined as cost-effective in the study *Additional Opportunities for Energy Efficiency in New Hampshire*, Final Report to the New Hampshire Public Utilities Commission, GDS Associates, Inc., 2009

[11] Ibid.

[12] Ibid..

[13] Based on first year savings as reported in the 2008-2010 electric and gas annual efficiency program filings.

[14] Based on information in 2010 electric and gas annual efficiency program filings.

[15] Includes customer savings, avoided generation, transmission and distribution costs, quantifiable resource costs (e.g. water and electricity), and an adder for other non-quantified benefits (e.g. environmental and other benefits).

- **Provided new business opportunities** for energy efficiency and weatherization contractors, remodelers, and product suppliers in New Hampshire;

- **Helped reduce demand on the electrical grid** and offset or defer the need for new generation capability and/or transmission and distribution upgrades; and

- **Helped preserve finite energy resources** (such as heating oil, natural gas, and propane) for future generations.

The use of sustainable, renewable energy in New Hampshire has:

- **Resulted in 16% of total electricity use in the state,**[16] **and 10% of all energy inputs** coming from hydropower, biomass, solar electricity, solar space and water heating, wind energy, landfill gas, farm methane, and geothermal;[17]

- Led to the **creation of new sustainable energy businesses;**

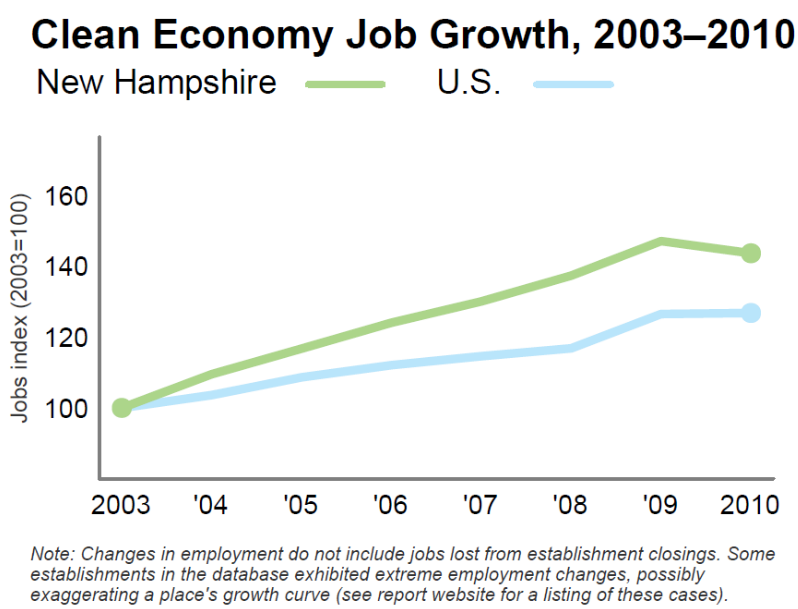

Figure 1.2. Clean Jobs in New Hampshire[18]

- **Helped diversify the portfolio of energy sources** relied upon in the state, thereby helping to address over reliance on any one energy source's pricing and availability in the future; and

- **Continued the long-held respect for independence and self-sufficiency in New Hampshire** as more citizens take control of their energy supply by relying on in-state resources.

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[16] New Hampshire Office of Energy and Planning, Energy Facts 2008; http://www.nh.gov/oep/programs/energy/nhenergyfacts/index.htm
[17] Share of gross renewable energy inputs of total gross energy input.
[18] Ibid.

1.5. Employment Impacts of Energy Efficiency and Sustainable Energy Use

The energy efficiency and sustainable energy policies, programs, and initiatives developed thus far in New Hampshire bring important employment benefits including (among others):

- **The creation of new jobs in New Hampshire.** According to a national study of clean jobs (defined as the sector of the economy that produces goods and services with an environmental benefit), there were nearly 13,000 clean jobs in New Hampshire in 2010. Of these, 5,000 jobs (or 40% of the total) were energy efficiency and sustainable energy jobs. These clean jobs represent about 2% of all jobs in the state.[19]

- **Faster growth in clean jobs in New Hampshire than in the nation overall**. As shown in Figure 1.2., the growth in clean jobs occurred at a faster rate in New Hampshire than in the nation overall. Between 2003 and 2010, clean jobs in New Hampshire grew by 5.3% annually. [20]
- **Higher median wage for clean jobs in New Hampshire.** The median wage of clean jobs in New Hampshire is $40,773, which is higher than the average of $38,657 for all jobs in the state.

- **A new way to address unemployment.** Research published in 2009 forecast that investments in the clean economy in New Hampshire could result in a net increase of about $650 million in investment revenue, and an increase of 8,000 jobs, even after assuming a reduction in fossil fuel spending. Adding 8,000 jobs to the labor market in 2008 would have brought the state's unemployment rate down to 2.8% from its 2008 level of 3.8.[21]

These accomplishments and their positive impacts on New Hampshire's economy and its citizenry environment provide an important foundation for further progress and success in stimulating even more energy efficiency and sustainable energy use in the future.

1.6. The Emphasis Placed on Market Development in this Study

This study sought to review and assess energy efficiency and sustainable energy policies, programs, and initiatives already underway in New Hampshire, and to recommend potential enhancements for the future. Experience indicates that the most successful energy efficiency and sustainable energy policies, programs, and initiatives are those which focus on developing markets,[22] and not only on the acquisition of energy efficiency and/or sustainable energy resources through public subsidy or one-time investment. Policies, programs, and initiatives that focus on market development in their design and approach begin by identifying and understanding key market barriers that are limiting otherwise cost-effective energy efficiency and sustainable energy investments. Many studies have been undertaken throughout the nation to identify such barriers and they typically include:

[19] Data analysis of Brookings-Battelle Clean Economy data available at http://www.brookings.edu/metro/clean_economy, Energy & Resource Efficiency include: Appliances, Battery Technologies, Energy-saving Building Materials, Green Architecture and Construction Services, HVAC and Building Control Systems, Lighting, Professional Energy Services, Public Mass Transit; Renewable Energy includes: Biofuels/Biomass, Hydropower, Renewable Energy Services, Solar Photovoltaic, Solar Thermal. No data was provided for New Hampshire for geothermal, waste to energy, wave/ocean power, and wind power.

[20] Sizing the Clean Economy, The Clean Economy in the State of New Hampshire, Brookings-Battelle Brookings-Battelle Clean Economy Database, http://www.brookings.edu/~/media/Files/Programs/Metro/clean_economy/clean_economy_profiles/states/33.pdf

[21] Robert Pollin, professor of economics and co-director of the Political Economy Research Institute at the University of Massachusetts-Amherst, James Heintz, associate research professor and associate director for Political Economy Research Institurte (PERI), Heidi Garrett-Peltier, PERI research fellow, http://images2.americanprogress.org/CAP/2009/06/factsheets/peri_nh.pdf

[22] Also referred to as "moving markets" and/or "market transformation."

- **Information overload** and uncertainty about whose information to accurate and can be trusted;

- **Transactional complexity** - the solutions are small and diffuse rather than few and mighty;

- **Lack of capital** to address high first costs and often short return on investment (ROI) expectations by energy users; and

- **Split incentives** - which occur when the cost of a measure or technology are borne by one market participant while the savings benefit another. In such situations, the financial incentive to adopt the technology is "split" from the participant responsible for putting it in place.[23]

National leaders in energy efficiency and sustainable energy program design and implementation have noted and documented for decades that many market barriers are in fact a result of market failures that warrant public intervention to help markets work more effectively.[24] It has been determined time and again that the energy market place often does not behave in a way that leads to energy efficiency and/or sustainable energy investments even when it is in a consumer's best interest financially to make such investments. This is true in many jurisdictions throughout the United States. This basic condition results in policymakers and regulators in many states choosing to legislate and/or mandate prudent public investment in energy efficiency and sustainable energy programs in order to ensure the public interest is well served.[25]

In New Hampshire, legislation developed in the 1990s while the utility industry was being restructured helped inspire the first round of regulated energy efficiency programs being offered to all energy customers throughout the state. As articulated in the restructuring legislation:

> **"Restructuring should be designed to reduce market barriers to investments in energy efficiency and provide incentives for appropriate demand-side management and not reduce cost-effective customer conservation. Utility sponsored energy efficiency programs should target cost-effective opportunities that may otherwise be lost due to market barriers."[26]**

As the nation (and New Hampshire) completes its first decade (or more, in some cases) of energy efficiency and sustainable energy program implementation, it is clear that continued success and realization of even more efficiency savings and new sustainable energy generation in the future will depend on careful attention to the market barriers that continue to exist today. A key question moving forward is:

> **"How can a jurisdiction best utilize what was learned through the first generation of energy efficiency and sustainable energy programs to address the ongoing market barriers and failures that continue to limit market development and true market transformation?"**

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[23] For example, http://blogs.edf.org/innovation/2010/04/19/top-five-barriers-to-energy-efficiency-savings/

[24] For example, Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency, William H. Golove, Joseph H. Eto, Lawrence Berkeley Laboratory, 1996, p. xi

[25] The details of New Hampshire's energy efficiency and sustainable energy policy and regulatory history are provided in Chapter 2: The Current Energy Policy, Regulatory, and Funding Framework in New Hampshire and in Chapter 6: Portfolio Review and Assessment of Energy Efficiency Programs.

[26] RSA 374-F:3.

Experience in those jurisdictions with the most successful energy efficiency and sustainable energy market development and true market transformation indicates that all aspects of energy efficiency and sustainable energy program design, implementation, and evaluation should be informed by careful attention to what will result in market development, and not simply resource acquisition. However, this is not occurring in many jurisdictions, even where programs are meeting stated goals and providing good value and service to consumers.

Currently, many energy efficiency programs throughout the nation are essentially going out and "buying" a certain amount of energy efficiency and/or sustainable energy resource from customers, relying almost exclusively on incentives, without aggressively understanding the market and developing integrated strategies that address real market barriers and failures. While such programs may be cost-effective and yield benefits to customers, the economy, and the environment, the results and the scale of the effort are limited by the nature of the program design. While the programs provide some intervention to overcome barriers for a defined period of time, they are not actually ending up developing or transforming the market over the longer-term. As such, the programs are not on a path that is likely to enable the programs to succeed in the future with reduced, or no, public subsidy or to use continued subsidy to achieve even broader and deeper savings (for efficiency programs) or substantial new energy production (for sustainable energy programs).

While conducted this study, emphasis was placed from the very beginning on reviewing and assessing the variety of energy policies, programs, and initiatives in New Hampshire with regard to their effectiveness in removing market barriers, addressing market failures, and developing and transforming the market in the future. The study team drew upon VEIC's direct experience designing, reviewing, and/or assessing energy efficiency and sustainable energy policies and programs in more than 35 states and VEIC's direct implementation experience in the mid-West, New Jersey, Vermont, and Washington, DC. VEIC's program design and implementation work has resulted in mature, robust, well developed, and transformed markets in multiple jurisdictions. In Vermont, the success of VEIC's energy efficiency market development work has enabled the state to achieve increasingly aggressive levels of savings, often in hard to reach markets. In New Jersey, the success of VEIC's sustainable energy market development work has enabled the state to achieve the highest market penetration of solar electric generation in the nation and to do so with decreasing levels of public investment over time.

1.7. Keys to Successful Market Development and Market Transformation

When reviewing energy efficiency and sustainable energy initiatives in New Hampshire and the types and extent of market barriers still at play in the state, the study team kept several critical points in mind:

- **There is not a single market, there are many markets**. There is a tendency to approach market development within a jurisdiction as though the same approaches work for all types of measures and types of customers, and that once one approach has been implemented no further action is needed. This is not the case because new technologies and changes in prices, products, and markets all keep altering the pool of opportunities.[27] For example, while the market for screw-in bulbs might be transforming to compact fluorescent lights (CFLs), there is a new range of opportunities with light-emitting diode (LED) lighting. Refrigerators have more than tripled in efficiency while declining in cost, due in large part to co-ordinated regulatory and program strategies; but television set-top cable and other boxes still have a long way to go and are sold in a very different market structure. Often opportunities are changes in practices as well as changes in

[27] This dynamic is not exclusive to energy efficiency. In natural gas markets, for instance, the estimate of available supply is not just a question of "gas in the ground," it is just as much a question of what the market price is and what is recoverable by new technologies including horizontal drilling and recovery from shale, for example.

products. Building commissioning, air sealing, and improved system and building design are examples of practice changes. Such changes in practice are likely to require different approaches than changes in product lines.

- **There are a variety of ways to develop and transform markets.** Direct investment strategies should lead to deeper levels of product acceptance. Rebates are an important beginning, but should not be the end. Work on "market channels" such as the wholesale and manufacturer levels can help move markets to lower cost, new products, and wider acceptance. Certification processes, labeling, and training can all help move markets. Codes and standards can institutionalize and formalize advances as well.

- **Overcoming barriers and transforming markets requires intelligence, responsiveness, innovation, and persistence.** Each product or practice needs to be understood for its own version of how the current approaches are not doing all they can to help the market to develop and mature.

1.8. Building Blocks Leading to More Market Development in New Hampshire

Experience in multiple jurisdictions in which there is effective market development indicates that the following characteristics lead to the greatest success in developing and transforming markets. The study team kept these in mind while reviewing and assessing energy polices, programs, and initiatives in New Hampshire for this study:

- **Clear policy direction articulated in legislation** and supported by specific goals, clear regulatory guidance for the appropriate ways to meet the goals, and appropriate incentives for achieving the performance and results desired.

- **A single, trusted source of information** with a common portal to program offerings.

- **High levels of coordination among service offerings**. If the goal is to institutionalize market development, then market actors, suppliers, implementers, and customers need a common set of program features. Those features (such as incentive levels or product offerings) must change in response to market conditions and opportunities, and the changes should be clear and uniform. Coordinated offerings work most effectively.

- **An emphasis on creating and expanding the market infrastructure**. Programs should focus on creating new business opportunities for key market actors including contractors, installers, designers, and vendors. Often training and certification help create, differentiate, and grow new businesses for these market actors.

- **Market development (and not simply resource acquisition) is rewarded.** While it is not appropriate to reward utilities for savings they had no part in securing, utilities should be allowed to claim some benefit for work they do that helps to develop markets, and helps to promote and support high-efficiency codes and standards. An interesting feature of well-run energy efficiency programs is that as market segments are transformed direct utility investment declines (as it should for the affected measures), but the benefits to consumers and the economy continue over time. The fact that utilities can no longer claim savings for such measures is appropriate in the long run, but utilities should not be penalized for success so significantly that their ongoing work to accomplish the next market transformation is jeopardized.

- **A sustained commitment to meeting goals and the willingness to increase goals over time.** It is a common failure of program design that energy efficiency targets, sustainable energy goals, and implementation budgets are arbitrarily limited, and that the focus becomes on spending available funds without an overall strategy for developing the market. This does not mean that there should be unrestricted funds available for energy efficiency and sustainable energy. Cost-effectiveness of programs, assessment of performance, and assessment of bill and economic impacts are vital components of effective performance. However, market development is not likely to succeed if programs are not designed to reach significant portions of the market. A common feature of programs that are not market-development–focused is that they tend to only manage to goals. If the goals are low, program implementers end up being as concerned about the regulatory risks of over-spending as they are about meeting the targets. It is difficult for a program to help develop markets in a sustained, orderly way if the program is shut down half way through the year because it ran out of funds.

- **A regulatory process that removes disincentives for energy efficiency investments and rewards strong performance.** The system should be carefully designed to ensure that consumers retain most of the benefit of the investment and that implementing entities are held to strict performance levels and are rewarded appropriately for meeting strong goals.

- **An ongoing system of evaluation, measurement, and verification (EM&V) conducted independently from the utilities being evaluated.** An amount in the range of 3-7% of energy efficiency program budgets should be dedicated to evaluation, monitoring, and verification. The EM&V should be conducted by a third party evaluator working independently from the implementing entity. The EM&V should assess how well the market is understood markets as well as assess program effectiveness. Outcomes of EM&V should feed back into program design and implementation enhancements for future programs.

- **A focus on performance combined with implementation flexibility for achieving performance goals.** Performance goals should not just be year-to year, but allow for ramp-up and innovation over at least a two-year period, with a clear feedback loop between program monitoring, evaluation, and verification and continuous program improvement. Performance incentives should be designed to reward implementers for innovation, responsiveness to shifting markets, and should not reward the status quo. Implementers should be able to change strategy, to alter incentives, or to make special offers as long as they are held to demanding savings goals.

- **An understanding of the importance of long term planning and for doing the planning through a collaborative process in a non-adjudicative setting.** Programs should be designed and planned for a minimum of two years (as was begun in New Hampshire for the 2011-2012 utility program filings.) Adjudicated regulatory proceedings are perhaps the least effective forum for contemplating program design changes, and reaching agreement on how effective they will be at market development and transformation. Instead, program design and planning should be done using a collaborative process in a non-adjudicative setting with the involvement of an independent, third party who has the expertise and resources to help ensure that both consumer and utility interests are aligned before program plans and budgets are submitted to regulators. Examples of states that have taken this approach include California, New Jersey, Rhode Island, and Vermont. When done well, this can streamline the regulatory process, reduce legal expenses for the parties, and result in more effective and innovative programs.

1.9. Key Areas of Focus in the Study

Key areas addressed in this study include:

- The design, implementation, and results of **energy efficiency and sustainable energy programs** in New Hampshire compared to other states and jurisdictions;

- Opportunities for **increasing the efficiency of thermal energy use** by incorporating a "fuel neutral" approach into more energy programs, building upon recent successes with fuel neutral pilot programs;

- The potential for utilizing **"Smart Grid"** technology to enable an electricity grid that fully integrates energy efficiency and sustainable energy in a way that benefits both consumers and utilities;

- **Performance incentives** in place for utility energy efficiency and sustainable energy program implementers, and opportunities for further motivating achievement of state goals while balancing consumer and utility interests;

- Opportunities for greater attention to **land use planning** as a key factor in future energy use, and integration of "smart growth" planning principles in the work of Local Energy Committees and municipal energy initiatives;

- Ensuring **sustainable funding and increased private investment** to soften the impact of anticipated decreases in federal funding for energy initiatives and to help stimulate economic growth opportunities and jobs in New Hampshire through the green economy; and

- Future **policy and regulatory initiatives** that would help ensure sufficient emphasis on market-based approaches moving forward.

1.10. Organization of this Report

This report:

- Describes key energy efficiency and sustainable energy policies, programs, and initiatives in New Hampshire and reviews their effectiveness at addressing key barriers to further market development in the future;

- Identifies where modifications and enhancements can be made to existing programs and initiatives to further enhance achievement of state goals in the future; and

- Contemplates new approaches for further developing energy efficiency and sustainable markets and optimizing financing and investment in the future.

This report serves as a resource for the Legislature, the Executive Branch, state planners and regulators, utility managers, industry and business leaders, and interested citizens. It provides substantial information about the design and implementation of current energy efficiency and sustainable energy programs and initiatives in New Hampshire, as well as recommendations for policy and program enhancements that would maximize effectiveness, increase coordination, and stimulate investments in the future. The report is organized in the following way:

- The current **energy policy, regulatory, and funding framework** is described in Chapter 2;
- The **portfolio of regulated energy efficiency programs** offered in New Hampshire is reviewed and assessed in Chapter 3;
- **Residential energy efficiency CORE programs** are reviewed and assessed in Chapter 4;
- **Commercial and industrial energy efficiency CORE programs** are reviewed and assessed in Chapter 5;
- **Low income and weatherization and assistance programs (WAP)** are reviewed and assessed in Chapter 6;
- **Sustainable energy programs and initiatives** are reviewed and assessed in Chapter 7;
- **Smart grid** initiatives are reviewed and assessed in Chapter 8;
- **Utility performance incentives** are reviewed and assessed in Chapter 9;
- The importance of effective **land use planning, municipal energy initiatives, and local engagement** is discussed in Chapter 10;[28]
- The importance of **building energy codes and code enforcement** is addressed in Chapter 11;
- The role of **state and local government in leading by example** is discussed in Chapter 12; and
- **Public and private funding and finance initiatives** are reviewed and assessed in Chapter 13.

Each of the chapters notes key recommendations for further advancement and improvement in New Hampshire within the chapter text, as well as a summary table of recommendations at the end the chapter. An overall conclusion to the study is presented in Chapter 14, which highlights the most important, overarching recommendations for consideration by the Legislatures, the Executive Branch, regulators, other state entities, utilities, private industry, and concerned citizens. Various appendices include supporting information.

[28] This area of assessment was not specified in the final version of SB 323. However, the study team chose to add this to the study because of the importance of land use planning, smart growth planning principles,and local action and initiative to future energy use in New Hampshire. Any jurisdiction serious about increasing energy efficiency and sustainable energy use should address land use planning and zoning issues early in their efforts. In addition, in a state like New Hampshire with a strong community-based and decentralized approach to addressing opportunities and challenges, the important role of municipal initiatives and local engagement cannot be overstated.

Chapter 2: The Energy Policy, Regulatory, Program Oversight, and Program Funding Framework in New Hampshire

2.1. Introduction

New Hampshire has a long history of policy, regulatory, and program initiatives that seek to increase energy efficiency, stimulate sustainable energy use, create jobs, and stimulate economic development. Given this, it is not surprising there is a well-established policy, regulatory, and program oversight framework in place and a range of funding sources to support energy programs in the state. Presented below is a description of the energy policy, regulatory, program oversight, and program funding framework currently in place, followed by recommendations for enhancement in the future.

2.2. Current Energy Policy Framework

There are a number of policy statements, legislative bills, state statutes, executive orders, and other documents in New Hampshire that articulate the intention to move toward greater energy efficiency and sustainable energy development and use over time. Examples of major initiatives include (among others) the:

- **Energy Policy Act** establishing the policy that each electric utility complete a least cost integrated resource plan (IRP) at least biannually, and indicating that it is the policy of the state that energy be provided at least cost.[1]

- **Electric Utility Restructuring Act** creating the goal of developing a competitive marketplace for wholesale and retail electricity based upon the principles of system reliability, customer choice, unbundled services and rates, open access to transmission and distribution (T&D), universal service for all customers/members,[2] etc.[3]

- **Renewable Portfolio Standard** requiring each supplier of electricity in New Hampshire to obtain 23.8% of their electricity from renewable energy resources by 2025.[4]

- **Net Metering Statute** providing standard tariffs (i.e. payment rates) for customer-sited renewable energy.[5]

- **Distributed Energy Resources Statute** aiming to stimulate utility investments in distributed generation.[6]

- **Greenhouse Gas (GHG) Emissions Reduction Fund** providing financial support for energy efficiency, conservation, and demand response programs that reduce greenhouse gas emissions.[7]

[1] RSA 378:37, New Hampshire Energy Policy, 1990.
[2] As a member owned utility, NHEC uses the title members instead of customers when referring to its ratepayers, for the sake of simplicity, customers/members will be referred to collectively as customers in this report
[3] RSA 374-F: Electric Utility Restructuring, 1996.
[4] RSA 362-F: Electric Renewable Portfolio Standard, 2007.
[5] RSA 362-A: Limited Electrical Energy "Producers Act, Net Energy Metering, 1998, 2007.
[6] RSA 374-G: Electric Utility Investment in Distributed Energy Resources, 2008.

- **"Smart Growth" Statute** establishing key principles for economic growth, resource protection, and planning that ensure "… clean water and air; productive mountain, forest, and agricultural open space land," and that impact directly land use development and transportation patterns that greatly affect energy use.[8]

- **Energy Commissions Statute** enabling municipalities to create or endorse existing groups to serve as Local Energy Commissions to assess local energy use and cost, and make recommendations including regarding energy conservation, energy efficiency, energy generation, and zoning practices.[9]

- **25 by '25 Renewable Energy Initiative** endorsed by the Governor that seeks to produce 25% of the energy consumed in the state from sustainable energy resources by 2025.[10]

- **Planning and Zoning Act** stating that renewable energy systems shall not be unreasonably limited by municipal zoning, or the unreasonable interpretation of zoning regulation.[11]

2.2. Current Regulatory and Program Oversight Framework

In tandem with the numerous policies noted above is an important portfolio of energy efficiency, and sustainable energy programs offered throughout the state. These programs have resulted in millions of dollars of investment in energy efficiency and sustainable energy in both the public and private sectors, reductions in energy use due to efficiency improvements, and production of thermal and electrical energy using sustainable, renewable resources. The programs and initiatives are regulated and /or overseen by a diversity of state agencies, commissions, and boards. The major state entities focused on energy issues are described below.

New Hampshire Public Utilities Commission

The New Hampshire Public Utilities Commission (NH PUC or "the Commission") was created in 1911 and currently consists of a variety of divisions including: Administration, Legal, Consumer Affairs, Safety, Electric, Telecommunications, Gas and Steam, Water and Sewer, Audit, and Sustainable Energy. The PUC has a staff of 70 employees. The PUC is responsible for ensuring that rates from regulated utilities operating in the state are just and reasonable, and that service provided by the regulated utilities is reliable and safe. The Governor appoints three Commissioners to the PUC for staggered six year terms, with these appointments confirmed by the Executive Council. The Commission reports on its programs in biennial reports.[12]

The Commission is funded primarily by a charge on regulated utilities' revenue. In addition, funds from the Regional Greenhouse Gas Initiative (which is an auction of carbon emission allowances) plus interest on investments are collected in a Greenhouse Gas Emissions Reduction Fund (GHGERF). New Hampshire legislation directs the Public Utilities Commission and the Department of Environmental

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[7] RSA 125-O: Regional Greenhouse Gas Initiative; Greenhouse Gas Emissions Reduction Fund, 2008.
[8] RSA 9-B: State Economic Growth, Resource Protection, and Planning Policy, 2000.
[9] RSA 38-D: Energy Commissions, 2009.
[10] RSA 362-F mandates that 23.8 percent of the state's electricity come from certain renewable sources by 2025, aligned with the 25 x '25 initiative: http://www.governor.nh.gov/media/news/2006/082906energy.htm
[11] RSA 672:1 III-a and III-d: Planning and Zoning Act. Although this was created for small wind energy systems it has broader implications.
[12] New Hampshire, Public Utilities Commission, Biennial Report, July 1, 2007 – June 30, 2009 was the most current report at the time research was conducted for this study.

Services to create a trading program consistent with the original RGGI Memorandum of Understanding (MOU) signed by Governor Lynch on December 20, 2005.[13] In addition, the PUC and the DES are required to report annually on the implementation of RGGI in New Hampshire.[14] The GHGERF fund supports, among others, energy efficiency, conservation, and demand response programs; at least 10% of the funds support low income initiatives. The Commission also manages the Renewable Energy Fund (REF) funded by alternative compliance payments (ACPs) from energy supplier resulting from implementation of the state's Renewable Portfolio Standard.

Electric Division: The Electric Division oversees electric utilities and energy efficiency programs offered by the utilities, including demand response/smart metering, the Forward Capacity Market (FCM), and transmission issues. Oversight includes rates, distribution, and energy efficiency programs (including low-income assistance programs).

Gas and Water Division: Gas and Water Division staff oversees gas utilities and the one regulated steam utility in the state (Concord Steam). Oversight includes rates, distribution, and energy efficiency programs (including low-income assistance programs).

Sustainable Energy Division: The Sustainable Energy Division was created in 2008. Its purpose is to promote renewable energy, energy efficiency, energy sustainability, affordability, and security. The Division implements New Hampshire's Renewable Portfolio Standard, administers two clean energy funds, and manages the statewide energy code program for residential and commercial buildings. The Division provides support to the Commission, which is responsible for reviewing applications for facilities seeking to produce and sell New Hampshire renewable energy certificates (RECs).

New Hampshire Office of Energy and Planning

The New Hampshire Office of Energy and Planning (NH OEP) is included in the Executive Branch within the Office of the Governor. The Director of NH OEP is appointed by the Governor and does not have a set term. NH OEP manages federal energy program funds and handles the State Energy Plan, State buildings efficiency, alternative fuels, industrial efficiency, sustainable energy, heating oil and propane, and additional energy-related education projects. NH OEP administers a diversity of energy programs and initiatives including:

- Development of the 25 x '25 Plan in collaboration with the New Hampshire Department of Environmental Services (NH DES);
- State building efficiency, and hosting the State's Annual Energy Conference in collaboration with the Department of Environmental Services;
- Collaboration with the New Hampshire Department of Resources and Economic Development (NH DRED) to assist businesses in assessing and addressing energy needs;
- Management of the federal Weatherization Assistance Program (WAP) and administration of sub-grants to six Community Action Agencies (CAAs);
- Renewable energy initiatives;
- Participation in the state's emergency management infrastructure, with responsibility for energy assurance and reliability and specific funding for that purpose;
- Co-chairs (with NH DES) the state's Interagency Energy Efficiency Committee, which provides leadership on in-state energy initiatives such as procurement policies, building efficiency, training and recognition of state energy reduction efforts, and implementation of the Climate Action Plan's Government Leading by Example goals;

[13] HB 1434.
[14] HB 1434, Section 125-O:21 VI.

- Technical assistance to Regional Planning Commissions and local municipalities for a variety of planning and energy-related long range planning issues, including Smart Growth legislation;
- Management of a clean transportation and alternative fuel program; and
- State heating oil and propane oversight, including monitoring of fuel costs.

Financial support for these programs comes from federal grants and the Petroleum Violation Escrow Fund. In addition to annual State Energy Program and Low Income Weatherization grants from the federal government, NH OEP also coordinates energy programs funded by the American Recovery and Reinvestment Act (ARRA), and is responsible for the statewide administration of the federal Low Income Home Energy Assistance Block Grant (LIHEAP), also referred to as the Fuel Assistance Program. NH OEP contracts with six local Community Action Agencies (CAAs) to provide services to eligible low income households, with funding provided through the U.S. Department of Health and Human Services.

The Office of Energy and Planning is involved in the State's Energy Facility Site Evaluation Committee (SEC). The committee includes representatives of eight state agencies who jointly review proposed plans for the siting, construction, and operation of energy facilities in the state as a committee.[15] This approach recognizes that "it is in the public interest to maintain a balance between the environment and the need for new energy facilities in New Hampshire" and provides a single forum designed to "ensure that the construction and operation of energy facilities is treated as a significant aspect of land-use planning in which all environmental, economic, and technical issues are resolved in an integrated fashion."[16]

In addition to energy related initiatives, the mission of the Office of Energy and Planning programs also includes state planning efforts for non-energy purposes.

New Hampshire Department of Environmental Services

The New Hampshire Department of Environmental Services is responsible for a range of issues from water quality and water resources management, to regulating the emissions of air pollutants, to fostering the proper management of municipal and industrial waste. The Department is involved with a variety of energy programs that relate to its mission. For example, the NH DES is the state agency that administers the clean transportation/alternative fuel program with some financial assistance from NH OEP. In addition, the Air Resources Division of the NH DES is involved in energy efficiency and sustainable energy policy and sponsored development of the *New Hampshire Climate Action Plan*.[17]

New Hampshire Department of Resources and Economic Development

The New Hampshire Department of Resources and Economic Development is comprised of several divisions with missions relating to economic development, forests and lands, parks and recreation, and travel and tourism. The Department is involved in programs relating to workforce trainings (including building contractor trainings) and administers energy audit and/or loan programs, among others.

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[15] This joint committee and integrated permitting process, created by RSA 162-H, provides a single forum for an applicant to present an integrated application

[16] RSA 162-H:1.

[17] http://www.des.state.nh.us/organization/divisions/air/tsb/tps/energy/index.htm and http://www.des.state.nh.us/organization/divisions/air/tsb/tps/climate/index.htm

New Hampshire Department of Administrative Services

The New Hampshire Department of Administrative Services (NH DAS) provides services to the Governor, executive branch/state employees, legislative branch, judicial branch, general public and local governments, and as such is also involved in energy related programs. The State Energy Manager, which was originally housed at NH OEP, is now located within NH DAS and oversees the state's Building Energy Conservation Initiative (BECI) performance contracting program.

Energy Efficiency and Sustainable Energy Board

The Energy Efficiency and Sustainable Energy Board was created in 2008 to promote and coordinate programs relating to energy efficiency, demand response, and sustainable energy in New Hampshire.[18] The EESE Board is administratively attached to the PUC with support provided by PUC staff but no financial resources, budget, or staff of its own. Membership in the Board is broad, including representatives from state agencies, non-profit organizations and associations, legislators, businesses in the energy efficiency and sustainable energy sectors, and non-voting members from the electric and natural gas utilities, as set forth by statute.[19] The Board's duties, as noted in statute, include but are not limited to the following:

- Review available energy efficiency, conservation, demand response, and sustainable energy programs and incentives and compile a report of such resources in New Hampshire.
- Develop a plan to achieve the state's energy efficiency potential for all fuels, including setting goals and targets for energy efficiency that are meaningful and achievable.
- Develop a plan for economic and environmental sustainability of the state's energy system including the development of high efficiency clean energy resources that are either renewable or have low net greenhouse gas emissions.
- Provide recommendations at least annually to the Public Utilities Commission on the administration and allocation of energy efficiency and renewable energy funds under the commission's jurisdiction.
- Explore opportunities to coordinate programs targeted at saving more than one fuel resource, including conversion to renewable resources and coordination between natural gas and other programs which seek to reduce the overall use of nonrenewable fuels.
- Develop tools to enhance outreach and education programs to increase knowledge about energy efficiency and sustainable energy among New Hampshire residents and businesses.
- Expand upon the state government's efficiency programs to ensure that the state is providing leadership on energy efficiency and sustainable energy including reduction of its energy use and fuel costs.
- Encourage municipalities and counties to increase investments in energy efficiency and sustainable energy through financing tools, and to create local energy committees.

[18] Created by HB 1561, codified as RSA 125-O:5-a
[19] RSA 125-O:5-a II, III. http://www.gencourt.state.nh.us/rsa/html/X/125-O/125-O-5-a.htm

- Work with community action agencies and the office of energy and planning to explore ways to ensure that all customers participating in programs for low-income customers and the Low Income Home Energy Assistance Program (LIHEAP) have access to energy efficiency improvements, and where appropriate, renewable energy resources, in order to reduce their energy bills.

- Investigate potential sources of funding for energy efficiency and sustainable energy development and delivery mechanisms for such programs, coordinate efforts between funding sources to reduce duplication and enhance collaboration, and review investment strategies to increase access to energy efficiency and renewable energy resources.

Other entities previously handled some issues now being addressed by the EESE Board and are no longer active. For example, until December 2008 the Energy Policy Commission (EPC) investigated energy issues including energy efficiency and sustainable energy.[20] In addition, the Energy Planning Advisory Board (EPAB) previously monitored and assisted with implementation of the *2002 State Energy Plan* (the most recent energy plan in New Hampshire).[21]

The EESE Board recognizes the importance of energy efficiency as the cleanest and least expensive resource and the need to further develop the energy efficiency and sustainable energy potential in New Hampshire.[22] The Board's discussions and efforts have focused on: an enhanced delivery system for energy efficiency and sustainable energy; coordinated municipal assistance, outreach and public education; the so-called "Beacon Communities Initiative;" clean energy job training; and workforce development, among other topics. The EESE Board has working groups that focus on specific topics, such as outreach and public education, municipal energy use, Beacon communities, workforce development and job training, and support for the NH PUC in managing this study, as required by statute.[23] Four working groups are typically active and meet frequently throughout the year. The EESE Board collaborates with other groups in New Hampshire including, for example, the Energy and Climate Collaborative (a voluntary effort started in 2009 to track implementation of the *New Hampshire Climate Action Plan*).[24]

New Hampshire Office of Consumer Advocate

The New Hampshire Office of Consumer Advocate (NH OCA) is an independent agency with five staff members that is administratively attached to the Public Utilities Commission. The NH OCA was developed by state statute and is charged with advocating for the interests of residential customers of the regulated utilities serving New Hampshire.[25] The NH OCA is a member of the EESE Board and has been involved in energy efficiency and sustainable energy policy and dockets for many years.

2.3. Current Program Funding Framework

Funding for energy efficiency and sustainable energy programs in New Hampshire currently comes from a diversity of sources. Some funding sources (such as the system benefits charge [SBC]) allow for relatively stable funding while others are temporary (such as federal ARRA funding), or subject to uncertainty (such as RGGI funding, which the New Hampshire Legislature considered repealing or

[20] HB 1146 of 2006 and SB140 of 2007.
[21] SB 443, Chapter 164:2.
[22] Energy Efficiency and Sustainable Energy Board RSA 125-O:5-a, First Annual Report, December 1, 2008.
[23] Chapter 335 of the NH laws of 2010 (Senate Bill 323).
[24] http://www.nhcollaborative.org.
[25] RSA 363:28

reforming in 2011. Presented in Table 2.1., Table 2.2., and Table 2.3. is information about energy program funding in New Hampshire. Acronyms used in the tables for ease of presentation are explained in Appendix A, as are acronyms used in other Chapters of this report. Since this section addresses program funding (not funding for individuals), various energy incentives available to consumers but not used directly to support energy programs are not listed in the Tables.[26]

Presented in Table 2.1 are the approximate funds allocated to the major energy efficiency and sustainable energy programs in New Hampshire. Key findings from the research done to create the table are summarized below:

Table 2.1. Approximate Funds Allocated to Energy Efficiency and Sustainable Energy Programs[27]

	State, County, Municipal	C&I	Residential[28]	Low-income	Communi-ties/ Non-profit	Building Code	Other	Total [29]
SBC - Electric[30]	***	$9,000,000	$6,200,000	$2,600,000 CORE	***	$40,000 CORE		**$18,000,000 (2011)** [31]
EE Charge - Gas	***	$3,600,000	$2,800,000	$800,000	***			**$7,000,000 (2011)**
ACP Funded REF		Variable, see Chapter 7 for details	Variable, see Chapter 7 for details					**$4,500,000 (2009)- $1,300,000 (2010)**
ARRA	$20,100,000	$10,000,000	$1,700,000	$27,400,000	$10,000,000	$600,000	$2,600,000	**$72,000,000 (2009-2012) –**
RGGI/ GHGERF	$3,000,000	$ 27,400,000[32]			$1,000,000		$200,000	**$31,000,000 (2009-2010)**
Other Federal				$2,500,000– WAP, 2009[33]				**$1,300,000-2,500,000 (WAP 2007-2009)**

******* Included in other categories

- **System benefits charge** funding provides $18 million annually for the electric efficiency programs, and $7 million for gas energy efficiency programs.[34] The systems benefit charge was established at the time of partial transition to retail choice in New Hampshire, and is collected

[26] Federal tax credits, such as the Advanced Energy Manufacturing Tax Credit - 48C provided under ARRA and state tax credits, such as the Renewable Energy Property Tax Exemption provided under NH RSA 72:61-72) are not listed.
[27] Some programs serve both residential and commercial & industrial customers, or whole communities, and some judgment was made when classifying funding into these categories.
[28] Does not include low-income programs.
[29] Totals may not add up due to rounding.
[30] Does not include additional monies voluntarily set aside by utilities for certain expanded energy efficiency and sustainable energy programs (e.g. the NHEC Social & Environmental Responsibility Program).
[31] In 2010, New Hampshire Senate Bill 300 directed the NH PUC to increase the Electric Assistance Program (EAP) portion of the SBC; the energy efficiency SBC share was reduced from 1.8 mills to 1.5 mills per kWh. The re-allocation of funds expired on June 30, 2011, and reverted to the prior rates (see Chapter 3 for details).
[32] Residential, low-income, and C&I are combined as the use of RGGI funds for the CORE efficiency programs spans several categories.
[33] Low income weatherization programs leverage federal funds from the U.S. Department of Energy.
[34] Budgets for 2011 reported in Docket No. DE 10-188 2011-2012 Core Electric Energy Efficiency and Natural Gas Efficiency Programs.

through a surcharge on utility customer bills.[35] A portion of the charge dedicated to providing assistance to low income electricity customers needing assistance with paying their bills has varied overtime (in response to various legislative actions), as has the balance available for energy efficiency programs. This is discussed in more detail in Chapter 3.

- **Renewable Energy Funds** from Alternative Compliance Payments resulting from the state's Renewable Portfolio Standard are variable and declined between 2009 and 2010.

- **Federal ARRA funds** are providing approximately $72 million for programs originally planned for 2009 through 2012. This equates to approximately $24 million annually over three years. These one-time funds will no longer be available once current funding is depleted, with some funds expected to roll over into 2013 as programs finish up activity once envisioned for 2012. Further information on the energy programs in New Hampshire currently funded by ARRA is provided in Table 2.2.

- **RGGI funds** provided approximately $31 million in 2009 and 2010, which is approximately equivalent to $15.5 million annually over two years. RGGI funds were directed through competitive solicitations to customers, to utility administered CORE efficiency programs, and to a range of other energy efficiency and sustainable energy initiatives. As noted above, the New Hampshire Legislature in 2011 contemplated returning New Hampshire's RGGI funds to the administrator of the multi-state initiative. This indicates that the future availability of RGGI funds for energy efficiency and sustainable energy programs in New Hampshire is uncertain. Further information on the energy programs in New Hampshire currently supported by RGGI funds is provided in Table 2.3.

- **Other federal support** for the Weatherization Assistance Programs and Low Income Heating Energy Assistance Program vary somewhat from year to year and are formula driven (at the federal level).

In addition, not shown in the tables are Forward Capacity Market (FCM) funds that are allocated to utility administrated energy efficiency programs that are demonstrated to reduce capacity requirements for the regional power grid. Such funds are tied to periodic FCM auctions. Such funds vary depending on market conditions, are quite limited overall, and are not likely to increase in the current New England market in the short term.

[35] The rate of the surcharge was 3 mills from 2001 through September 30, 2008. From October 1, 2008 to the present, the rate has been 3.3 mills.

Table 2.2. Energy Programs in New Hampshire Receiving ARRA Funds[36]

Program[37]	Funding Recipient	Amount
State, County, and Municipal Programs		
EECBG Technical Assistance	Multiple municipalities and counties	$ 2,000,000
EECBG Subgrant	Multiple municipalities and counties ($6.6 M of $7.1M)	$ 7,100,000
SEP Municipal Energy Planning	Multiple municipalities	$ 300,000
SEP State Building EE/RE Program	State buildings	$ 10,700,000
Total		**$ 20,100,000**
Commercial and Industrial/ Higher Education		
SEP Enterprise Energy Fund	RLF- Multiple businesses and non-profit organizations	$ 6,600,000
SEP Community College System of NH	Community Colleges	$ 1,300,000
SEP Expanded Business Energy Efficiency Program	Multiple businesses	$ 750,000
SEP University System of NH	Universities	$ 1,300,000
Total		**$ 9,950,000**
Residential Programs		
SEEARP	Residential customers	$ 1,262,000
SEP Expanded Renewable Energy Program	Residential rebate	$ 500,000
Total		**$ 1,762,000**
Low Income Weatherization Program		
ARRA Weatherization	Low-income residential customers[38]	$ 23,200,000
Sustainable Energy Resources for Consumers (SERC)	Low-income residential customers	$ 2,565,000
Total		**$ 27,365,000**
Multi-sector Programs		
EECBG Beacon Communities – BetterBuildings	Competitively selected communities (residential, C&I, and non-profits)	$ 10,000,000
Building Code		
SEP Building Code Compliance	Workshops	$ 600,000
Other		
SEP Expanded alternative fueled vehicle/Rideshare	State fleet and other projects	$ 400,000
SEP Feasibility studies and training	Renewable energy resources	$ 400,000
SEP Innovative Initiative	UNH- Green Launching Pad	$ 1,500,000
Energy Assurance	Risk and vulnerability assessment of the energy infrastructure	$ 320,729
Total		**$ 2,620,729**
ARRA Grand Total		**$ 72,000,000**

[36] NH OEP American Recovery and Reinvestment Act Resources http://www.nh.gov/oep/recovery/index.htm
[37] Some projects have multiple objectives and may fit in multiple categories.
[38] Not including Base Grant Weatherization ($1.19M for 2011), which is not an ARRA funded program.

Table 2.3. Energy Programs in New Hampshire Receiving RGGI Funds[39]

Program[40]	Funding Recipient	Amount
State, County, and Municipal Programs		
CDFA Revolving Loan Fund 09-2010	Multiple municipalities	$1,500,000
Clean Air/Cool Planet, 2009	Multiple municipalities	$400,000
Installation/ retrofit, 2009-2010	City of Rochester	$394,000
Installation/ retrofit, 2009-2010	Town of Temple	$332,100
UNH Carbon Solutions New England, 2009	State government	$139,945
Installation/ retrofit, 2009	Town of Walpole	$138,345
Installation/ retrofit/ audit, 2009	Multiple municipalities	$113,750
Total		**$3,018,140**
Commercial and Industrial/ Higher Education		
New Hampshire Pay for Performance, 2010	Large commercial and industrial	$5,000,000
BFA Business Energy Conservation Fund, 2009 - 2010	Multiple businesses and non-profit	$4,000,000
Retail Merchants Association of NH, 2009-2010	Multiple retail businesses	$3,372,028
Fraser NH LLC Installation/ retrofits, 2009	Multiple businesses	$500,000
Dartmouth College, Measurements, 2009-2010	Higher education institution	$330,936
Light Tech Inc., Installation/ retrofits 2009-2010	Commercial, Industrial, and Municipalities	$316,000
Stonyfield Farm, Installation/ retrofits 2009	Multiple businesses/ Agriculture	$148,927
So NH Conservation& Development Area Council, 2009	Multiple businesses/ Agriculture	$87,000
Commercial and Industrial Sub-Total		**$13,754,891**
Residential (non Low-income)		
Construction Institute of NH 2009-2010	Residential customers	$178,169
UNH Carbon Challenge, 2009-2010	Outreach to residential customers	$813,402
Plymouth Area Renewable Energy Initiative, 2009	Residences and community projects	$99,250
Residential Sub-Total		**$1,090,821**
Low Income Weatherization Program		
StayWarmNH, 2008-2009 heating season	*Low-income residents*	*$1,200,000*
NH Community Loan Fund, 2010	Manufactured homes	$2,000,000
NH Housing Finance Authority and CAAs 2010	Low-income apartment units	$2,000,000
DRED Training, 2009-2010, expanded in 2010	Workforce training/ audits	$574,000
Low-income Sub-Total (2009-2010 only)		**$4,574,000**
Commercial, Industrial, and Residential		
Expansion of the "CORE" efficiency programs (Re-CORE), 2009-2010	Commercial, Industrial, and Residential	$7,646,020
Total Commercial, Industrial and Residential		**$27,065,732**
Non-profit Organizations and Other		
TRC Energy Services, Benchmarking, 2009-2010	Schools	$499,948
Crotched Mountain Rehabilitation Center, 2009	Non-profit	$176,531
NH Institute of Art, 2009-2010	Non-profit	$146,060
Various programs (<$100,000 each), 2009	Non-profit and schools	$184,924
Total		**$1,007,463**
Other		
Home Builders and Remodelers Association of NH, Training, 2009-2010	Workforce training	$200,000
Total (RGGI 2009-2010)		**$31,291,335**

[38] 2010 RGGI Annual Report of the NH Dept. of Environmental Services and Public Utilities Commission
[40] Some projects have multiple objectives and may fit in multiple categories.

2.4. Conclusions and Recommendations

New Hampshire citizens, businesses, and industries have benefited in many ways from the variety of energy efficiency and sustainable energy programs the state has been able to offer, using the range of funding sources noted above. The one time "bubble" of federal ARRA funding has provide the state a jump start in further stimulating energy efficiency and sustainable energy markets in the state, and in helping to further develop the infrastructure needed to serve those markets. With ARRA funding certain to be depleted in the 2012 to 2013, now is the time to contemplate ways to stretch the limited resources remaining once the ARRA funds are gone, with an eye towards not losing the many market and infrastructure development gains made while the funding was available. A variety of strategies for ensuring future funding and investment addressed in detail in Chapter 13: Energy Finance Programs Review and Assessment. In addition, some key policy, regulatory, and program recommendations made in subsequent Chapters are noted below, including information on which Chapter in which they are addressed.

Adopt an Energy Efficiency Resource Standard (EERS) as State Policy *Chapters 3 and 14*

Ensure Availability and Stability of Funding for Energy Efficiency and Sustainable Energy Programs *Chapters 3 and 7*

Update New Hampshire's Renewable Portfolio Standard to Support Local Market Development *Chapters 7 and 14*

Address Available Finance Levels Post-ARRA and RGGI Funding *Chapter 13*

Amend RSA 9-A and 9-B to convert the language from "Smart Growth" to Sustainability and Energy Efficiency *Chapter 11*

Complete Efforts to Finalize and Publish the State Development Plan required by RSA 9-A *Chapter 11*

Develop Clearer Regulatory Guidance *Chapters 3, 9, and 14*

Chapter 3: Electric and Gas Utility Energy Efficiency Programs – Portfolio Level Review and Assessment

3.1. Introduction

Energy efficiency is the process of doing more with less. The goal of energy efficiency policies, programs, and initiatives is to enable the same tasks and functions m as before while using less energy. Presented below is a discussion of the benefits of increased energy efficiency in general and for New Hampshire specifically; an overview of the energy efficiency efforts underway by the regulated electric and gas utilities in New Hampshire; a comparison of results of New Hampshire's portfolio of energy efficiency programs to other states and jurisdictions; and recommendations for enhancements in the future. More detailed review and assessment of the specific energy efficiency programs offered by New Hampshire regulated electric and gas utilities is provided for residential programs in Chapter 4, for commercial and industrial (C&I) programs in Chapter 5, and for low income weatherization programs in Chapter 6.

Energy Efficiency…

- Is the lowest cost and lowest impact energy; energy that is saved instead of generated
- Makes better use of limited resources, freeing up capacity, capital, and other resources for new uses
- Saves electricity at the point of use, and saves even more energy at the point of generation by avoiding transmission losses, magnifying the benefits
- Is quick to deploy as an energy resource, compared to new power plants or transmission lines
- Has a very large potential and can be viewed as a new power source
- Keeps money in the state in ratepayers' pockets, in jobs, and in improved buildings
- Reduces air pollution; both locally to improve health and air quality, and globally to mitigate climate change
- Decreases stress on the grid, improves reliability and helps delay the need for distribution system investments and new transmission lines.

3.2. The Benefits of Energy Efficiency

Broadly speaking, an electric utility needs to match their resource supply—the energy it can make available to its customers—to its load requirements. Power planning has traditionally meant forecasting load requirements and building an adequate number of new power plants to meet the forecasted peak demand. Peak demand is the chief factor in determining how large a system's capacity needs to be.

As resources tighten, it becomes more important not just to build capacity to meet peak demand. Meeting that demand cost-effectively is a key consideration for regional grids, transmission companies, and distribution utilities. Energy industry stakeholders have begun to identify non-traditional energy resources (via the wide array of efficiency and sustainable energy technologies) as cost-effective ways to meet that demand. Lower energy use per light bulb, per weatherized building, and per piece of manufacturing equipment, adds up to lower environmental costs, as well— measured in terms of reduced fossil fuel and water use, and lower greenhouse gas emissions, among other resources.

Energy efficiency is typically the least cost energy resource, meaning that the costs and impacts of energy efficiency are typically lower than those for other energy resources. Energy efficiency can provide significant benefits to consumers, to the utilities serving consumers, and to the regulators overseeing the utilities. For consumers, increased energy efficiency results in lower energy bills and significant environmental benefits through less use of fossil fuels to produce electricity. For utilities, increased energy efficiency improves system reliability, decreases stress on the electric grid, helps delay the need for new transmission and distribution upgrades, and can reduce peak load requirements. For regulators, increased energy efficiency can improve the affordability of energy as well as system reliability, both of which are of importance when serving the public interest. In addition, energy efficiency provides non-energy benefits, as more efficient heating and air conditioning equipment creates lower indoor temperature variations, better insulation stabilizes indoor temperature from one area to the next, and better ventilation systems improve indoor air quality. Finally, money spent on energy efficiency is likely to be spent in-state compared to money spent on electricity and gas supply, thus providing increased state and local regional economic benefits.

3.3. State Goals as a Pathway to Energy Efficiency

State energy efficiency goals can be a first-choice path for securing a stable energy future, and for recognizing the least-cost nature of energy efficiency as a way of acquiring energy resources. The U.S. Department of Energy indicates that when states adopt aggressive goals that set long-term energy savings targets energy costs are significantly lowered, air pollution reduced, climate change mitigated, and energy reliability improved. These policies also lead to job creation as utilities implement new efficiency programs and monitoring systems.[1]

One recent study analyzed eleven studies of the scope of possible energy savings if more aggressive efficiency was in place. The study indicated that a median level of cost-effective achievable potential for electricity savings, nationwide, is 24%.[2] This means that on average, the opportunity exists for homes and businesses nationwide to reduce their energy use by approximately a quarter of their current level of energy consumption. The analysis looked at demand-side energy management in the same framework that it looked at the supply side (using the term "efficiency resource assessment" instead of the prevailing industry term, "achievable potential"), and incorporated a policy scenario assessment by "modeling a specific suite of efficiency policies that can be implemented at the state level."[3]As of 2011, 26 states had adopted some form of such standards. In New England, all states have these standards, with the exception of New Hampshire and Connecticut.[4]

3.4. History of CORE Programs in New Hampshire and Overview of Funding

New Hampshire enacted legislation in 1996 that restructured its electric energy markets to include energy efficiency programs for low-income ratepayers. The legislation created a System Benefits Charge (SBC) to support those programs. In 2000, the NH PUC issued Order 23,574 compelling the electric utilities to develop energy efficiency programs that would complement and not impede new energy markets. Effectively, this resulted in the establishment, in 2002, of "CORE" energy efficiency programs, operating

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[1] Glatt, Sandy, and Beth Schwentker, 2010. *State Energy Efficiency Resource Standards Analysis* (State Policy Series: Impacting Industrial Energy Efficiency). Golden, Colo.: U.S. Department of Energy,

[2]Eldridge, Maggie, R. Neal Elliott, Max Neubauer. 2008 State-level energy efficiency analysis: Goals, methods, and lessons learned. *Proceedings of the ACEEE Summer Study Conference.* Washington, DC: American Council for an Energy-Efficient Economy.

[3] State-level energy efficiency analysis, p. 8-67.

[4]Connecticut used to have EERSs, but discontinued them in 2010. State energy resource standard activity, June 2011. American Council for an Energy-Efficient Economy.http://www.aceee.org/fact-sheet/state-energy-efficiency-resource-standard-activity

under the umbrella program name of NHSaves and formed from the revenue collected via the SBC.[5] The gas utilities administer energy efficiency programs approved by the NH PUC. Gas efficiency programs were available between 1993 and 1999, but discontinued as the utility markets underwent restructuring. The natural gas utilities began offering efficiency programs again in early 2003.[6]

Through the gains in energy efficiency from the CORE programs described below, New Hampshire electric utilities are now able to participate as providers of "other demand resources" in the ISO New England Forward Capacity Market (FCM). Efficiency is a "demand resource" because it helps reduce peak demand, and thus contributes to system stability and reliability. Demand resources bring value to the grid. Consequently, entities with efficiency programs receive revenue for energy saved, that is, for energy not taken from the grid. Revenue from ISO New England for the utilities' participation in the Forward Capacity Market helps augment the SBC fund.

Electric and Gas Utilities Providing CORE Programs

In New Hampshire, the CORE energy efficiency programs are offered through the State's four major electric utilities, including Public Service Company of New Hampshire (PSNH), Unitil Energy Systems, Inc. (Unitil), Granite State Electric Company d/b/a National Grid (National Grid), and New Hampshire Electric Cooperative, Inc. (NHEC), and by the gas utilities serving the state, including Northern Utilities Inc. d/b/a Unitil (Unitil), and EnergyNorth Natural Gas, Inc. d/b/a National Grid NH (National Grid). The five municipal utilities in New Hampshire are not required to offer energy efficiency programs, although they may do so, should they wish. The State's electric utility service territories are presented in Figure 3.1.[7]. The number of customers and retail sales of the major utilities for residential and commercial customers is presented in Table 3.1. The State's gas utility service territories are presented in Figure 3.2.

The CORE programs administered by the utilities serve both residential and commercial and industrial (C&I) customers. Their most prominent components are services for new construction, retrofitting existing structures (*retrofits*), and rebate programs for qualifying lighting and appliances. Individual utilities are allowed to run specific (not statewide) programs, as needed. Residential programs support consumer purchases of qualifying ENERGY STAR® lighting and appliances, ENERGY STAR new home construction, insulation, thermostats and other efficiency measures. Programs for qualified low-income residents provide funding for insulation, thermostats, lighting upgrades, and efficient refrigerators.[8] Commercial programs support new construction and major renovations, with efficiency measures ranging from lighting upgrades to energy management systems, to air conditioning improvements.

Funding for the CORE Programs

Initially, the SBC assessed to electric customers in New Hampshire was the sole source of funding for the CORE programs. The SBC is assessed to customers at a rate of $0.0033 per kilowatt-hour (kWh). Revenue from the SBC is divided between the regulated energy efficiency programs and an Electric Assistance Program (EAP), which helps income-eligible customers pay their electric bills.[9] The System

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[5] Pursuant to RSA 374-F:4 VIII(c). For information on NHSaves: http://www.nhsaves.com/about/.
[6] See the NH PUC website for more information:
http://www.puc.nh.gov/Gas-Steam/energyefficiencyprograms.htm.
[7] NHEC website
[8] Further information about financial incentives, rules and policies, and programs related to efficiency in New Hampshire can be found at the Database of State Incentives for Renewables and Efficiency (DSIRE), at
http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NH07R&re=1&ee=1.
[9] Discounts of up to 70% on electric bills are possible, depending on size of household and income level. Because the growth in enrollment of customers in the EAP and its funding structure, the NH PUC has had to lower the eligibility requirements for low-

Benefits Charge for electricity produces funds that are typically characterized in terms of mills (one-tenth of a cent) per customer kWh of use. In New Hampshire, 1.8 mills (.018 cents) per kWh is the rate allocated to energy efficiency programs, and 1.5 mills is allocated to the Electric Assistance Program.[10] The SBC is one of six itemized charges on a typical New Hampshire electric ratepayer's utility bill. The other charges are for delivery, customer service, stranded cost recovery, and the energy itself, and an electricity consumption tax.[11] The average monthly cost of the SBC for a household consuming 1,000 kWh is approximately $3.30.[12] By comparison, the total bill, based on an average cost of $0.1634 per kWh, at 1,000 kWh per month would be $163.40.

The CORE programs also receive revenue from the regulated utilities' participation in the ISO New England Forward Capacity Market (FCM). As a result of the proven savings from past energy efficiency programs, New Hampshire utilities are now able to participate as providers of what is described as "other demand resources" in the FCM. Efficiency is viewed as a demand resource in the Forward Capacity Market because it helps reduce peak demand and thus contributes to system stability and reliability. Demand resources bring value to the grid. Consequently, entities with qualifying, evaluated efficiency programs receive revenue for energy saved—that is, for energy not taken from the grid).

In addition to the Forward Capacity Market revenue, revenue from New Hampshire's participation in the Regional Greenhouse Gas Initiative (RGGI) and ARRA-funded projects currently provide funding for CORE programs. This is not guaranteed in the long run, however. ARRA funds will be depleted in 2012-2013. And the New Hampshire Legislature attempted in early 2011to repeal legislation allowing New Hampshire to participate in RGGI. Although the Governor vetoed that bill, future New Hampshire participation in RGGI is not certain.

Funding for gas efficiency programs is collected through an energy efficiency charge adjusted annually at a level sufficient to recover energy efficiency and other costs (Local Distribution Adjustment). This charge is adjusted in Cost of Gas proceedings and accounts for any reconciliation of prior year program expenses, and for the rate necessary to fund the following year's program budget. There is no cap on the funding level.

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income assistance to 175% of the federal poverty guidelines, and to cap the amount of electric usage eligible for the discount. For more information, see State PBF/USF History, Legislation, Implementation, 2011. New Hampshire. Bethesda, Md.: LIHEAP Clearinghouse, U.S. Department of Health and Human Services. http://liheap.ncat.org/dereg/states/nhampshire.htm.

[10] In 2010, New Hampshire Senate Bill 300 directed the PUC to increase the EAP portion of the SBC, and the portion devoted to the EAP program was increased from 1.5 mills to 1.8 mills per kWh and the energy efficiency SBC share was reduced from 1.8 mills to 1.5 mills per kWh. The re-allocation of funds expired on June 30, 2011, and reverted to the prior rates. The 2010 action was preceded by a similar action in 2006 to reallocate the energy efficiency SBC to serve the EAP. As a result, the utilities could maintain the budgets that had been filed and approved, but collected the difference across a three-year spread, reducing the budgets in those years.

[11] For more information see "A typical bill," NH PUC website: http://www.puc.state.nh.us/Electric/typicalbill.htm.

[12] The efficiency surcharge in 2011 is $0.0015 per kWh + a separate low-income charge of $0.0018 per kWh; assuming 1,000 kWh monthly household consumption = $1.50 + $1.80 = $3.30. For further information, see http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NH07R&re=1&ee=1.

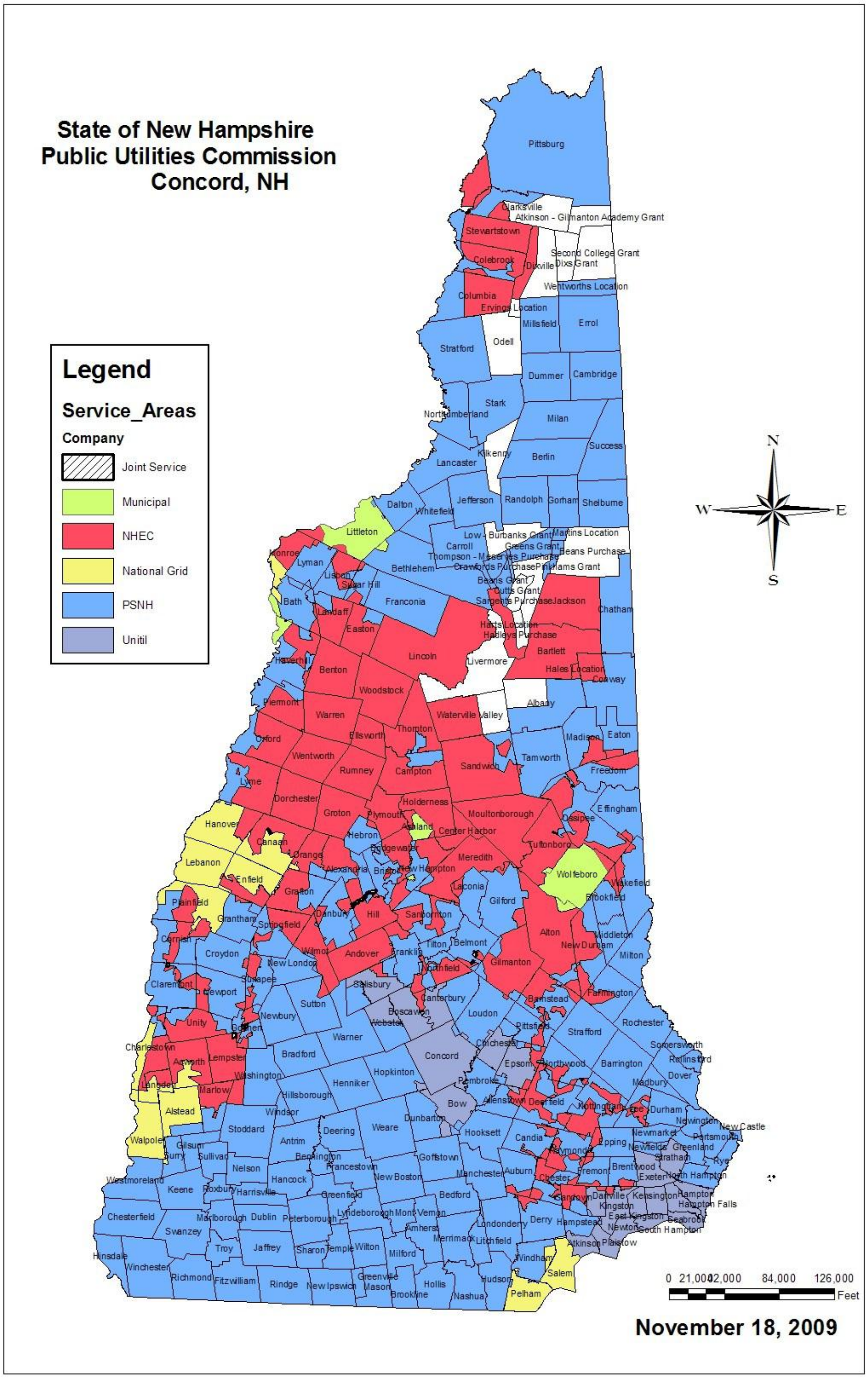

Figure 3.1. Service Territories of New Hampshire's Electric Utilities

Table 3.1. Electric Sales by Utility[13]

		Public Service of New Hampshire	Unitil Energy Services	New Hampshire Electric Co-op	National Grid	Municipal Utilities, Other	Total
Residential	Electric revenue (1,000$)	$ 506,725	$ 74,506	$ 88,298	$ 39,801	$ 9,812	**$ 719,149**
	Electric sales (MWh)	3,147,276	480,638	441,369	284,420	67,819	**4,421,522**
	Customers	414,544	63,626	68,041	35,223	9,726	**591,160**
Commercial	Electric revenue (1,000$)	$ 414,074	$ 50,734	$ 39,046	$ 39,017	$ 9,435	**$ 646,071**
	Electric sales (MWh)	3,334,729	349,265	229,870	475,704	51,192	**4,440,760**
	Customers	61,387	12,309	10,269	6,358	2,307	**92,630**
Industrial	Electric revenue (1,000$)	$ 112,461	$ 22,856	$ 4,612	$ 6,069	$ 14,374	**$ 253,948**
	Electric sales (MWh)	1,267,872	347,651	41,223	109,175	70,290	**1,836,211**
	Customers	2,755	151	10	224	57	**3,197**
TOTAL	**Electric revenue (1,000$)**	**$ 1,033,260**	**$ 148,096**	**$ 131,956**	**$ 84,887**	**$ 220,969**	**$ 1,619,168**
	Electric sales (MWh)	**7,749,877**	**1,177,554**	**712,462**	**869,299**	**189,301**	**10,698,493**
	Customers	**478,686**	**76,086**	**78,320**	**41,805**	**12,090**	**686,987**

[13] EIA Electric Power Annual Report 2009.

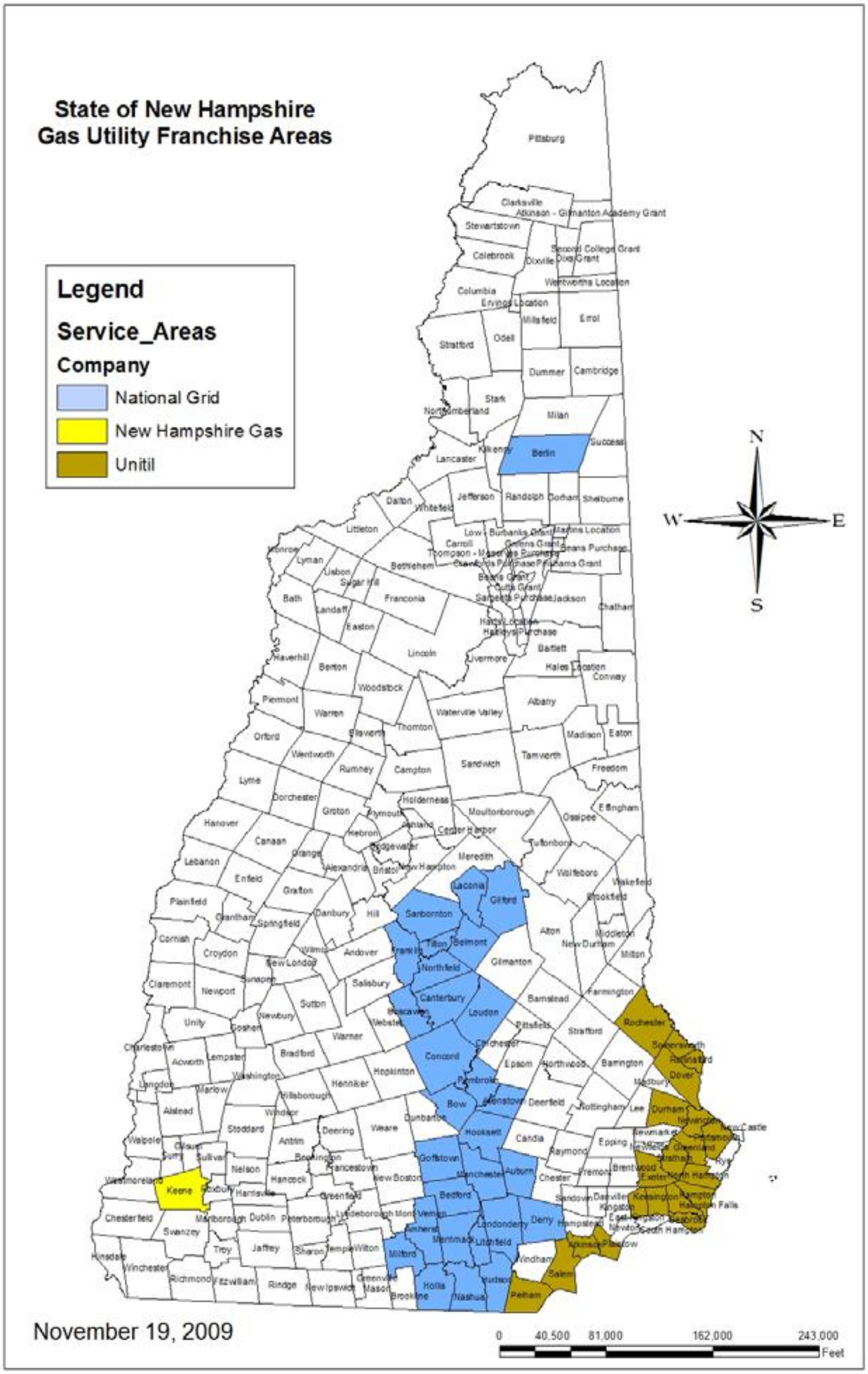

Figure 3.2. Natural Gas Utility Territories in New Hampshire

3.5. Portfolio Level Review and Assessment

Presented below are results of a portfolio-level review and assessment of energy efficiency programs offered by regulated electric and gas utilities in New Hampshire. This review assesses the programs currently offered as a collection, or portfolio, of offerings, The examination enables an understanding of how well energy efficiency programs and the policies that fund them are working in achieving goals, and reflects on their overall success in developing long-term, sustainable markets for energy efficiency services. A more detailed, program-by program assessment is presented in subsequent Chapters, based on the specific market segments the programs address. Programs directed at the residential sector (not including low-income markets) are reviewed and assessed in Chapter 4, followed by the C&I sector in Chapter 5. The low-income market is addressed in Chapter 6.

When reviewing the portfolio, two key components were assessed: (1) energy efficiency goals and the state's investment in energy efficiency; and (2) the state's evaluation, measurement, and verification (EM&V) practices. The features reviewed for each component include:

- **Review of Energy Efficiency Goals and Investment:**
    - The overall goals for energy efficiency (at the state or utility level), and who sets them
    - The funding mechanisms and funding trends
    - Achieved annual energy savings
    - The likelihood of the annual energy savings leading to achievement of the goals
    - If not, the policy and relationship-building measures needed to achieve the goals
- **Review of Evaluation, Measurement, and Verification:**
    - Methods for evaluating the portfolio, and who is doing the evaluation
    - How savings are measured and verified, and by whom
    - The extent of consistency in measure characterizations and saving calculations among the regulated utilities; if there is noticeable inconsistency, the extent of it and the reasons for it
    - The frequency with which the savings assumptions are updated as technologies advance and baselines shift
    - The extent to which external economic effects (free-ridership, spillover effects, and in-service rates[14]) are in play

Results are presented below.

[14] These are classic, recognized factors typically subtracted from evaluated program benefits. **Free riders** are program participants who would have, in the case of energy efficiency, installed measures even if an energy efficiency program would not have existed. **Spillover effects** occur when a participant implements an efficiency project but does not take advantage of program incentives. **In-service rates** are the calculated percentage of measures already installed and running, the cost of which was offset by incentives. These are measures that have already occurred and are no longer opportunities waiting for incentives. A percent value is frequently assigned in regulated verification processes, to acknowledge the loss in program benefits due to these three factors.

3.6. Portfolio Level Investment and Funding Review and Assessment

As shown in table 3.2., energy efficiency spending per capita varies by state in New England, with Vermont having the largest energy efficiency budget per capita for electric programs and Maine having the smallest budget per capita. New Hampshire is fifth out of the six New England states for its per-capita electric energy efficiency budget, and ranks second in gas energy efficiency budgets per capita in the region, as shown in Table 3.2.[15] New Hampshire has approximately 117,000 gas customers, constituting approximately 18% of homes and businesses.[16]

Table 3.2. 2009 and 2010 Efficiency Budgets in New England States[17]

State	Electric Efficiency Budgets (million USD)		Budget per Capita -- Electric	Gas Efficiency Budgets (million USD)		Budget per Capita -- Gas
	2009	2010		2009	2010	
New England	**$ 332.9**	**$ 494.1**		**$ 67.2**	**$ 99.4**	
Connecticut	73.3	115.3	$35.01	9.6	10.8	$3.08
Maine	12.4	14.0	$10.78	0.8	0.4	$0.32
Massachusetts	179.3	281.2	$42.65	44.1	75.9	$11.50
New Hampshire	**17.3**	**19.0**	**$14.47**	**4.6**	**5.6**	**$7.76**
Rhode Island	24.7	30.6	$29.05	6.1	4.6	$4.35
Vermont	25.9	34.0	$54.81	2.0	2.1	$3.43

The funding mechanisms and policies governing allocations for efficiency programs are different throughout the Northeast. Because the revenue streams from the SBC are tied to energy consumption, the funding available from some of the mechanisms fluctuates across time. For example, many utilities, efficiency programs, and other energy market actors throughout the New England states participate in the ISO New England Forward Capacity Market. But revenues from the periodic FCM auctions vary, depending on market conditions. In some states, FCM revenue from saved energy is vulnerable to reallocation from efficiency programs to general state funds. RGGI fund allocation for efficiency programs is regulated by fixed percentages in all New England states except New Hampshire. Both the FCM and RGGI are examined together in this report, because they each constitute a potentially substantial source of non-SBC revenue to efficiency programs in New England. Further, their revenue levels are based on the extent to which efficiency programs are successfully delivering energy savings to customers. Table 3.3 indicates the respective contributions of SBC and RGGI funds to efficiency programs in the New England states, and presents the benefits RGGI funding has provided, state by state.[18]

[15] State of the Efficiency Program Industry 2009 Expenditures, Impacts & 2010 Budgets, Consortium for Energy Efficiency, December 10, 2010

[16] NH PUC. Gas/Steam data. http://www.puc.nh.gov/Gas-Steam/gas-steam.htm. The denominator is derived from U.S. Census 2010 data for New Hampshire (Households: 502,201. Number of firms: 137,816).

[17] Data from CEE Annual Energy Efficiency Industry Report 2009 and 2010 for all states but NH. Values for NH come from 2009 and 2010 utility filings excluding load management.

[18] RGGI Benefits, Regional Greenhouse Gas Initiative. http://www.rggi.org/rggi_benefits.

Table 3.3. Comparison of Efficiency Program Funding Sources, not Including Revenues from Participation in the ISO New England Forward Capacity Market[19]

State	SBC – Electric & Gas	RGGI
Connecticut	Electric SBC - 3 mills/kWh	Regulations set at 69.5% of total SBC • Connecticut has invested $29.6 million of its RGGI proceeds in energy efficiency programs overseen by the Energy Conservation Management Board (ECMB). Together, those programs served more than 1 million households and 7,700 businesses, resulting in 6.3 billion kilowatt-hour lifetime savings. • Proceeds represented about 9 percent of the total funding provided for the ECMB's programs in 2009 and 2010.
Maine	Electric SBC - 3 mills/kWh for most utilities) but cannot exceed .15 cents/kWh. Gas SBC – ≥ 3% of each gas utility's delivery revenues	Statute sets at 100% • Maine is investing RGGI proceeds in energy efficiency programs administered by Efficiency Maine. • Proceeds represented 35 percent of Efficiency Maine's total funding in 2010.
Massachusetts	Electric SBC - 2.5 mills/kWh plus and adjustment to distribution charges to procure all cost-effective energy efficiency and demand resources	Statute sets minimum 80% of proceeds (Massachusetts Department of Energy Resources [DOER] commits 100%) • Massachusetts is investing RGGI proceeds in energy efficiency programs administered by the state's electric utilities. • Proceeds are projected to represent 11.5 percent of the total funding provided for these programs over the three-year period 2010-2012.

[19] Information on the SBC and the RGGI formulas are provided by ACEEE State Energy Efficiency Scorecard and NEEP Update on Efficiency Policy: Progress, Innovation and Challenges.

State	SBC – Electric & Gas	RGGI
New Hampshire	Electric SBC- As of July 1, 2011 - 1.8 mills/kWh for energy efficiency, 1.5 mills/kWh for low income bill payment assistance[20]	Statute set at 100%, minus administrative costs, to reduce GHG emissions via energy efficiency and demand response programming. Competitive bidding process for specific programs • New Hampshire awarded $31 million in RGGI proceeds to 36 energy efficiency projects and programs. Through July 2010, 30 of the projects received a total of $17.7 million. Those 30 projects have: o Supported energy efficiency job training for more than 170 workers across the state; o Supported energy use assessments and energy audit evaluations for 436 buildings across the state. • In addition, those 30 projects are expected to: o Reduce consumer energy costs by $60.6 million over the lifetime of the installed measures; o Avoid the emission of 220,000 tons of CO_2 pollution over the lifetime of the installed measures.
Rhode Island	Electric SBC - 2 mills/kWh non-bypassable public benefits fee specifically for energy efficiency programs	Regulation sets at 100% • Rhode Island has invested nearly $4 million of its RGGI proceeds in cost-effective energy efficiency programs administered by National Grid. In 2010, these programs: o Provided energy efficiency services to more than 150,00 Rhode Islanders; o Saved more than 80 million kWh of electricity. • According to National Grid, RGGI proceeds accounted for approximately 14 percent of the total funding provided for these programs.
Vermont	Efficiency Utility 3-year budget process referred to as Demand Resource Plan	Statutes set at 100% • Vermont is investing RGGI proceeds in Efficiency Vermont's Vermont Community Energy Mobilization (VCEM) project, a program to train volunteers to install energy efficiency measures in homes across the state. • Proceeds represented about 25 percent of the funding for EVT's heating and process efficiency programs, including VCEM, in 2010.

[20] Gas efficiency programs funded under non-SBC mechanism

Recommendations

- **Increase the SBC surcharge** to allow increased investment in energy efficiency which provides net benefits which exceed upfront dollar investment. In conjunction with other policy measures such as an Energy Efficiency Resource Standard and Least Cost Procurement (discussed in Chapter 14)

- **Extend the SBC mechanism** to also cover natural gas, systematizing the funding for the natural gas efficiency programs. The Province of Quebec, for example, has implemented a charge on all carbon-dioxide-emitting fuels to raise monies for a Green Fund that supports policies and programs that reduce pollution from burning these fuels. [21]

Other policies could be implemented with the goal to create a stable fund for fossil fuel efficiency programs using existing and proposed policies such as the: Greenhouse Gas Emissions Reduction Fund funded by Regional Greenhouse Gas Initiative (RGGI) allowance auctions; Renewable Portfolio Standard (RPS)/ Renewable Energy Fund, funded by Alternative Compliance Payments, and the EGU Action 2.9 – to Promote Low- and Non-CO2-Emitting Distributed Generation.

Recommendation

- **Adopt a charge similar to the SBC for un-regulated fuels**. Funding for these programs would significantly increase New Hampshire's economic activity and household income.[22] The funding could be structured in several ways, such as:
    - A charge applicable to all fuels (heating oil, propane, kerosene, electricity, natural gas, and coal);
    - A charge targeted to those fuels (heating oil, propane, and kerosene) whose sales are not already funding other efficiency programs; or,
    - A variation on the second option, in which the charge on non-regulated fuels would be applied in tiers. A tiered rate would mitigate the effects of a charge on retail prices and place the burden on those portions of the oil industry best able to bear it in an era of very high oil company profits. These larger companies have greater economies of scale, and often have corporate links to upstream assets and profit centers in the fossil fuel business and therefore have greater means of absorbing the charge's small impacts through increased operational and managerial efficiencies. [23]

New Hampshire will soon enter a post-ARRA funds (and possibly post-RGGI funds) era, when several very successful programs will lose funding. These new funding approaches may provide an opportunity for establishing new funds to support the successful fossil-fuel programs established with ARRA and RGGI support.

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[21] http://www1.eere.energy.gov/wip/solutioncenter/pdfs/fundingforenergyefficiencyprogramsforunregulatedfuels.pdf

[22] A recent study estimated that $716 million invested in unregulated fuels efficiency programs would increase state economic activity over 15 years by $10 billion, boosting state economic activity (GSP) by $6.1 billion, and increasing real household income by $4.4 billion while creating 52,000 job years of new employment; Energy Efficiency in New Hampshire: Engine of Economic Growth, Environment Northeast , October 2009 http://www.env-ne.org/public/resources/pdf/ENE_EE_ECON_NH_FINAL.pdf

[23] Whole-Building Efficiency Services For Vermont Families and Businesses, The Regulatory Assistance Project, June 2011, www.raponline.org/document/download/id/4439

The Challenge of Funding for Energy Efficiency Services for Unregulated Fuels

In New Hampshire, an estimated 74% of homes are heated with fuels that are not regulated, and the unregulated fuels are not currently assessed a fee for the provision of energy efficiency services to their customers.[24] While a few fuel neutral pilot programs have been implemented recently in New Hampshire, they are funded by ARRA or RGGI funds, and the programs' futures are uncertain.

Energy efficiency programs can be difficult to establish for customers heating with unregulated fuels, due to the difficulty in securing funds for that purpose. The use of SBC funds for that purpose is not always welcomed because it raises the question of whether it is equitable to collect funds from electric and natural gas ratepayers to fund programs that serve oil, propane, and wood fuel customers. However, if efficiency programs are offered solely for regulated electric and gas customers, there is the potential to forego crucial cost effective energy savings for customers of unregulated fuels. Presented below is a sampling of what other jurisdictions are doing to address this challenge.

Vermont

Vermont is currently the only state with a direct charge on heating fuels. Vermont has had this system in place since 1990. A charge of 0.5% is collected from the distributors of oil and propane (for fuels not powering vehicles) who generate more than $10,000 annually from the sale of these fuels. The charge is collected at the distribution level and is not visible at the consumer level. Funds collected are used to help fund the low income weatherization program. One advantage of this system is that when the price of fuel increases, the funds collected increase and the programs are able to deliver more services when they are needed the most. A more detailed case study is presented below.

Massachusetts and Rhode Island

In Massachusetts and Rhode Island, least cost procurement legislation mandates the funding of all cost-effective efficiency measures, regardless of fuel type.

Wisconsin

Wisconsin established a fuel neutral fund created through an SBC on electric and gas ratepayers.

Maine

Maine introduced legislation to create a goal to reduce oil consumption. To achieve the goal, Maine may put in place a funding mechanism such as an SBC on fuel oil.

[24] DOE EERE statistics http://apps1.eere.energy.gov/states/residential.cfm/state=NH

3.7. Portfolio-Level Program Results Review and Assessment

Savings from energy efficiency are usually measured in terms of two frames of time: first-year savings and lifetime savings. The energy requirements and consumption for each efficiency measure are known through technical databases. Because new technologies enter the market every year, databases need to be updated frequently. The most reliable databases are not only up to date, but also contain metered data—that is, data based on the installed technology measured with a meter for a long enough period to determine its actual energy consumption per unit of time. Many databases also contain engineering estimates and/or manufacturers' energy consumption data.

The benefits of energy efficiency installations begin as soon as the measure is installed and working. Because the technical databases make it possible to calculate the savings per hour of use, data about the technology that has been replaced can be compared to data for the replacement measure, and first-year savings determined. Since the "measure life" of the efficient technology has also been calculated, "lifetime savings" is also a fairly straightforward calculation. Each measure has a different lifespan.

First-year savings are of interest to consumers who are making a decision about installing a measure, and of interest to regulators in determining aggregate savings to the energy load—and to the efficiency program in terms of achieving goals. Lifetime savings are of interest to an efficiency program's portfolio—both in terms of reporting savings to the regional grid (to aid in forecasting and accruing benefits from adding capacity) and claiming savings to regulators in fulfillment of program goals.

New Hampshire's annual energy savings from efficiency programs is close to 70,000 first-year MWh (800 million lifetime MWh) for electric programs and between 1 and 2 million first-year Therms (16 to 26 million lifetime Therms). This represents 0.6-0.8% of the electricity and natural gas volume sold in New Hampshire (1-2% of the revenue generated, see Tables 3.4 and 3.5), depending on the year.

The metrics for first-year and lifetime $/kWh (for electricity) and $/therm savings (for gas) are simple metrics that provide a high-level snapshot of the program yields. Program yields indicate the amount of energy saved per dollar of investment in the energy

Weatherization Trust Fund

Vermont is not only New Hampshire's neighbor, with a similarly high dependence on unregulated fossil fuels for heat, it is also the unique example of an efficiency fund sustained by a charge on unregulated fuels. In 1990, Act 272[1] was passed in Vermont to stabilize funding for a program which in the recent past had received Petroleum Violation Escrow (PVE) funds to compensate for dramatically reduced federal funding. The Weatherization Trust Fund was established to provide programs that go beyond the restrictions of federal funds, and allow for more flexibility and independence in program design. The Weatherization Trust Fund is financed by a gross receipts tax of 0.5% on the sale of electricity, natural gas, oil, propane, kerosene, and coal. The fund allows programs to invest in long-term savings rather than short-term bill support. To pass this legislation, the Board worked with legislative leaders, program administrators, low-income advocates, and utilities to create a small gross receipts charge on both regulated and non-regulated fuels, coupled with a tax credit option for utility efficiency programs that met the same program goals.

efficiency program. The first-year and lifetime metrics should not be confused with "levelized cost of energy," which compares electric or gas efficiency energy savings with electric or gas energy production costs.

Levelized costs provide a useful picture of the actual value, in aggregate, of efficiency in a portfolio and as a point of comparison in regions that have numerous efficiency programs, The levelized cost of energy from an efficiency program is calculated by amortizing program expenditures over the life of the portfolio of efficiency measures and then dividing by the annual energy savings of the same portfolio. The metrics for first-year and lifetime $/kWh and $/therm savings are calculated by dividing total budgets by total annual or lifetime savings.

Table 3.4. New Hampshire Electric Energy Efficiency Program Achievements in 2008 – 2010

	"Actual"[25]			Predicted	
	2008	2009	2010	2011	2012
$/kWh saved, first year (electric)	$ 0.23	$ 0.24	$ 0.26	$ 0.35	$ 0.36
$/kWh saved, lifetime (electric)	$ 0.022	$ 0.021	$ 0.023	$ 0.031	$ 0.032
Total Electric EE Spending	$ 17,721,259	$ 17,295,904	$ 18,303,734	$ 18,049,300	$ 19,558,300
Total EE spending / total retail revenue (electric)	1.3%	1.2%	1.3%	1.3%	1.4%
First year savings/total state retail MWh sales (electric) (predicted for 2011-2012)	0.8%	0.7%	0.7%	0.5%	0.5%

Table 3.5 New Hampshire Gas Energy Efficiency Program Achievements in 2008 – 2010

	"Actual"[26]			Predicted	
	2007-2008	2008-2009	June 2009 to December 2010	2011	2012
$/therm saved, first year (gas)[27]	$1.60	$3.77	$3.70	$5.52	$5.44
$/therm saved, lifetime (gas)	$0.10	$0.22	$0.21	$0.34	$0.33
Total Gas EE spending	$2,598,666	$3,705,625	$8,364,665	$7,250,634	$7,862,290
Total EE spending/total retail revenue (gas)[28]	1.07%	1.52%	2.29%	2.98%	3.23%
First year savings/total state retail therm sales (gas) (predicted for 2011-2012)[29]	0.75%	0.45%	0.69%	0.60%	0.66%

[25] These values are reported as "actual," but in reality are an approximation, because some annual savings were estimated using lifetime savings and average measure life.
[26] These values are reported as "actual," but in reality are an approximation, because some annual savings were estimated using lifetime savings and average measure life.
[27] Gas EE savings data set incomplete
[28] Total spending as a percent of total retail revenue uses 2008 retail sales data http://www.puc.nh.gov/Gas-Steam/Statistics/2008biennialrptstats.pdf
[29] 05/2009-12/2010: adjusted for 18 month timeframe

Determining the true value of efficiency programs was challenging in this assessment, due to the varying ways program results are reported. Value to customers is typically a function of money spent on energy—taking lower energy costs and the System Benefits Charge into consideration, and a function of increased comfort, productivity, and other factors that accrue from installation of cost-effective efficiency measures. Value to utilities, which are in the business of selling energy—but which also need to be able to assure a reliable supply of energy - presents a different set of considerations.

From a policy perspective, there are several approaches to determining the value of an efficiency program. One approach is to compare three factors:

- **Program yield**—dollars spent per unit of energy consumed ($/kWh or $/therm) and dollars spent per unit of energy demanded ($/kW);

- **Efficiency savings** as a percent of retail sales; and

- **Spending** as a percent of retail electric or gas sales.

Not all jurisdictions collect or interpret data in the same way, and thus any comparison needs to take these inconsistencies into consideration. For example, electric efficiency program results can be reported at the customer meter or at the generation source; they might also be reported as gross savings or net savings that have been adjusted by free rider or spillover effects. Further, efficiency program budgets are understandably linked to state regulatory requirements and thus vary widely. For example, they can include (or not) all program administrative costs; IT support; as well as evaluation, measurement, and verification activities. With these cautions in mind, the program yields and percent of retail gas and electric sales in New Hampshire can be compared to other programs.

The electric CORE programs were reviewed as part of a recent benchmarking study by Navigant Consulting, which compared Efficiency Vermont and Burlington Electric Department in Vermont to 27 other mature electric efficiency programs across the country. The study analyzed first-year $/kWh, efficiency spending as a percent of the revenue from electricity consumed, and energy savings as a percent of retail sales. The analysis used data from 2008 as reported by program annual results. Baseline data were collected from the Energy Information Administration (EIA). Table 3.6 presents overall median results from the study with the data reported from the New Hampshire CORE programs. As Table 3.6 indicates, at the portfolio-level, the New Hampshire CORE Electric Programs in 2008 spent less money on efficiency, saved less energy, and cost more per unit of energy savings compared to other mature programs.

Table 3.6 Performance Results of 27 Mature Energy Efficiency Programs, Compared to New Hampshire CORE programs (2008)

	Spending as a Percent of Program Revenue	Electric Savings as a Percent of Sales of Electricity	Cost of First-Year Savings ($/kWh)
Median results from 27 mature programs[30]	1.9%	1.0%	$0.18
NH CORE programs	1.3%	0.8%	$0.26

The gas CORE Programs were compared to a national review of six states with gas efficiency programs.[31] The performance ranges from Connecticut, with a high of $0.55/therm saved, to Iowa, with a low of $0.27/therm saved. Other states in the sample are: Wisconsin ($0.31/therm saved), California ($0.32/them saved), Oregon ($0.34/therm saved), and New Jersey at $0.45/therm saved. The median of the sample is $0.33/ per therm saved. The mean for the sample is $0.37/therm saved. The reporting period compared in four of the states' samples is at least three years; California's sample is two years, and Connecticut's is one year. The New Hampshire utilities' average for the four years 2006-2009 is $0.16/therm saved in C&I and residential markets. This data shows the CORE gas program performance in costs is demonstrably better than other jurisdictions.

The fact that the gas CORE programs show relatively low spending to achieve savings and the electric programs show relatively higher costs to achieve savings does not lead to clear conclusions. Possible factors for consideration to explain differences between gas and electric CORE programs include:

- Regulatory activity and funding stability;
- Variable economic factors between sectors;
- The maturity of the programs;
- Comprehensive and deep savings costs more in incentives and program administration than pure "resource acquisition" measures;
- Initiatives that focus on market transformation can cost more in the short term; and
- Lack of standardized reporting ;

Recommendation

- **Further explore portfolio-level results** to better assess the difference New Hampshire results compared to other states. This could be done through a New Hampshire specific benchmarking study, for example, and the findings could help inform future CORE program modifications.

Figure 3.5 shows New Hampshire's goals for the electric CORE programs, compared to actual savings achieved. In 2008 – 2010 the goals were exceeded. Goals for 2011 and 2012 were set below previous

[30] Benchmarking of Vermont's 2008 Electric Energy Efficiency Programs: A Comparative Review of Efficiency Vermont and Burlington Electric Department. Navigant Consulting. May 21, 2010
[31] Saving Energy Cost Effectively, Page 7 Table 2

performance. In the past few years, CORE Program goals have consistently been exceeded by significant margins.

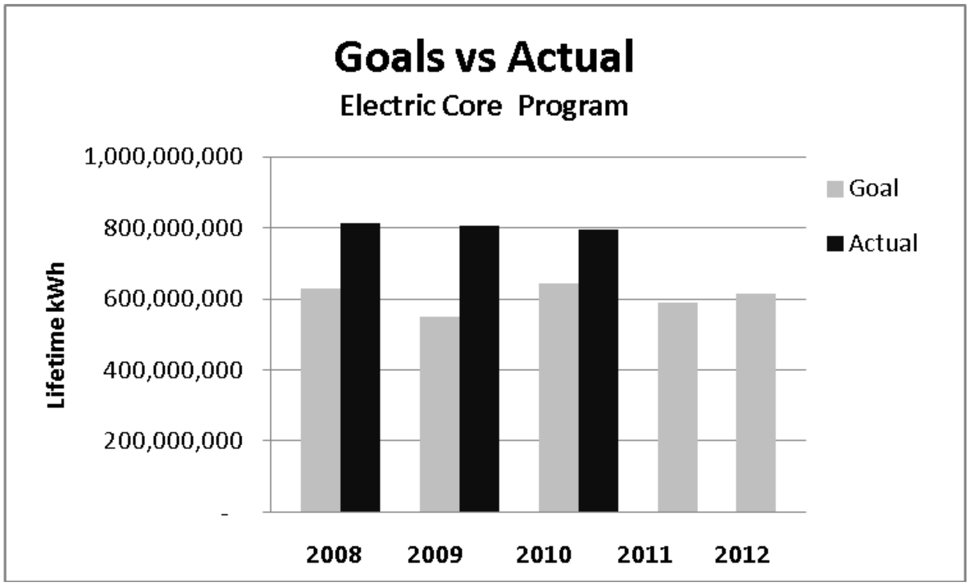

Figure 3.3. Goal-Setting Trends

Recommendations

- **Develop overarching policies** that provide guidance for CORE program funding levels and goal setting.

- **Adopt an Energy Efficiency Resource Standard (EERS)** that establishes a framework for goal setting and specific targets. An EERS for New Hampshire, with electric and gas savings targets, could provide enough built-in flexibility to achieve the targets via a market-based trading system or a buyout-option to purchase credits at a default price.[32] Policies based on EERS have been adopted by 26 states nationwide. Four of the six states in New England have EERS. Connecticut discontinued its EERS in 2010, and New Hampshire has never adopted EERS. An EERS features long-term energy savings targets for either electricity or natural gas relative to retail energy sales, and is typically established by the Public Utilities Commission in a state, following adoption by a legislative body. The presence of an EERS should not hamper utilities' innovation with such programs and projects, but instead widen the effects of those innovations

3.8. Evaluation, Measurement, and Verification Review and Assessment

Evaluation, measurement, and verification (EM&V) are critically important activities for all efficiency programs. In basic terms, program EM&V establishes an ongoing process to document, review, and assess program assumptions and effectiveness; as well as to incorporate the lessons learned to improve a

[32] For a comprehensive analysis of how EERS are used, and their effectiveness, see: Nowak, Seth, Martin Kushler, Michael Sciotino, Dan York, & Patti White, 2011. Energy Efficiency Resources Standards: State and utility strategies for higher energy savings. ACEEE research report U113. Washington, DC: American Council for an Energy-Efficient Economy. http://www.aceee.org/research-report/u113.

program. Best practice features periodic independent review of program effectiveness—savings claims, administrative structures, market effects, and impacts on baseline - working separately from and not under the direction of the entity responsible for program implementation. Another important component of EM&V is the assessment of gross energy saved—energy saved at the meter upon installation of an energy conservation measure, compared to net energy savings (gross energy minus factors such as free ridership, spillover effects, and in-service rate). EM&V activities and results should be closely aligned with program goal setting processes.

The term EM&V is often used as a catchall phrase for any type of quality assurance, evaluation, and data verification activities, but doing so can reduce the importance of each activity. In this overview, EM&V is grouped into three categories:

- **Periodic evaluation** of market studies, program reviews, and baseline assessments;

- **Measurement** according to deemed savings (average energy and demand savings expected for different measures), with comparisons to actual performance; and

- **Verification** through an audit of savings claimed.[33]

New Hampshire acknowledged the need for EM&V with the Public Utilities Commission Order 24,599 in 2006 which established broad criteria for "monitoring and verification" for energy efficiency activity with National Grid, PSNH, and Unitil.[34] The responsibility for monitoring and evaluation of the electric CORE programs was transferred from utilities to NH PUC Staff pursuant to an agreement in March 2007,[35] in order to provide more independent oversight. Since that time, the NH PUC has worked with the electric utilities to develop priorities and allocate the monitoring and evaluation budgets. The language in the documentation is not explicit that gas utilities fall under the same oversight structure.

In the 2011-2012, CORE programs, NH PUC staff and the utilities agree to provide quarterly reports about the status of monitoring and evaluation activities. The report will provide the total amount budgeted for each Monitoring and Evaluation Program, the amount spent to the date of the report, and a description of what funds remain available for Monitoring and Evaluation. If the funds are not spent, the CORE Program Management Team (which is composed of utility representatives) "may propose allocating such unencumbered funds to support the CORE Programs."[36]

The Commission approved the utilities' requests for a multi-year evaluation plan; program impact evaluations for lighting, small business programs, and C&I programs; evaluation of a home energy fuel-neutral pilot program; and to undertake NEEP EM&V Forum activities. The protocols cover several specific focus areas of EM&V:

- Protocols to support participation in ISO-New England's FCM;
- Load shape development;

[33] Chapter 9 discusses the role of verification in determining whether a utility has earned its performance incentive
[34] All of New Hampshire's EM&V information is easily accessible via the Northeast Energy Efficiency Partnerships' EM&V Forum, which supports the development and use of consistent protocols to evaluate, measure, verify, and to report the savings, costs, and emission impacts of energy efficiency and other demand-side resources. The Forum is funded by utilities and regulators in the Northeast; in New Hampshire the following fund the Forum's activities; PSNH, National Grid, Unitil, and the New Hampshire Electric Co-operative. Information on the EM&V history in New Hampshire can be found at: http://neep.org/emv-forum/emv-library/state-policies-activities%20#NH.
[35] Petition for approval of 2006 Core Energy Efficiency Programs, Order No. 24,599 in Docket No. DE 05-157
[36] NH PUC, Order 25,189, p. 10. See www.puc.nh.gov/Regulatory/*Orders*/2010*orders*/*25189*eg.pdf.

- Common reporting guidelines; and
- Multi-year evaluation planning.

Three months after Order 25,062 was signed, Order 25,099 was issued in response to the passage of Senate Bill 300, which reduced SBC funds for energy efficiency. Two of the effects on EM&V stemming from the reduction in funding was the removal by PSNH of $100,000 out of its large C&I retrofit EM&V budget, and a diversion of EM&V funds to make up for losses in its low-income program. The EM&V reductions left the budget still sufficient to cover the programs that have to be evaluated to allow the Core Programs to continue to receive revenue from their participation in the Forward Capacity Market.

The CORE Programs and the NH PUC participate in the Regional EM&V Forum. NH PUC Commissioner Clifton Below has served on the EM&V Forum Steering Committee since its inception, and is currently Co-Chair. In addition, Tom Belair, Manager of Energy Efficiency Services at PSNH and David Jacobson of National Grid have served as Co-Chairs of the Research & Evaluation Project Committee.

Evaluation

Evaluation in this report refers to a combination of periodic market studies, program reviews, and baseline assessments used to evaluate program portfolios. Although there is no national evaluation standard, the California Public Utilities Commission and its advisory group commissioned a report entitled, *California Evaluation Framework*,[37] which is a comprehensive guide to measurement and evaluation for program administrators, regulators, and other stakeholders in California. It is a useful reference for other efficiency programs. The report describes several types of evaluation studies:

- **Impact evaluations**: Which evaluate current assumptions for measure level savings, gross and net effects from the implementation of one or more energy efficiency programs and can include metering to support the evaluation.
- **Market transformation evaluations**: Which review the effect the programs have on long term market transformation.
- **Information and education evaluations**: Which assess the impact of educational outreach and information sharing on program results.
- **Process evaluations**: Which examine the way programs are implemented and identify improvement to increase the effectiveness of program operations.

Results from evaluations help inform and improve program design. Because markets evolve and change, it is important to assess current conditions in order to fine-tune existing programs or develop programs to target new or underserved markets.

Since 2000, the New Hampshire utilities have participated in more than 100 evaluation reports that provided varying levels of evaluation of the CORE programs.[38] For example, many of the studies were regional lighting studies that the New Hampshire utilities participated in. The next more recent series of reports were completed and released in 2008, covering a wide range of topics including custom commercial and industrial retrofits, industrial lighting, and residential lighting. There has not been an overall evaluation of the CORE programs themselves. The most recent evaluation report is both a process

[37] California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals. Prepared for the California Public Utilities Commission by The TecMarket Works Team. APRIL 2006.

[38] NH PUC. Completed Monitoring and Evaluation Studies: http://www.puc.state.nh.us/Electric/Monitoring%20and%20Evaluation%20Reports/Monitoring_Evaluation_Report_List.htm.

and impact evaluation of the Home Performance with ENERGY STAR program, and was released in June 2011. As reported in the CORE Program Plans for 2011-2012, several studies are being commissioned in 2011. The majority of the funding will be spent on studies that are required in order to continue to receive payments from participation in the ISO New England Forward Capacity Market.

New Hampshire's evaluations on programs such as Home Performance, Large Business Retrofit, and Small Business Energy Solutions, and the utilities' low-income retrofit programs certainly are key elements for verification activity.[39] Despite the number of reports and evaluations listed on the NH PUC website, their scope appears to be more appropriate for new efficiency programs rather than for relatively long-lived programs such as New Hampshire's.[40]

Recommendations:

- **Conduct a portfolio-level evaluation** of regulated energy efficiency activities in New Hampshire. Although the State has contracted with many able consulting firms to perform EM&V or similar evaluative work since 2000, the reports and assessments are so tailored to specific programs that it is difficult to see what overarching conclusions could be followed, portfolio-wide. New Hampshire would do well to conduct a high-quality critical evaluation of all of the electric and gas utilities' portfolios, benchmarking savings verification protocols and processes.

Measurement

It is critical for program administrators, regulators, other stakeholders, and the public to be able to accurately measure the savings achieved by a program's efforts. Although sometimes energy efficiency savings can be measured before installation and metered after use, this is typically not possible or practical in the field. Therefore, a "deemed savings" tool is important in managing measure-level savings claims, and the assumptions used to claim energy savings and establish cost effectiveness. These approaches include assessment of load shapes, baselines, operating hours, free rider and spillover effects, and in-service rates. Some jurisdictions' deemed savings tool is known as a Technical Reference Manual (TRM). Such tools serve a wide range of users and functions, including for:

- **Utilities—**for cost-effectiveness screening and program planning, tracking, and reporting that is used uniformly through the program territory;

- **Mercantile customers—**for assessing energy savings opportunities (mercantile customers are non-residential consumers of substantial amounts of energy);

- **Independent program evaluator**—for evaluating utilities' performance relative to statutory goals, and facilitating planning and portfolio review; and

- **Forward capacity and carbon markets**—for valuing efficiency resources.

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[39] NEEP (July 2011). *Repository of State and Topic EM&V Studies.* New Hampshire tab. http://neep.org/emv-forum/emv-library.

[40] In addition to including impact evaluations of programs, the studies comprise specific impact evaluations of custom process installations, and custom HVAC installations, for example. Completed Monitoring and Evaluation Studies, NH PUC website: http://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/Monitoring_Evaluation_Report_List.htm.

The development of flat-rate incentives and savings for certain energy efficiency measures (known as prescriptive measures) and their updates are managed by the CORE Program Committees. The savings claims for many prescriptive measures are uncomplicated and are uniform among utilities. This uniformity stems from the fact that the efficiency measures are calculated on the basis of common algorithms and assumptions used among utilities for annual savings claims (e.g., savings, costs, incentives, and measure life). These algorithms and assumptions are maintained and updated by the Program Committees, as needed. Also maintained by the CORE Program Committees are protocols (algorithms and data collection priorities) to calculate custom savings from measures that are not implemented in large numbers each year (e.g., industrial processes or large-scale HVAC retrofits) , or measures that could have a wide range of savings depending on the existing conditions of the project (whole-house insulation retrofit).

New Hampshire should consider further developing the protocols and measures maintained by the CORE Program Committees into a formalized deemed savings database. The importance of a formal database is likely to grow rather than diminish, in the face of increasing regional cooperation in the wholesale energy markets and as technologies rapidly evolve. A well-crafted deemed savings tool is important both for planning and for assessment of success in meeting goals. It also supports bidding efficiency resources into resource markets, such as the wholesale capacity market, and in setting and tracking future environmental and climate change goals. It provides a common platform for utilities to characterize measures within their efficiency programs, analyze and meaningfully compare cost-effectiveness of measures and programs, and communicate with policymakers and stakeholders about program details. It can guide future evaluation and measurement activity and help identify priorities for investment in further study.

New Hampshire's lack of a deemed savings database hinders the state's ability to apply consistent EM&V policy across the energy efficiency activity of the various utilities. It also limits utility efficiency programs from being able to set cost-effective incentives for custom projects, which are critically important to attracting and keeping large energy users to efficiency programs. Reducing the energy consumption of large users is widely recognized as the single most important step an efficiency program can take.

Recommendations

- **Acquire or develop a consistent, formal measures and protocols database** to assist the state in taking advantage of regional market conditions that might enable it to acquire more revenues from energy efficiency activity.

- **Consider adopting the TRM** recently developed through the NEEP EM&V Forum for the mid-Atlantic states.[41] Even though the document is intended for relatively new energy efficiency programs, the Forum initiated the project "as a benefit to both the Mid-Atlantic States and the overall Forum Region." New Hampshire should examine the deemed savings tool and consider either adopting it or using it as a template for a New Hampshire specific effort. The TRM is a living body of work and an ongoing technical advisory group should be set up to review additions and modifications as well as provide a forum to discuss technology and issues in the jurisdiction as well as regionally.

Verification

[41] *Mid-Atlantic Technical Reference Manual,* p.6.
http://neep.org/uploads/EMV%20Forum/EMV%20Products/Mid%20Atlantic%20TRM_V1.1.pdf.

In order to ensure that savings claims are accurate, an annual review and audits of savings claims are recommended for all efficiency programs. This includes not only an examination of an annual savings claim report, but also a review of the tracking system, calculation protocols, underlying key assumptions, along with site visits to view projects as necessary. A verification team can and should make spot-checks on claimed savings, and should select measures that inform the overall assessment. The purpose of verification is to assure regulators (and their constituents, the ratepayers) that performance goals are being met.

A key component of the verification process is a critical review of a statistically significant sample of custom commercial and industrial projects (focusing more attention on larger savings projects). Random project samples are chosen for a comprehensive review of custom savings estimate algorithms, baselines, and operating assumptions. Reviewing every project is cost prohibitive and impractical, so savings claim adjustments for the sample group can be applied across all savings claims. Prescriptive measure inputs, supporting documentation and total savings claims are examined, as well as the data quality control assurances built into the tracking system.

Data quality controls should check for and eliminate errors in reporting. These checks can include:

- **Monthly reconciliation reports** - between the accounting system and the tracking system;
- **Data validation reports** – special reports that seek out errors for correction;
- **Project completeness reports** – special reports to ensure all project information is complete; and
- **Annual reporting clean-up processed** – special reviews and systems that are established to ensure all data are accurate for reporting.

Currently, utilities in New Hampshire self-report savings to the NH PUC quarterly and annually. Some utilities engage a third-party auditor to review project savings claims, cost-benefit calculations, and overall data integrity. The annual savings claims are then used to calculate the shareholder incentives and both calculations are submitted to the NH PUC.

Recommendation

- **Develop a portfolio-level approach to verification activity** of the CORE Programs, following the guidelines and including the factors presented in this study. To do this cost-effectively, a range of savings verification approaches should be explored —from the most aggressive models (the Vermont Department of Public Service's model is one example) to NEEP resources (for information on other approaches in the region), to states that have stable EERS in place. Their experience can inform new savings verification design in New Hampshire.

- **Continue to engage in the NEEP EM&V Forum**. Efficiencies from consistent, regional EM&V standards and protocols can assist in wholesale market activity, transmission planning activity, and climate change reporting and planning.

Oversight and Roles for EM&V Activities

Roles and responsibilities in EM&V are often determined by the regulatory structure in place for the state or jurisdiction, as well as by the incentive structure for achieving goals and the consequences for non-performance. Across the United States, efficiency programs have differing implementation structures, regulatory oversight, and legislative requirements. This lack of consistency results in many possible configurations for EM&V roles and responsibilities.

Because California has had to address a large state's complex utility structure and customer base, it creates a useful frame of reference for addressing protocol types and oversight roles. One California PUC report shows the various protocols and how they are related to each other, as well as whether they are implemented by the program administrators alone or jointly with the PUC. Figure 3-9 provides a useful model for other jurisdictions that are considering EM&V protocol design. It enables judgments about pertinent roles and responsibilities, and provides a framework for flexible responses to changes in an energy efficiency portfolio.

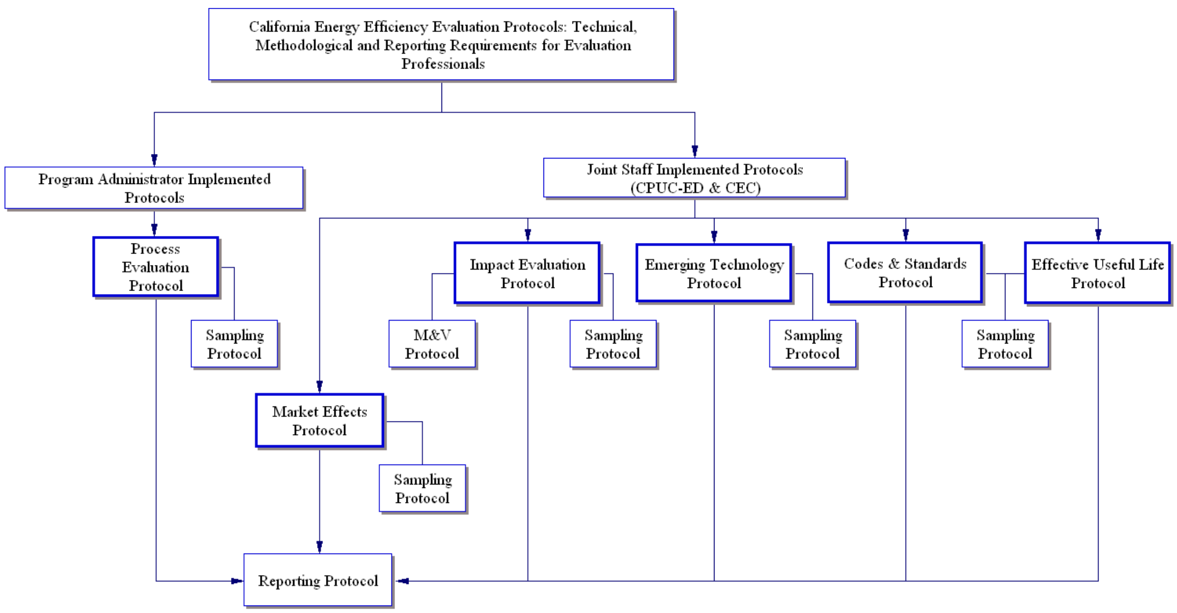

Figure 3.4. The Energy Efficiency Program M&V Protocol Used in California[42]

Currently, the responsibility for monitoring and evaluation of the CORE programs resides with the NH PUC Staff and the PUC works with the electric utilities to develop priorities and allocate the Monitoring and Evaluation Program budget.

Recommendations

- As CORE Program EM&V activities are modified, **consider developing explicit roles and responsibilities for the various EM&V activities** as shown in the California example.

- **Review both electric and gas programs** under the same EM&V processes and requirements.

[42]California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals. Prepared for the California Public Utilities Commission by The TecMarket Works Team. April 2006. Page 23.

EM&V Spending Levels

The Consortium for Energy Efficiency reports that in 2010, on average electric programs spent 3.9 % of program budget son EM&V, and gas programs spent 3.8%.[43] EM&V spending as a percent of overall portfolio spending varies nationwide. It is noteworthy that New Hampshire spends approximately 5% of its total energy efficiency portfolio budget on verification activity.[44] By comparison, Maine and New York spend approximately 2%; Connecticut spends 3%; and Massachusetts spends between 3 and 5%. New Hampshire's funds support:

- Evaluation planning;
- Monitoring and evaluation of the CORE Energy Efficiency Programs;
- Regional M&V projects;
- Regional avoided energy supply cost studies;
- Research; and
- CORE Energy Efficiency Program Tracking and Reporting.

Many issues specific to the program factor into decisions about how much to spend, including whether the program is new with high levels of uncertainty and market acceptance, or whether it is well established with a deep understanding of program influences and market acceptance. Other factors include the growth cycle of the program (preparing for large budget increases or decreases) as well as how precise the reporting data needs to be. For example, bids into regional markets such as FCM and RGGI need to be precise and well documented.

Although periodic economic downturns and/or shifts in state energy policies can result in reduced budgets for energy efficiency programs, reducing EM&V allocations puts future revenues significantly at risk. Reducing evaluation budgets to bare minimums puts utilities at risk of no longer being able to meet requirements for market participation in the Forward Capacity Market. If programs critical to market participation go unevaluated, utilities might find themselves in the position of acquiring energy efficiency resources and adding real value to grid operations, but being unable to receive payment for that value.

Recommendation

- **Institute a long term planning framework** with clear roles and responsibilities ensuring allocated funding is spent on EM&V activities with an appropriate level of rigor for energy efficiency markets in the future.

3.9. Conclusions and Recommendations

A key to increasing energy savings, helping residents and businesses lower their energy costs, and realizing environmental benefits from energy efficiency lies in greater consistency across the state's energy efficiency portfolio design and its corollary, standardized EM&V. Presented below is a summary of the recommendations discussed above. These recommendations provide a basis for further enhancing results of New Hampshire's energy efficiency portfolio in the future.

[43] 2010 State of the Efficiency Program Industry, CEE. December 10, 2010.
[44] NEEP (2006). *The Need for and Approaches to Developing Common Protocols to Measure, Verify and Report Energy Efficiency Savings in the Northeast, p.23.*

Table 3.7 Recommendations for Electric and Gas Utility Energy Efficiency Programs

Increase SBC funding for energy efficiency.	*Recommendation 3.1, Section 3.4*
• Increase the SBC charge to allow increased investment in energy efficiency which will provide net benefits which far exceed the upfront dollar investment.	
• Extend the SBC mechanism to also cover natural gas, thereby systematizing funding for the natural gas efficiency programs.	

Adopt and Implement an Energy Efficiency Resource Standard	*Recommendation 3.2, Section 3.7*
• Consider setting specific efficiency targets for the state over multiple years, or establish a clear mandate for setting such targets on a recurring basis and direct state regulators to ensure that process occurs.	
• Create a process to establish an EERS which includes multiple stakeholder inputs.	
• Identify clear roles, roles and timelines to set and revise efficiency goals.	
• Identify programmatic efforts that can contribute to goals (CORE programs as well as other initiatives).	

Implement the Energy Efficiency Resource Standard (EERS)	*Recommendation 3.3, Section 3.7*
• Develop process and timeline for program planning and budgeting to meet EERS goals	
• Involve stakeholders in collaborative processes for program development and implementation	
• Establish supportive utility regulatory guidance and direction	
• Develop complementary policies to capture non-program savings	

Secure Funding for Unregulated Fuels	*Recommendation 3.4, Section: Case Study*
• Explore mechanisms and existing models to fund unregulated fuels programs	
• Adopt a charge similar to the SBC for un-regulated fuels.	
• Integrate unregulated fuel programs with CORE Programs, once adopted.	

Assess feasibility of Deemed Savings Database	*Recommendation 3.5, Section 3.8*
• Leveraging existing efficiency program committees, convene a technical group to assess feasibility of Deemed Savings Database.	
• Review current methods of managing information such as measure characterizations and savings algorithms for incorporation into database.	
• Assemble technical advisory group to review additions and modifications as well as provide a forum to discuss technology and issues in the jurisdiction as well as regionally.	

Acquire a consistent, formal M&V protocols document for CORE programs	*Recommendation 3.6, Section 3.8*
• Develop uniform requirements for annual verification activity across all utilities including outside auditors.	
• Explore a range of savings verification approaches—from the most aggressive models to regionally available "off the shelf" resources.	

Acquire a consistent, formal M&V protocols document for CORE programs *Recommendation 3.6, Section 3.8*
• Continues to participate in NEEP regional EM&V standards and protocol development.
• Take a systematic approach to whole-portfolio evaluations of the CORE program.
• Ensure reporting and data are consistent between all utilities.
• Institute a long term planning framework with clear roles and responsibilities ensuring allocated funding is spent on EM&V activities.

Chapter 4: Residential Energy Efficiency CORE Programs Review and Assessment

4.1. Introduction

Residential buildings account for nearly 41% of electricity use in New Hampshire, 45% of fuel oil consumption, and 19% of natural gas use.[1,2,3] Overall, there are about 592,000 households in New Hampshire, and each is a potential site for energy savings. Of all residential buildings, 63% are detached, single-family units (an estimated 375,680 houses). The majority of households, or 80%, are one- to four-unit homes (475,530 buildings). Approximately 14% of the total housing stock (81,527 units) is multifamily homes with greater than four units and 6% are mobile homes (35,759 units).[4] Approximately 73% of occupied housing units are owner-occupied and 27% are renter-occupied (139,026 units).[5] Given the age of the housing stock, the heating requirements in winter, increasing cooling demands in summer, and the growing number of electrical appliances and "plug loads" in homes, there is substantial opportunity for increasing energy efficiency in residences in New Hampshire and thereby reducing demand (and costs) for electricity, fossil fuel, natural gas, and other energy resources.

An important component of the portfolio of energy efficiency programs discussed collectively in Chapter 3 is programs directed at the residential sector. Presented below is a description of the residential energy efficiency programs offered to electric and gas utility customers in New Hampshire, a review and assessment of the program results, and recommendations for enhancements in the future. The discussion focuses on the CORE programs offered by the major electric utilities serving the state, including Public Service Company of New Hampshire (PSNH), Unitil Energy Systems, Inc. (Unitil), Granite State Electric Company d/b/a National Grid (National Grid), and New Hampshire Electric Cooperative, Inc. (NHEC), and by the gas utilities serving the state, including Northern Utilities Inc. d/b/a Unitil (Unitil), and EnergyNorth Natural Gas, Inc. d/b/a National Grid NH (National Grid). Single-family homes and multifamily homes are often treated separately by energy efficiency programs because of differences relating to the types and numbers of efficiency opportunities found in the buildings (HVAC, lighting, air sealing, etc.). The discussion in Chapter 4 primarily addresses efficiency programs targeting single-family homes. Efficiency programs directed at multifamily homes are discussed in Chapter 5 as part of the commercial and industrial (C&I) discussion. Low income weatherization assistance programs are discussed in Chapter 6.

The residential energy efficiency CORE program review and assessment below focuses on characteristics of the programs that are working well in meeting state policies and goals, and identifies areas in which even greater public and private benefit could be achieved through further program enhancements and modifications. The discussion is organized by different market segments that various CORE programs are designed to serve including:

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[1] U.S. Energy Information Administration, Form EIA-861, "Annual Electric Power Industry Report, Top Five Retailers of Electricity, with End Use Sectors, 2009, http://www.eia.gov/cneaf/electricity/st_profiles/new_hampshire.pdf

[2] Distillate Fuel Oil Consumption Estimated, 2009.
http://www.eia.gov/emeu/states/hf.jsp?incfile=sep_fuel/html/fuel_use_df.html

[3] Annual Company Level Natural Gas Supply and Disposition (EIA-176 Data through 2009) http://www.eia.gov/cfapps/ngqs/

[4] New Hampshire Selected Housing Characteristics: 2005-2009, Data Set: 2005-2009 American Community Survey 5-Year Estimates Survey: American Community Survey, http://factfinder.census.gov/servlet/ADPTable?_bm=y&-geo_id=04000US33&-qr_name=ACS_2009_5YR_G00_DP5YR4&-ds_name=ACS_2009_5YR_G00_&-_lang=en&-_sse=on

[5] VITAL SIGNS 2011 New Hampshire Employment Security, Economic & Social Indicators for New Hampshire, 2006-2009 Economic & Labor Market Information Bureauhttp://www.nh.gov/nhes/elmi/pdfzip/econanalys/vitalsigns/vs2011/vs-2011-11-construction.pdf

- Existing homes (§4.2);
- Residential new construction (RNC) (§4.3);
- Residential retail products (§4.4); and
- Residential heating, ventilation, and air conditioning (HVAC) equipment (§4.5)

Educational programs offered to all market segments are discussed in section (§4.6).

4.2. Overview of CORE Programs for Existing Homes

Research conducted around the nation indicates that the most effective energy efficiency programs in the nation feature an integrated package of services that includes marketing and consumer education, technical assistance (audits, economic and technical analysis of efficiency options, design recommendations, etc.), financial incentives (rebates or financing), follow-up quality assurance, and verification of results. They also typically use evaluations to assess performance and make improvements.[6]

Energy efficiency services have been offered to residential utility customers in New Hampshire through the CORE energy efficiency programs since 2002, as a result of recommendation developed by the New Hampshire Energy Efficiency Working Group in 1998 and 1999.[7] The New Hampshire Public Utilities Commission (NH PUC) provisionally approved the recommendations in November 2000. Subsequently, the New Hampshire electric utilities and Commission staff held technical sessions and settlement talks with interested parties. Following many filings, the utilities received final approval from the Commission in May 2002 to launch eight CORE energy efficiency programs. This was the first instance in which a coordinated effort was made by the electric utilities serving New Hampshire to offer the same (or similar) programs statewide. Statewide, approximately half of the programs budgets were directed at residential customers and the other half were directed at C&I customers.

Current utility-administered energy efficiency programs directed at existing homes provide an important framework for continued progress in increasing residential energy efficiency throughout the state. During the past decade, approximately 11,000 houses participated in the Home Energy Solution/New Hampshire Home Performance with ENERGY STAR[R] (HPwES) programs and 8,600 participated in the Home Energy Assistance programs offered by the major electric utilities. In addition, approximately 5,000 customers participated in Weatherization Assistance programs offered by the gas utilities.[8] Through these programs combined, approximately 4% of existing homes in the state have participated in an energy efficiency program offered through CORE programming during the past 10 years. This progress provides a strong foundation for addressing the 96% of homes that have not yet been served.

Market Barriers to Increasing Energy Efficiency in Existing Homes

Market barriers exist in New Hampshire (and many other jurisdictions) that limit investment in energy efficiency improvements in existing homes. These include, for example:

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[6]Kushler, M, York, D, and Witte, P, Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs, ACEEE Report Number U035, December 2003;
Friedrich, K, Eldridge, M. and York, D, Saving Energy Cost-Effectively: A National Review of the Cost of Energy Saved through Utility-Sector Energy Efficiency Programs, ACEEE Report Number U 092, September 2009

[7] Docket No. DR 96-150)

[8] Some of these customers may have participated in both programs, if they are served by both an electric and a gas utility.

- **Lack of customer awareness and education:** Absent consistent, coordinated, and well-targeted energy efficiency education and outreach efforts, consumers in New Hampshire (and elsewhere) may lack an understanding of and attention to energy use in their home, options for increasing comfort (and energy efficiency), and ways to decrease their energy bills.

- **Limited network of qualified contractors:** It can be confusing and difficult for customers to identify properly trained and qualified contractors. In addition, contractors may not have the training, technical skills, or tools to provide comprehensive diagnosis and treatment of energy problems in existing homes.

- **Risk aversion:** Contractors may experience (or perceive) a lack of demand for home energy retrofit services, and therefore be reluctant to invest in the training and tools needed to provide such services. Contractors and customers may misunderstand and/or mistrust products that look and / or operate differently from those traditionally used in the home remodeling trade.

- **High initial cost:** Although it may be cost-effective over the life of the measures installed, a comprehensive, whole-house energy efficiency retrofit has a relatively high initial cost. This cost can—and does—limit customer investment.

- **Insufficient capital and/or financing options:** The lack of access to capital (or a lack of awareness of available capital) to make such investments can be a barrier to home energy retrofits.

- **Split incentives:** In rental housing, most, if not all, infrastructure-related decisions (such as energy efficiency improvements) are made by the building owner, while energy costs and any savings associated with efficiency investments are borne by the tenant. This creates a situation referred to as "split incentives." The problem exists for both single-family existing homes and multi-family buildings.

Characteristics of Successful Existing Home Programs

Key characteristics of successful home energy retrofit programs that address market barriers and result in strong market development over time include:

- **Education and outreach to customers:** Simple, but continuous outreach efforts that emphasize increased comfort, reduced energy bills, and health and safety benefits that result from energy efficiency have been shown to be effective for the existing homes market.[9]

- **Financial incentives for participating customers:** Incentives are important during the initial phase of new programs, to help overcome the price premium of energy efficiency measures as the home energy retrofit market is in the early stage of development. Such incentives should be able to be reduced or eliminated over time as the market develops.

- **Training and on-the-job mentoring for home performance contractors:** Including marketing and sales training for Building Performance Institute (BPI)-certified contractors helps

[9] Much of the significant literature on this topic can be found annually at the Behavior, Energy, and Climate Change Conference, an event convened by ACEEE, CIEE, and Precourt Energy Efficiency Center. For example, see Anne Dougherty, Tom Zara, & Hunter Marshall (2010). *Engage 360: Towards a New Norm: California Case Study*, for the effects of consumer education and outreach. http://www.beccconference.org/. See also at that site Marketing Communications topics from Session 5.

promote the value of working with certified contractors and training on proper HVAC sizing, installation, and servicing.

- **Financial incentives for contractors**: Incentives to encourage contractors to pursue training and BPI certification increases the qualified-contractor marketplace. Additional incentives for contractors for purchasing diagnostic equipment adds value to the retrofit marketplace. In some cases, incentives can be split (or shared) between the contractor and the customer. Financial assistance is also available in some areas for cooperative advertising. Other less frequently applied incentives include those for building commissioning, and incentives for bundled ENERGY STAR-qualified lighting, appliances, and building products such as insulation and windows.

- **Quality assurance and savings verification:** Both of these features ensure that customers and the utility receive the intended benefits and savings from the program.

- **Emphasis on partnership opportunities**: Programs should be designed to increase partnership opportunities with providers of energy-efficient goods and services. Key partnerships include distributors, local suppliers/retailers, contractors, manufacturers, and allied organizations such as government agencies, non-profit organizations, and trade groups.

- **Coordination and consistency across programs:** Coordination ensures that multiple and competing programs are not offered to the same customers, as well as similarity in electric and gas program offerings among utilities serving customers in overlapping jurisdictions.

Existing Homes Programs for Electric Utility Customers

New Hampshire residents interested in retrofitting their homes to make them more energy efficient are offered several options through the electric utilities' CORE programs. Lighting and appliance programs are available to all residential customers. Lighting and appliance retrofits address only one component of a home, whereas a whole-house approach considers the interaction among residents, building sites, climate, and other elements or components of the home (e.g., lighting and appliances, HVAC, insulation and air sealing, windows and skylights, etc.). Whole-house programs in New Hampshire are offered to qualifying residential customers.

As summarized in Tables 4.1 and Table 4.2, residential electricity customers living in one- to four-unit homes and interested in whole-house energy efficiency improvements can participate in the Home Performance with ENERGY STAR (HPwES) program.[10] In 2009-2010, multifamily facilities larger than 4 units also received home performance services under a fuel-neutral program funded by a one-time Regional Greenhouse Gas Initiative (RGGI) grant (referred to as *Re-CORE*). Residential customers verify their eligibility for the program by calling their utilities or filling out an online form on the utility's website or on the NHSaves website. Electric utility staff members administer the program and contractors deliver the services. The HPwES programs offered by Public Service of New Hampshire (PSNH) and Unitil are run as fuel-neutral pilots. Fuel-neutral pilots were developed because some utilities have marketed to and served remaining interested electrically heated homes and need to transition the program to the next tier (New Hampshire Electric Co-op [NHEC] also offers a small fuel neutral HPwES program using company funding). As part of this fuel-neutral pilot program, gas customers are first served by gas utilities until gas energy efficiency funds run out. If gas funds do run out and the customer is also an electric customer of PSNH or Unitil, they may qualify for their HPwES Program.[11]

[10] http://www.energystar.gov/index.cfm?fuseaction=hpwes_profiles.showSplash
[11] Thomas Palma, Manager Distributed Energy Resources, Unitil, personal communication, May 31, 2011.

Table 4.1. Home Performance with ENERGY STAR Programs for Electric Utility Customers

Measures Offered	Eligibility	Key Program Characteristics
Hot Water: Showerhead, faucet aerators, tank wrap, pipe insulation **Electric:** Refrigerator brush, appliance upgrades, CFL upgrades, CFL fixture **Thermal Package**: Air sealing, duct sealing, dense pack cellulose, thermostat, and attic, wall and basement insulation **Blower door testing:** If air sealing is required. Thermal imaging is not included but customers could chose to pay extra for this service **Health and Safety Measures** such as Combustion Appliance Zone (CAZ) testing **Heating and cooling system** distribution and system improvements	• Existing home or 1-4 unit apartment building • Home heating index (HHI) used to qualify homes (except National Grid)	• 50 % of cost up to $4,000 per customer $100 audit fee (a $450 value); • Air sealing is free for National Grid customers • Educational materials are available • PSNH and Unitil offer a fuel neutral pilot; NHEC and National Grid serve only electrically heated homes • Interest-free revolving loan program is available (max. loan is $7,500). On-bill financing offered by all four electric utilities since 2010. National Grid is looking into pursuing increased financing.

To partner with utilities in the HPwES / gas weatherization programs, contractors may opt to apply to receive a request for proposals when the utilities go to bid for home performance contractors (currently once a year).[12] If the contractor meets the utility's criteria, they can be added to a list of Home Performance contractors for each utility. Among other requirements, contractors need to be certified BPI auditors, go through an interview process, and have good references. Some utilities might provide contractors with a percentage of reimbursement incentives for training and the purchase of required diagnostic tools.

[12] The NH PUC directed the utilities to modify this procedure to allow a more open and continuous contractor qualification and enrollment methodology in Order No. 25, 189, at p. 26

Table 4.2. Re-CORE Expanded Home Performance with ENERGY STAR Programs for Electric Utility Customers

Measures Offered	Eligibility	Key Program Characteristics
RGGI Expansion of CORE residential programs (HPwES)	• For eligible projects (co-pay) for weatherization and heating system replacements	• Fuel Neutral Multi-Family Program: Fuel neutral home weatherization services through the Home Energy Solutions (HES) Program for single and multi-family facilities larger than 4 units. • Revolving loan fund for weatherization and heating system replacements in the HPwES program.

At the time of enrollment, customers have the choice of selecting a participating BPI-certified contractor from a list provided by the utilities, or having a BPI-certified contractor assigned directly by the utility. The large majority (~80%) of customers end up working with a contractor that has been assigned to them.[13] Prices that contractors charge for various measures are set by the utilities based on an annual survey of program contractors and market pricing. An independent third-party contractor will spot-check at least 10% of the work (although the percentage is higher for new contractors). Outreach for the HPwES program includes referrals, marketing of the program through a brochure and bill inserts, as well as NHSaves and utility websites, radio, social media such as Twitter and Facebook, tradeshows, energy fairs, contractor promotion, city and town websites and local energy committees.

Aside from HPwES programs, some utilities offer load management programs to their residential customers/members (Table 4.3). These programs are not funded by the System Benefits Charge (SBC): NHEC offers a load management program for customers who have electric baseboard heat and / or electric water heating, as noted in Table 4.3; PSNH offers a program called HEATSMART that can interrupt electric heat and hot water when ISO-NE implements Operating Procedure Action (Capacity Deficiency Actions) (this program is also described in chapter 4.3).

Table 4.3. Existing Homes Load Management Program for Electric Utility Customers

Eligibility	Offering	Key Program Characteristics
Radio-controlled switch Electric baseboard Electric water heater	• Maintenance of the controls and related equipment, • Services for new customers (upon request)	Offered by NHEC to about: 4,000 members with water heater controls 1,000 members with Electric Thermal Storage, Dual Fuel, and/or Storage Water Heater controls
Electric heat and electric hot water	• Electric heat and hot water interruption	Offered by PSNH

Budgets allocated to the residential existing homes market segment across all four utilities are summarized in Table 4.4. The share of the total core budget spent on the electric home performance program[14] varied between 8% and 13% during the period 2008 to 2010. The share of the total electricity

[13] Information provided by the New Hampshire Office of Energy and Planning (NH OEP), August 10, 2011.
[14] Home Energy Solutions program (2008-2009) and current Home Performance with ENERGY STAR program

savings for the HPwES program varied between 2% and 6% of total electricity savings for 2008-2010. The yield for the HPwES program—the amount of energy saved per dollar spent on energy investment—averaged $0.08 per lifetime kWh saved over the last three years. With the introduction of the fuel-neutral pilot, the average dollar amount spent per kWh is higher than in prior years, but this metric does not include fuel savings associated with other fuels (reported as MMBTU saved). Dollars spent per unit of energy saved can be useful in comparing programs across jurisdiction and years. However, with the recent implementation of the fuel-neutral program, comparing program yield in New Hampshire with prior years and with programs in other states is difficult.

Table 4.4. Electric Utility Home Performance with ENERGY STAR[15] Budgets, Goals, and Savings

Year	Budget	Budget Spent	Lifetime Savings Goal (kWh)	Savings Goal Attained (%)	Participation Goal (# of Homes)	Participation Goal Attained (%)
2008	$ 1,956,794	70%	28,329,553	67%	1,528	83%
2009	$ 2,019,389	108%	15,566,478	328%	1,545	116%
2010	$ 2,054,566	93%	11,092,915	144%	2,307	79%
2011 Plan	$ 2,122,900	NA	9,942,800	NA	1,150	NA
2012 Plan	$ 2,306,400	NA	10,698,200	NA	1,236	NA

Existing Homes Programs for Gas Utility Customers

In 2011, residential natural gas customers can receive home performance services through the HPwES program, which follows the same model as the fuel neutral HPwES program offered by electric utilities. In prior years home performance services were offered at two levels in New Hampshire: an educational home audit and a more in-depth weatherization project by a certified contractor. As the programs have changed in recent years and have historically differed between the two utilities, an analysis of recent program performance is difficult. For example, until 2010, Unitil offered a Self Install Program and Residential Home Assessment program, and National Grid offered an Energy Audit and Home Performance Program, and a Weatherization program. The HPwES program for gas customers has not been offered by both utilities long enough to allow for an assessment of program success during research for this report. All insulation measures for properties with more than 20 units are put out to competitive bid and coordinated with the New Hampshire electric utilities' multifamily building programs.

[15] Home Energy Solutions in 2008-2009

The home performance programs offered by gas utilities in 2011 are summarized in Table 4.5. The programs are based on a similar design as the fuel-neutral pilot HPwES program, and are structured to ensure collaboration across programs that result in both electric and gas savings in existing homes. The gas utilities also offer a Residential Building Practices and Demonstration Program[16] that might explore: renewable energy for hot water, advanced home heating systems, insulation, building envelope techniques, and new home construction practices.

Table 4.5. Home Performance with ENERGY STAR Programs for Gas Utility Customers

Measures Offered	Eligibility	Key Characteristics
• Identifies energy savings improvements • Estimates costs of the improvements • Prioritizes the improvements based on a simple payback analysis • Identifies health, moisture, and safety issues • Measures may include: Attic insulation, wall insulation, basement/crawl space insulation, rim joist insulation, duct insulation, heating system pipe insulation, attic ventilation (in conjunction with attic insulation), ductwork leakage testing, ductwork leakage sealing, air infiltration testing, and air infiltration sealing.	Qualifying gas utility customers	Similar to the Electric HPwES program: Incentive of 50% of measures installed by participating contractors, up to $4,000 for 1-4 unit homes. Incentive for cost effective opportunities to upgrade gas HVAC equipment is via the Residential GasNetworks program National Grid also offers$750 per individually metered dwelling unit for multifamily buildings. Unitil serves both individual and master metered units in multifamily buildings.

Gas program budgets and savings are presented in Table 4.6. Comparison of gas program budgets and energy savings between years is difficult because programs have changed between 2008 and 2011, and program description and names varied between the two utilities. The yield—again, the amount of energy saved per dollar invested in energy efficiency—for existing homes programs appears to be highly variable; it averaged $0.29 per lifetime Therm saved between 2006 and 2008 ($0.15-$0.42 depending on the program, the utility, and the year). The average dollar per lifetime Therm saved is one way to measure of the success of a program; this metric illustrates how much program funds were needed to achieve one unit of energy saved.

[16] 2011-2012 Energy Efficiency Plan

Table 4.6. Gas Budgets, Goals, and Savings from Energy Audit, Weatherization, and Home Performance with ENERGY STAR Programs[17,18]

Year	Planned Budget[19]	Lifetime Goal[20] (Therm)	Reported Savings (Therm)
2006-2007	$ 267,514	1,175,671	1,059,281
2007-2008	$ 251,984	953,505	727,144
2008-2009	$ 360,928	792,139	1,487,620
May 2009-December 2010	$ 2,113,393	6,775,933	6,378,365
2011 plan	$ 1,675,631	3,592,960	NA
2012 plan	$ 1,810,406	4,156,960	NA

Case Study: Single Family Home Pelham, New Hampshire

Some utilities offer case studies of their residential program success on their website, below is an example of a National Grid HPwES case study available on the utility's website[1]:

Richard Halde had an in-home energy assessment completed at his duplex style home located in Pelham, New Hampshire. Mr. Halde made the recommended upgrades, and upon completion of the work received a rebate of over $2,400 towards the cost of insulation.

"The auditor and the installation crew could not have been any more professional. The work that was done was beyond reproach and the results have definitely made a huge difference this season." -Richard Halde

Project Summary
Air Sealing & Insulation

- Sealed air leaks in attic
- Added 6" of cellulose to attic and knee wall floor
- Insulated hatch, pipe tenting, prop-a-vents and fiberglass damming.
- Added 2" polyisocyanurate to knee wall
- Replaced old bathroom fan vent installing insulated hose and new roof vent.

Savings Summary

- Project Cost $3,241.14
- National Grid Incentive $2,430.85
- Annual kWh Savings 787 kWh
- Annual MBTU Savings 27,486 MBTU
- Annual Cost Savings $509.42

[17] Includes savings reported for the gas programs by NGrid and Unitil.
[18] 2006-2009 includes budgets previously included in Residential Conservation Services / Measures; Self-Install Rebate; and Internet Audit Guide.
[19] "Planned Budgets" do not match exactly between 2009-2010 planning documents and 2009-2010 shareholder incentive reports. Values reported here are from 2009-2010 Shareholder incentive documents.
[20] Planned lifetime savings and Actual lifetime saving reported were off by a factor of 100. We divided reported numbers by 100 to get therm savings. This correction method was confirmed by Angela Li on June 20 through personal communication.

Existing Homes Program Results and Market Development

Home Performance with ENERGY STAR is the primary CORE program with a whole-house approach that addresses the residential existing homes market. Other programs specifically targeting lighting and appliances are discussed in subsequent chapters.

Savings Goals: The electric savings goals for HPwES programs offered by the electric utilities declined between 2008 and 2010, and remain level going forward into 2011 and 2012 (Figure 4.1). The MMBTU savings reported and savings goals for 2011-2012 are increasing. Compared to achievements in prior years, the residential HPwES program electric savings goals are set lower than historical savings achievements for 2011 and 2012. The transition to the fuel neutral pilot was originally capped to a small number of units served (200). The 2011 and 2012 plan was designed under the assumptions that the cap would be removed, and therefore more non-electrically heated homes would be served. To fully understand the impact of the fuel-neutral pilot on the existing homes market segments, it would be helpful for future planning and evaluation efforts if participation and savings was disaggregated into fuel categories (e.g. electrically-heated, oil, LP gas, wood, etc.) in the annual filings. In that manner, electric savings achieved in electrically heated homes could be compared to prior program achievements.

Recommendation

- **Report savings from the fuel-neutral pilot disaggregated by fuel types.**

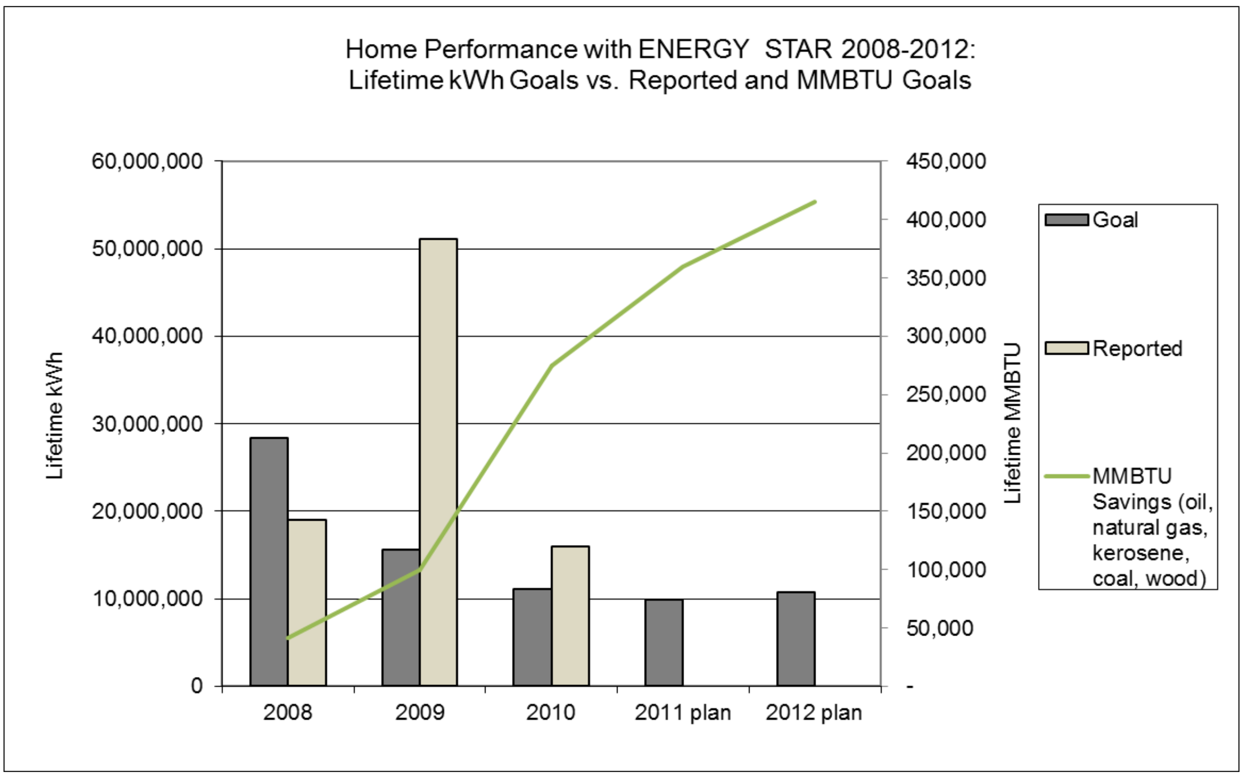

Figure 4.1. Electric Utility HPwES Lifetime Savings Projected and Reported 2008-2012

Two measures of success for this program are to attain the savings goal and the participation goal set for the program. Between 2008 and 2010, New Hampshire electric utilities achieved 180% of the savings goals, reached their participation goal one year out of the last three, and spent on average 90% of the budget allocated to Home Performance with ENERGY STAR. Participation goals established for 2011-2012 are lower than those reported previously, even though the fuel neutral program is planning on serving more non-electrically heated homes.[21] The budget established for the program remains the same.

Financial Incentives and Private Investment: Offering modest incentives for installation of efficiency measures through a HPwES program is effective in reducing the risk to contractors of trying a new business model, but incentives that are set too high impede market development by reducing out-of-program participation. When the incentive is very generous, customers may prefer to wait on a waiting list to qualify for the utilities' incentive than proceed with upgrades without the incentive, delaying the upgrades and limiting the number of out-of-program projects available for out-of-program contractors. The incentive offered to New Hampshire customers participating in HPwES appears to be very effective in providing some customers with access to capital for efficiency installations. That said, the incentive level in New Hampshire (which is presently 50% of the total cost, up to $4,000 in incentive) appears high in the light of program oversubscription at the 75% incentive level (capped at $4,000) and compared to what other states in the region offer. For example:

- The HPwES incentive in Massachusetts is up to $2,000;[22]
- In Vermont, the incentive for the fuel-neutral HPwES is capped at $2,500;[23] with an average incentive of $1,500.[24]
- In New York, the incentive is 10% of the total job cost, up to $3,000.[25]

In New Hampshire, the average HPwES rebate is approximately $2,300,[26] which is higher than some neighboring states. The average total HPwES project cost in Vermont is between $7,500 and $8,000.[27] While New Hampshire average project costs may be different, under the current New Hampshire program structure it is possible that many customers will have projects with total costs reaching $8,000, which would still qualify them to receive the maximum incentive of $4,000 - even though the incentive declined from 75% to 50% of project costs. Some HPwES contractors noted that "since the percentage rebated is lower in 2011, more people are trying to reach the maximum program amount of $4,000".[28]

Research indicates that HPwES incentive levels in New Hampshire are higher than those in nearby states with well-developed and successful HPwES programs. New Hampshire utilities do not currently plan to further reduce the incentive (50% capped at $4,000), as it was not recommended by the recent HPwES evaluation. The recent process evaluation conducted by Cadmus [29] concluded that the reduction of incentive from 75% to 50% was "appropriate" and that "The New Hampshire program appears to have arrived at a good compromise incentive structure in offering a 50% incentive". The process evaluation did not explicitly state whether or not the program would benefit from an incentive that is lower than 50%, up to $4,000, but noted that "Contractors and the National Grid lead vendor indicated that customers were very satisfied with both the 75% and 50% of measure cost rebate amounts, with several

[21] Analysis of data in the 2011-2012 Energy Efficiency Plan and 2008-2009 Annual Efficiency Programs Filings
[22] http://www.masssave.com/residential/heating-and-cooling/find-incentives/incentive-details-home-energy-assessments
[23] www.efficiencyvermont.org
[24] Logan Brown, Efficiency Vermont, personal communication
[25] http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/best_practices_case_study_new_york.pdf
[26] Information provided by the New Hampshire utilities, August 10, 2011
[27] Logan Brown, Efficiency Vermont, personal commuication
[28] NMR Group, Inc.The Cadmus Group, Inc. / Energy Services, *Process Evaluation: New Hampshire Home Performance with ENERGY STAR® Program, REVISED DRAFT,* Prepared for EnergyNorth (National Grid Gas), PSNH, Unitil, June 2011
[29] NMR Group, Inc.The Cadmus Group, Inc. / Energy Services, *Process Evaluation: New Hampshire Home Performance with ENERGY STAR® Program, REVISED DRAFT,* Prepared for EnergyNorth (National Grid Gas), PSNH, Unitil, June 2011

noting that the lower rate has not affected their rates for closing sales." While it is still too early to see the impact of the lower percentage incentive on program participation and budgets, utilities and regulators should evaluate the incentive level regularly and act swiftly if the incentive level appears not to be appropriate to support market development.

The conversion rate for HPwES (which reflects the number of weatherization projects completed, compared to the number of audits done) was between 80 and 90% for PSNH and Unitil. The conversion rate for National Grid was approximately 40%, which might be due to the offering of the free audit and the fact that the audit does not require the use of the Home Heating Index (HHI), which measures how efficiently heating fuel energy is used in a home. High HHI values can qualify a home for weatherization services. In comparison, Maine has a conversion rate of approximately 33%, using a different program model.[30]

Recommendations

- **Monitor the market's response to the 50% incentive** and consider adjusting the incentive structure further. As the maximum incentive ceiling remains at $4,000, a large number of projects may still qualify for the maximum incentive and the program may continue to be oversubscribed.

- **Consider channeling appliances and fixtures rebates through the retail products program** to increase the funds available through HPwES.

- **Offer a less generous maximum incentive** and drive program participation through marketing, education, and through contractor incentives and salesmanship training. While a high incentive is helpful for reaching a large participation and targeting wide diversity of customers, education and market transformation are the ultimate goals of the program. These goals will not be met if the HPwES is oversubscribed and marketing and education are put on hold to avoid a waiting list.

Marketing and Outreach: Approximately one-half of the households surveyed for the report *Additional Opportunities for Energy Efficiency in New Hampshire* indicated they were aware of their utility offering energy efficiency programs, and 30% had participated in them in some way.[31]

Marketing for the HPwES program is relatively targeted and consists, among others, of a brochure which is:

- Provided upon request and through direct mailing
- Distributed by contractors
- Distributed at trade shows and energy fairs
- Included as a bill stuffer
- Distributed with information about financing

Other marketing strategies for this program include information on the NHSaves and utilities websites, partnership with 211nh.org, media outreach (radio), distribution of a newsletter, social media, etc. Minimal or no mass marketing is currently conducted for the program and word of mouth and the outreach noted above are sufficient for generating enough market interest to use up the program budget.[32]

[30]Palma, Thomas, Manager Distributed Energy Resources, Unitil, *Personal Communication*, May 31, 2011

[31]GDS Associates Inc., *Additional Opportunities for Energy Efficiency in New Hampshire*, Final Report to the New Hampshire Public Utilities Commission, January 2009.

[32]Palma, Thomas, Manager Distributed Energy Resources, Unitil, *Personal Communication*, May 31, 2011

When utilities exhaust their budget (for HPwES or any other program), they stop marketing to avoid adding to their customer waiting list. [33] Whatever amount of the marketing budget is not spent at that point can be rolled into the program incentive, allowing more customers to participate in the program. Overall, current promotion of the program seems to result in sufficient customer demand to meet the program goals using the current program design and the current incentive level.

Additional marketing opportunities exist for stimulating further market development for increasing energy efficiency in existing homes. The Cadmus Process Evaluation research pointed to the difficulties utilities face in marketing the program without creating more demand than their budget allows them to handle:

> "**Program staff indicated that they are trying to reduce the burden on the utility for promoting the program, thus they encourage contractors to be lead generators because contractors have a vested interest in bringing in clients and the auditing and installation work is referred back to the contractors. However, another member of the program staff stated that the program is constrained in terms of the available resources for incentives, so it cannot be over-marketed because then people will be put on a waiting list.**"

Additional marketing could occur through additional distribution of promotional materials that help inform consumers of the benefits of energy efficiency, educate them to more easily identify knowledgeable contractors, and help create long-term demand in the marketplace. In a market open to home performance contractors, cooperative advertising can help support certified contractors in marketing their services, reducing their risk of investing in new skills. While some utilities support cooperative advertisement, the recent contractor recruitment structure in New Hampshire may not have been a supportive design for extensive cooperative advertisement, as the HPwES market was not open but rather limited to a short list of participating contractors.

Recommendation

- **Drive participation in the program through education and a marketing campaign** that more strongly emphasizes the benefits of improving home comfort and reduced energy bills, by including customer testimonials.

Contractor Technical Assistance, Training, & Certification: Energy efficiency programs that strive for short- and long-term market development for home energy retrofits typically partner with Home Performance contractors by offering training that increases contractor knowledge and skills. This helps create a private market infrastructure capable of accurately and comprehensively diagnosing and addressing energy problems in homes. BPI certification provides qualified contractors with a marketing tool that they can use to differentiate themselves in the market, and gives consumers a criterion they can use to identify knowledgeable contractors.

[33] Utilities establish a waiting list as directed by NHPUC Order 25,189: "In the event more customers seek to participate in the program than are set forth in the proposed levels, PSNH and UES will maintain a waiting list and may petition the Commission for approval to serve additional customers."

Utility Partnerships to Promote Building Performance Institute (BPI) Trainings

BPI certification is a nationally recognized certification that focuses on existing residential buildings. To obtain and maintain BPI certification, building professionals need to go through a rigorous examination and re-certification process. Utilities partner with building professionals in several ways to support the BPI certification and continuous education:

- All utilities partner with BPI-certified contractors for the New Hampshire Home Performance with ENERGY STAR[R] (HPwES) program. BPI certification is a requirement for contractor participation.

- Utilities encourage contractors to join the New Hampshire Residential Energy Performance Association (REPA-NH.org) to share information and to participate in continuous education. The New Hampshire Residential Energy Performance Association (REPA) is an organization consisting of individual Residential Energy Auditors and Weatherization Professionals providing Energy Efficiency Services in New Hampshire. Customers who do not qualify for the HPwES program are provided with educational material that encourages them to hire someone to audit their home. Utilities recommend that customers contact REPA-NH.org to find a qualified contractor who will meet their needs.

- New Hampshire electric utilities partner with community colleges to offer an energy auditor training program: *Training Tomorrow's Energy Auditors*. The eight-week training course prepares students to earn a BPI certification. The course is offered at the Manchester and Laconia Community Colleges. The utility partnership with these community colleges has included the purchase of curriculum, training, and classroom and field equipment.

- The *Expanded Energy Efficiency and Renewable Energy* Program is an energy auditor training program offered by the New Hampshire Division of Economic Development and funded by a RGGI grant. This program leads to BPI certification and is offered in partnership with:
    - New Hampshire's energy utilities
    - New Hampshire colleges
    - Not-for-profit Organizations: Home Builders & Remodelers Association. of NH (HBRANH), Plymouth Area Renewable Energy Initiative (PAREI), Sustainable Energy Resource Group (SERG), Society for Protection of NH Forests (SPNHF)
    - New Hampshire Office of Employment Security

Photo courtesy of: Andy Duncan & Tom Goulette, Lakes Region Community College, Bob Reals, Jr., NH Division of Economic Development, http://www.puc.nh.gov/EESE%20Board/20110708Mtg/EESE%20LRCC-DED%20ETP%20Presentation%20Jul8%2711-PDF.pdf

By partnering with a wide range of BPI-certified contractors, beyond the limited list of contractors currently approved to participate in HPwES, New Hampshire utilities could take an active step in developing the state's Home Performance market. When a high incentive is available through the program, it is a dis-incentive for customers to hire an out-of-program BPI-certified contractor and some customers may prefer to wait to be in the program. Utilities could partner with more contractors if the program dollars were made to extend further. Other tools can also be used to develop the contractor market, such as sales training that enables contractors to more effectively educate consumers on efficiency improvements, or incentives for purchasing diagnostic equipment or installing efficiency measures.

The New Hampshire utilities' proposed strategy to further develop the supply/installation side of the home energy retrofit market should be clearly stated in the filings. The 2011-2012 Core Program Plan does not clearly address the supply/installation side of the home energy retrofit market. [34] Prior issues with contractor recruitment (i.e. contractors not having the ability to be added to the approved list at any time of the year[35]) indicated that market development was not being achieved effectively on the contractor side of the market. A recent public solicitation of interest that assessed the interest of contractors to participate in the HPwES program was a step in the right direction toward a process that would be open to all interested qualified building professionals. The utilities plan to offer a Request for Qualifications in the fourth quarter of 2011 in order to select 2012 contractors, if the program is approved to go forward by the Commission. Providing regular contractor training and increasing the number of qualified contractors participating in the program would further develop the home energy retrofit market in New Hampshire.

Although program administrators and contractors have ongoing conversations about the price level set for measures, the draft evaluation report for the HPwES program indicates that five out of eight contractors mentioned concerns about prices set by some utilities for the energy efficiency measures; two said that there is not enough profit margin when work was subcontracted.[36] While each year utilities review pricing and provide an opportunity for contractors to suggest changes, the set price system may need to be re-evaluated. Having a system that allows contractors to bid competitively for the efficiency work may allow contractors to receive market prices, while keeping prices low, which is a key ingredient for effective market development.

Recommendations

- **Clearly develop and state the long term vision to develop the contractor market.**
- **Develop the contractor market further** by transitioning to a model that allows more partnering contractors to participate, and improves the contractor's success in selling efficiency measures.
- **Revise model to allow contractor prices to be dictated by the market**, possibly by offering more prescriptive incentives rather than incentives based on contractor costs.
- **Consider offering contractor incentives and providing more mentoring, salesmanship training, and education to contractors.** Providing a small incentive to

[34] 2011-2012 Core Programs Plan, Measures of Success & Market Transition Strategy, p.26
[35] The NH PUC directed the utilities to modify this procedure to allow a more open and continuous contractor qualification and enrollment methodology in Order No. 25, 189, at p. 26
[36] NMR Group, Inc. The Cadmus Group, Inc. / Energy Services, *Process Evaluation: New Hampshire Home Performance with ENERGY STAR® Program, REVISED DRAFT,* Prepared for EnergyNorth (National Grid Gas), PSNH, Unitil, June 2011

contractors to install efficient measures may be more cost-effective than providing customers with a larger rebate to cover the higher cost of the efficiency measure.

Consistent Branding and Ease of Access for Customers Across the State: Consistent branding, coordination of marketing, and a single point of access for similar programs offered by multiple utilities can stimulate customer demand for and participation in home energy retrofit programs. In addition, these practices can save administrative costs. New Hampshire electric utilities have done a good job overall coordinating their existing homes efficiency programs.[37] Implementation of the HPwES program is similar across the state except that utilities' contractors use different audit software. For the pilot program, PSNH and the other utilities developed Surveyor with Performance Systems Development. During the pilot program PSNH used Surveyor while Unitil used TREAT; therefore, savings assumptions and calculation differ for different utilities. Utilities also use different tracking tools: some use OTTER, and some use in-house tracking programs (e.g., InDemand for National Grid).[38] The utilities are working towards all using the Surveyor tool, and in 2012 plan to review the auditing tools currently being developed for possible use in 2013. PSNH, Unitil, and NHEC have similar program approaches; National Grid has its own approach with a lead vendor conducting free air sealing and arranging contractor for customers. The differences in modeling software means that assumptions are different among utilities and that realization rates and calculated have the potential to vary by utilities. The electric and gas utilities are expecting to incorporate the conclusions of the Cadmus HPwES impact and process evaluations to determine the best approach to programs going forward and are expecting to move toward using the a statewide prescriptive, deemed savings approach in 2012, pending approval by the NH PUC.

Recommendation

- **Ensure that utilities use the same modeling software** so that savings assumptions are the same statewide and can more easily be compared and verified.

Customer Satisfaction: Overall, among participants, satisfaction with the HPwES program in New Hampshire seems extremely high.[39] One contractor summarizes this well in a hyperbole: compared to programs in other states, "the New Hampshire process is good; customers don't have to do anything."[40] Indeed, eighty percent of participants indicate an increase in comfort level in their homes.[41]

Savings Results: Regular independent evaluation of HPwES programs is necessary to ensure that the program is having the impact intended. The only prior evaluation of the electric utilities home performance program was conducted in 2005 for programs run in 2003. An evaluation of the fuel neutral HPwES pilot took place in 2010. Preliminary findings from this evaluation indicate that realization rates vary widely among utilities (from 36-98%). Each utility uses a different technique to estimate savings. Combining engineering and bill analysis[42] results, realization rates were found to be 92% for gas and 52% for electric utilities, meaning that energy savings were lower than had been estimated for gas programs. In

[37] All four electric utilities and two gas utilities are implementing the Home Performance with ENERGY STAR Program. PSNH and Unitil have served electrically heated homes and have transitioned to fuel-neutral customers. NHEC and NGRID are still serving electric heat (or electric use) customers only and the gas companies are serving gas customers. Technically speaking, the fuel neutral pilot is not currently offered statewide.

[38] NMR Group, Inc. The Cadmus Group, Inc. / Energy Services, *Process Evaluation: New Hampshire Home Performance with ENERGY STAR® Program, REVISED DRAFT,* Prepared for EnergyNorth (National Grid Gas), PSNH, Unitil, June 2011.

[39] GDS Associates Inc., *Additional Opportunities for Energy Efficiency in New Hampshire*, Final Report to the New Hampshire Public Utilities Commission, January 2009.

[40] Joseph Bates, Personal Communication, 4/28/2011

[41] NMR Group, Inc. The Cadmus Group, Inc. / Energy Services, *Process Evaluation: New Hampshire Home Performance with ENERGY STAR® Program, REVISED DRAFT,* Prepared for EnergyNorth (National Grid Gas), PSNH, Unitil, June 2011

[42] A verification of energy savings by analyzing customers energy bills and accounting for external factors such as weather

comparison, realization rates for other states presented in the Cadmus draft report ranged from 58-117%.[43]

Recommendation

- **Conduct evaluations of HPwES program more frequently** to identify and address issues rapidly as the market evolves

Conclusions

Overall, the existing homes market in New Hampshire is well served by the utilities through the HPwES program (electric, gas, and fuel-neutral pilot). Customer satisfaction and conversion rates are high. Overall, an estimated 4% of existing homes have been served since program inception.[44]

Program review and assessment completed for this study indicate the incentive offered to customers in New Hampshire for the existing homes programs may be greater than needed. High incentives are effective for achieving high conversion rates and help accurately reach target participation and goals. However, incentive levels set higher than needed can result in programs becoming oversubscribed, create a "stop and start" dynamic in the market, and hinder the development of the home-performance market for contractors outside of the program. There appears to be enough customer demand in New Hampshire to justify lower incentive levels, which would also enable utilities to serve more customers.

The current contractor selection process ensures tight scrutiny of contractors' ability to provide customers with accurate and thorough whole-house energy savings. While the process allows utilities to select contractors that are best qualified for the job, and that is an important aspect of a successful program, this methodology does little to develop the market. Effort should be made to include a broader range of contractors.

The existing home retrofit programs should have a stated long-term vision on how the incentive will be reduced over time and how the home performance contractor base will be further developed. Verification of savings, goal setting, and evaluation of program success should be conducted on a regular basis by a third party to ensure maximum program effectiveness.

4.3. CORE Programs for Residential New Construction

In the last few years, between 2,200 and 5,700 new home building permits were issued annually in New Hampshire, declining since 2008 which is a trend seen across the nation. More than 40% of new homes built over the last four years were in Hillsborough and Rockingham Counties. The percentage of single family home permits declined from 85% to 73% of total residential building permits issued between 2006 and 2009,[45] indicating that over the last few years, single family home construction declined more than multi-family home construction.

[43]NMR Group, Inc. The Cadmus Group, Inc. / Energy Services, *Process Evaluation: New Hampshire Home Performance with ENERGY STAR® Program, REVISED DRAFT,* Prepared for EnergyNorth (National Grid Gas), PSNH, Unitil, June 2011

[44] Since 2002, approximately 11,000 houses participated in Home Energy Solution/ NH Home Performance with ENERGY STAR Programs (not including low-income programs) and approximately 5,000 gas customers also participated in weatherization programs

[45]VITAL SIGNS 2011 New Hampshire Employment Security, Economic & Social Indicators for New Hampshire, 2006-2009 Economic & Labor Market Information Bureau http://www.nh.gov/nhes/elmi/pdfzip/econanalys/vitalsigns/vs2011/vs-2011-11-construction.pdf

A whole house approach to reducing energy consumption in the residential new construction sector is an important opportunity to capture cost-effective energy efficient improvements. Each new home in New Hampshire adds approximately 16,600 MWh to the electric load. Another way to look at this is that residential new construction in 2009 added approximately 0.4% to New Hampshire's residential electrical use.[46] While the electric energy use is not as large as other sectors, there are significant opportunities to reduce consumption and educate the contractor market on efficiency concepts that will spillover to existing homes, as many contractors work both in new construction and renovation. Choices made to improve efficiency on heating equipment, appliances, and envelope systems during the home design phase cost much less than retrofitting a home at a later date and the energy savings continue for many years into the future. In addition, the improvements in new homes reduce the energy consumption and operating costs from the moment the building is occupied.

Market Barriers to Increasing Energy Efficiency in Residential New Construction

A variety of barriers exist in New Hampshire (and many other jurisdictions) that limit contractor and customer interest and investment in energy efficient residential new construction. These include, for example:

- **Lack of contractor and customer awareness and education**: Contractors and customers may lack understanding of the energy savings potential of energy efficient new construction, and of the non-energy benefits (improved comfort, lower maintenance costs, etc.) of a well built, efficient home.

- **Risk aversion:** Contractors may be concerned that costs or production schedules will be affected by new building methods. Doubts about the savings claims and the ability to recover the efficiency investments from the homebuyer may also exist.

- **Product availability and proper installation**: Some lighting showrooms are reluctant to stock and display energy efficient fixtures. Some HVAC contractors oversize heating and cooling equipment, and few install central air conditioners for optimal performance.

- **Split Incentives:** The developer of a housing project and the builder typically do not bear the long-term energy costs of the housing they create or realize the long-term savings of up-front efficiency investments, and thus may not be convinced that the investment made to build energy efficient housing will be worthwhile for them.

Characteristics of Successful Residential New Construction Programs

In general, the residential new construction market can be effectively addressed with a program such as ENERGY STAR qualified new homes. Key characteristics of a well-run ENERGY STAR program for residential new construction include:

- Technical assistance, education, and training;
- ENERGY STAR certification of the residence;

[46] 2009 average energy use per household: U.S. Energy Information Administration, Form EIA-861, "Annual Electric Power Industry Report, Top Five Retailers of Electricity, with End Use Sectors, 2009,http://www.eia.gov/cneaf/electricity/st_profiles/new_hampshire.pdf; and New Hampshire Selected Housing Characteristics: 2005-2009, Data Set: 2005-2009 American Community Survey 5-Year Estimates Survey: American Community Survey, http://factfinder.census.gov/servlet/ADPTable?_bm=y&-geo_id=04000US33&-qr_name=ACS_2009_5YR_G00_DP5YR4&-ds_name=ACS_2009_5YR_G00_&-_lang=en&-_sse=on

- Financial incentives; and
- Market development activities.

When offering financial incentives in the residential new construction market, those designing the programs seek (1) to offer incentive amounts that are high enough to motivate a builder to participate, but not higher than needed to achieve this; and (2) to leverage customer and third-party investment, whenever possible. Also important for residential new construction programs is to prepare for program modifications, including stricter standards. EPA's ENERGY STAR Homes program is moving to Version 3 which expects to be fully implemented in 2012. Version 3 includes many modifications that further increase the energy efficiency of new homes as well as include new requirements for increased contractor training, water management checklists, and HVAC requirements.

Residential New Construction Programs in New Hampshire

Customers looking for a whole-house approach for construction of their home have the option to participate in the ENERGY STAR Homes program. The program helps develop the market for energy efficient new construction by providing a Home Energy Rating (HERS) - a nationally recognized index for measuring a home's energy efficiency. A nationally certified HERS Rater is available to customers for design assistance, efficiency recommendations, testing, and certification. A RESNET certified home energy rater will review construction plans and conduct the home energy rating analysis. If the home does not already meet ENERGY STAR standards, upgrade options will be presented in collaboration with the builder and buyer. Typically two site visits are conducted to the home: after insulation is installed and before the drywall is in place; and once the home is built and mechanical systems are operating. PSNH and NHEC also offer efficient heat pumps programs. Incentives offered through CORE and utility specific programs are presented in Table 4.7., 4.8., and 4.9. Additional programs offered through RGGI funding are summarized in Table 4.10.

Table 4.7. CORE Residential New Construction Programs in New Hampshire: ENERGY STAR Homes

Measures Offered	Eligibility	Key Characteristics
Provides builders with technical assistance, financial incentives for home certification, upgrades to ENERGY STAR products, marketing support, and instruction to improve efficiency levels above the minimum required to meet federal ENERGY STAR standards.	New or completely renovated existing single-family or multi-family home	Incentives are performance based using the HERS Index, plus prescriptive incentives for ENERGY STAR lighting, appliances and programmable thermostats;

Table 4.8. Utility-Specific Residential New Construction Programs[47]

Measures Offered	Eligibility	Key Characteristics
PSNH: Incentive for geothermal heat pump (until 2009), geothermal and air source heat pumps (2010). **NHEC:** All ductwork designed, installed, sealed, and insulated properly	New or completely renovated existing single-family or multi-family home. Homes must meet EPA ENERGY STAR standards in order to qualify. There is a list of qualified HVAC vendors and installers.	**PSNH:** Geothermal track - PSNH offers higher incentives for the installation of geothermal heat pumps in new home construction, incentives up to $7,500 are available.[48] **NHEC:** For Geothermal: $800/ton up to $4,000 + $500 for ducts in conditioned space. A charge of $350 for ENERGY STAR Certification will be deducted from the rebate. For High efficiency and Hybrid: $2,000 for equipment with a SEER of 16 or higher.

Table 4.9. PSNH HEATSMART Program

Measures Offered	Eligibility	Key Characteristics
Discounted kilowatt-hour rate for separately metered space heating (and cooling if using a heat pump) and electric water heating.	Electric heat customers (incl. geothermal), provided there is no fossil fuel heat systems on site.	In exchange for the lower rate, customers agree to allow PSNH to briefly interrupt service to their heating circuits during periods of high demand for electricity.

Table 4.10. Re-CORE Expansion of Residential New Construction Program

Measures Offered	Eligibility	Key Characteristics
Expansion of Residential New Construction Program	New or completely renovated existing single-family or multi-family home. Homes must meet EPA ENERGY STAR standards in order to qualify. There is a list of qualified HVAC vendors and installers.	The Program will certify homes as meeting the nationally recognized ANSI approved National Green Building Standard. The utilities are using the RGGI funds to pay for the NH Build Green verification while also providing a $500 builder incentive for their efforts to do both the site work required and the paperwork. PSNH ENERGY STAR Homes: Increase spending for new geothermal homes.

[47] ENERGY STAR Homes Program Enhancement: For PSNH customers: Geothermal Option (2008-2009) and Air Source Heat Pump Option (2010). For NHEC customers: High Efficiency Heat Pump.
[48] http://www.psnh.com/SaveEnergyMoney/For-Home/Homes-and-Renovations.aspx#Energy%20Star%20Homes

New construction programs for natural gas customers were offered by both gas utilities (National Grid and Unitil), but Unitil is not offering ENERGY STAR Homes in 2011. The programs are referred to as New Home Construction with ENERGY STAR by National Grid, and ENERGY STAR Homes by Unitil. Custom rebates are offered for a variety of heating and water-heating devices, as well as for home insulation.

Utilities provide an incentive for the cost of the ENERGY STAR rating fees for gas heated homes. Rating fees are typically less than $750 for a single family home and less than $500 per unit for a multi-family residence. Natural gas and electric utility providers in the territory of an ENERGY STAR home under construction share the costs of providing technical support and certification testing services.

Utility staff and HERS Raters recruit new projects, work to educate builders on the benefits of energy efficiency, and work with HERS consultants to ensure that national program standards are met or exceeded. There are approximately 17 HERS-raters statewide (including both individuals and about 10 companies).[49] Conservation Services Group, Inc. (CSG) is National Grid's sole rater for their ENERGY STAR Homes program in New Hampshire.

New Hampshire utilities have improved their program yield for the electric ENERGY STAR homes from about $0.08/lifetime kWh in 2008, to $0.03/lifetime kWh in 2010. Plans for 2011-2012 assume yields of about $0.11/lifetime kWh. Program yields can vary for a number of reason. Higher cost per lifetime kWh in 2011-2012 were expected as a result of the change to Version 3 of the ENERGY STAR Homes criteria and changes in New Hampshire's Energy Code, which will affect baseline usage. New construction programs in the gas sector had yields around $0.15-0.16 /lifetime Therm in 2007-2008. Plans for 2011-2012 assume yields of around $0.39/lifetime Therm.

The share of the total electric budget allocated to the ENERGY STAR Homes program is approximately 8%. The share of savings resulting from this program is between 2% and 6% of total CORE program savings.

Budgets, goals, and savings allocated to the residential new construction market segment across all four utilities are summarized in Table 4.11 and 4. 12.

Table 4.11. Budgets, Goals, and Savings for Electric ENERGY STAR Homes CORE Program

Year	Budget	Budget Spent	Lifetime Goal (kWh)	Savings Goal Attained	Participation Goal (# of homes)	Participation Reported
2008	$ 1,458,510	96%	2,686,115	689%	554	110%
2009	$ 1,362,346	86%	4,944,960	515%	512	94%
2010	$ 1,468,855	110%	5,649,141	850%	514	129%
2011 plan	$ 1,419,500	NA	13,347,700	NA	501	NA
2012 plan	$ 1,522,600	NA	13,575,800	NA	510	NA

[49] Ben Stephenson, Unitil, Personal Communication, 2011. Reference to RESNET or other reference might be more appropriate.

Table 4.12. Budgets, Goals, and Savings for Gas Residential New Construction CORE Program

Year	Budget	Lifetime Savings Goal	Reported Savings (Therms)	Participation Goal (# of homes)
2006-2007	$ 57,625	866,200	359,700	122
2007-2008	$ 52,267	648,300	340,000	89
2008-2009	$ 74,375	180,750	-	296
May 2009-Dec 2010	$ 118,072	53,950	211,480*	75
2011	$ 79,355	204,000	NA	30
2012	$ 89,769	231,200	NA	34

*Does not include savings in 2009.

Residential New Construction Program Results and Market Development

On average over the last three years, the ENERGY STAR Homes programs met the participation goals (111% of the goal) and budget goals (98%). The program consistently exceeded the lifetime savings goal (between 515-850% of the savings goal in 2008-2010). The goal for 2011-2012 was set higher than prior years' goals, but still lower than prior years' achievements (Figure 4.2). The transition to the new ENERGY STAR 3.0 criteria, which may initially reduce the number of qualifying houses, and the decrease in savings due to the implementation of new Energy Code (IECC 2009) baseline were factored into setting lower goals.

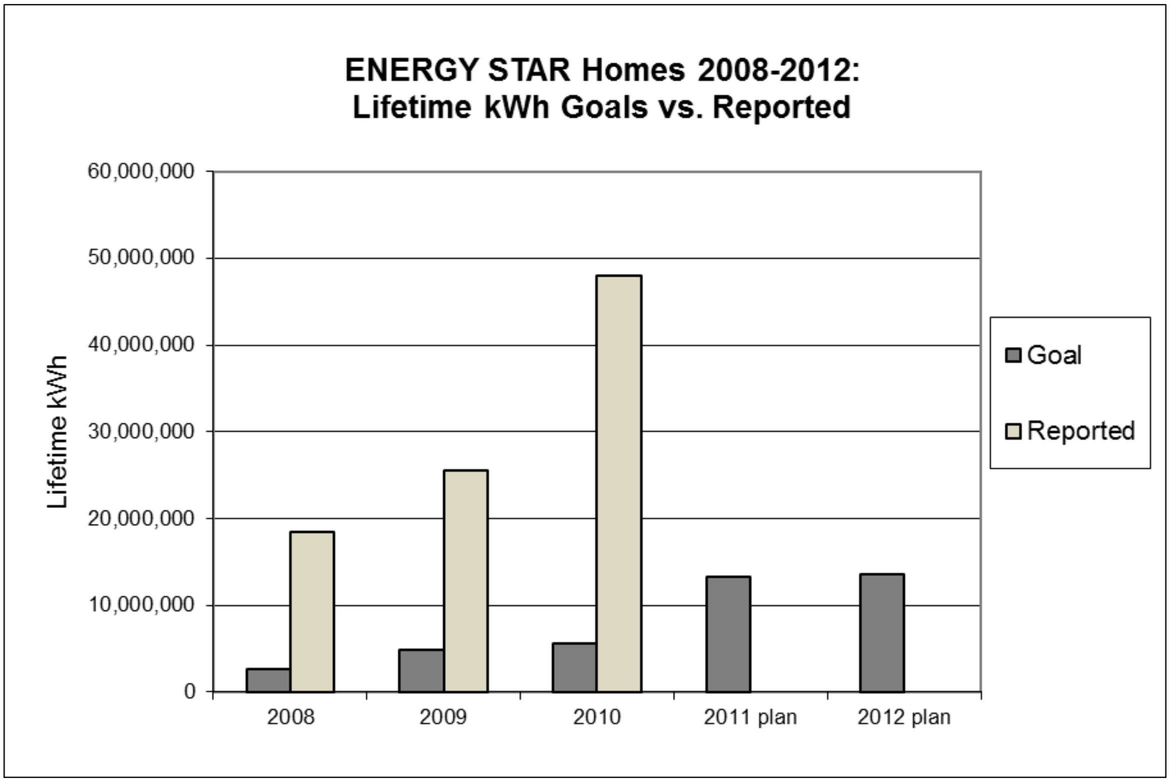

Figure 4.2. ENERGY STAR Homes Savings - Projected and Reported

Program participation has been relatively stable: 609 in 2008, 480 in 2009, and 664 in 2010. The market penetration rate for this program was approximately 18% in 2008 and 21% in 2009 (based on the number of ENERGY STAR homes build compared to the number of building permits filed for new residences).

Marketing activities for the ENERGY STAR Homes program consists primarily of direct outreach to builders by qualified home raters, home inspectors, and program administrators “throughout the state’s most active building regions” as stated by the National Grid 2011-2012 program filing. Many of the trainings are part of seminars such as Energy Code Training, Home Builders & Remodelers’ Association and Architects meetings, and utility contractor training sessions. It would provide an additional measure of program success if utilities reported participation in builder trainings. To assess the success of the trainings, it would help to have public documents report the number of participants and the conversion rate. More than 40% of new home construction occurs in the southern part of the state, the most active building region. While there are typically larger and more technically knowledgeable builders in more populated regions, many builders also build few homes annually, have a very small staff, use local subcontractors, and build specifically for a known customer. This makes reaching and influencing the efficiency decisions made by builders challenging and makes changes in standard building practices a comparatively slow process. An annual count of ENERGY STAR homes disaggregated by geographic location or between large and small builders would be helpful in understanding if the program is successful in addressing all segments of the market and in encouraging smaller builders to actively participate in the program. Understanding how well utilities partner with small builders may help understand how changes in different segments of the market will affect participation in the program.

Recommendations

- **Report the demographics of builder participating in programs and in trainings** in the annual CORE program filings

- **Continue offering builder and HVAC trainings** as the program transitions to ENERGY STAR 3.0

While the ENERGY STAR Homes program appears to be quite similar statewide from the customer's point of view, ENERGY STAR programs in NHEC and PSNH territories include a geothermal or heat pump option, while the other utilities do not. Therefore, the maximum incentive that a customer can receive varies throughout the state. Geothermal and heat pump programs offer high savings potential and high yield ($0.01-0.02/ lifetime kWh) but are expensive upfront for the customer. As markets evolve, new technologies providing additional savings can be added to existing programs. In addition, it would be beneficial to conduct in-depth evaluation of the savings and market development potential that could occur if the geothermal and heat pump program was offered as a CORE program.

Recommendation

- **Evaluate the potential for offering a statewide geothermal and heat pump program**

Statewide coordination between gas utilities programs is not as thorough as for electric programs. For example, Unitil does not plan to offer a natural gas New Home Construction-ENERGY STAR Homes program in 2011, due to the decrease in construction that occurred in the last few years.

Conclusions

A third-party, independent evaluation of the ENERGY STAR Homes programs for residential new construction in New Hampshire has not occurred for several years. Key program metrics that would allow administrators and others to understand the impact of the program on market development and transformation are not readily available (e.g. the number of builders enrolled, geographic distribution of participating builders and homes, number of new builders enrolled annually, number of repeat builders, etc.). While the program appears to be doing well - with market penetration around 20% for several years - regular program evaluation is advised to ensure the program evolves with the market (e.g. includes new technologies), that incentives are appropriate, and that the program continues to develop and educate the contractor market.

4.4 CORE Programs for Residential Retail Products[50]

Every year hundreds of thousands of light bulbs, lighting fixtures, appliances, personal computers, and appliances are purchased by New Hampshire residents. The majority of these transactions involve the replacement of existing products. Because some of these products have relatively short lives, replacements can occur frequently. Growth in these numbers comes from increases in population, new households and businesses, and trends in new housing toward more lighting and more appliances.

[50] Residential retail products programs are also referred to as market opportunity programs. Typically, such programs encourage the selection of higher efficiency equipment at the time of a purchase. Market development impacts can be relatively large when the focus is on lost opportunity markets.

Market Barriers to Increased Use of Energy Efficient Retail Products

A variety of barriers exist in New Hampshire (and many other jurisdictions) that limit customer awareness and investment in energy efficient retail products. These include, for example:

- **Lack of customer understanding and demand:** New Hampshire consumers must understand the benefits of energy efficient retail products, and request those products at the point of purchase.

- **Lack of motivation for retailers to sell the products:** Retailers must value and benefit from stocking energy efficient products and need to be confident there will be sufficient demand for the products once offered.

Goals and Characteristics of Successful Retail Products Programs

Typically, the goals of energy efficient retail products programs are to:

- Significantly increase the market share of high-efficiency technologies and products;
- Consistently identify new candidate efficient technologies and products; and
- Ultimately attain market acceptance of the technologies and products.

Experience with successful energy efficient retail products programs in other states indicates that information about the products should be on hand in the store and the products need be in stock and available for immediate sale and/or delivery. Suppliers' risk of stocking new products can be reduced by helping to create demand and providing training to sales people about the benefits of efficiency, the features of new technologies and products, and the ways stocking products can help differentiate a business from its competition.

A variety of strategies can be used to address market barriers including incentives, consumer education, and special events leveraging local festivals and other community activities. Incentives are most effective when targeted to address a specific situation or hard to reach market. For example, an incentive may be designed to significantly reduce the incremental cost of an expensive efficiency purchase to motivate a buyer as well as be used to reduce the risks to vendors associated with introducing new products with uncertain market demand.

Retail products are generally considered devices that are "plug loads" and therefore use electricity. This type of program is almost exclusively focused on reducing electricity consumption and could be better integrated with fossil fuel programs. However, certain products from Retail Products Programs (such as lighting products) are direct installed as part of Home Performance with ENERGY STAR programs.

Success depends on building strong relationships with retailers, manufacturers, and other key trade allies (e.g. buyer groups for independent appliance retailers). In rural sections of New Hampshire, special attention could be given to developing a network of local stores (such as grocery stores; drug stores; independent electrical, HVAC and building supply houses; and hardware stores) that stock efficient products. Circuit riders could recruit and retain retail partners to the program as well as provide training and support on new technologies. This service could also provide materials for retail promotion events, such as banners, informational signs, and interactive displays.

Retail products programs should also support the ENERGY STAR brand, U.S. Department of Energy (DOE) standards, and Consortium for Energy Efficiency (CEE) standards with the goal of a long-term development of residential markets by continuous expansion toward emerging technologies and products. An effort could be made to coordinate with similar programs throughout the region to take advantage of economies of scale and to negotiate more effectively with other players in the residential markets.

CORE Lighting and Appliance Programs

New Hampshire has multiple programs with various funding sources targeting the efficient retail products market. Program details are provided in Tables 4.13 to 4.16. Efficient products are also installed as part of HPwES, ENERGY STAR Homes, and HEA programs,

Table 4.13. CORE ENERGY STAR Lighting Program

Measures Offered	Eligibility	Key Characteristics
CFLs Indoor fixtures Outdoor fixtures LEDs	All residential electric utility customers for the rebate program. All residential and small business customers for the catalog and the online store.	Rebate is a point of purchase instant rebate Catalog price reflects rebate

Table 4.14. CORE ENERGY STAR Appliance Program

Measures Offered	Eligibility	Key Characteristics
Clothes washer Room AC Smart Power strips Refrigerators Room air cleaners	All electric utility customers	Rebate is a point of purchase mail-in rebate Smart Power strips: Catalog price reflects rebate

Table 4.15. Re-CORE ENERGY STAR Lighting Products Program

Measures Offered	Eligibility	Key Characteristics
ENERGY STAR Lighting Products	All electric utility customers	Additional funding for lighting program Coordinated with CORE programs

Table 4.16. Re-CORE ENERGY STAR Appliance Turn-in Program

Measures Offered	Eligibility	Key Characteristics
Second refrigerator/ freezer recycling program Room air conditioner turn in	All electric utility customers	The refrigerator/freezer turn-in program was offered through RE-CORE (RGGI) and remains open as a CORE program.

The CORE Lighting and Appliance Programs promote efficient lighting and appliances throughout New Hampshire. This coordinated effort between the four major electric utilities involves reaching agreement on many aspects of program design including rebate amounts, catalog design, and selection of the contractors who assist in delivering the program by providing circuit riders and incentive processing.

Efficient lighting is available at almost 150 local retailers (Figure 4.3). Instant rebate values are determined by the number of bulbs in the package and range from $1 to $7. Incentive levels are the same for standard and specialty bulbs regardless of wattage. Also available at local retailers is a $10 rebate toward interior or exterior fixtures and torchieres. Appliance mail-in rebates are available for ENERGY STAR refrigerators, room air conditioners, clothes washers, air purifiers, and smart powers strips purchased at over 100 appliance retailers (Figure 4.4). Instant rebate coupons require customers to provide their address and zip code. Because regulators and utilities seek to obtain customer level data, the CORE Programs have relied almost exclusively on in-store coupons. They currently account for approximately 90% of the transactions processed.

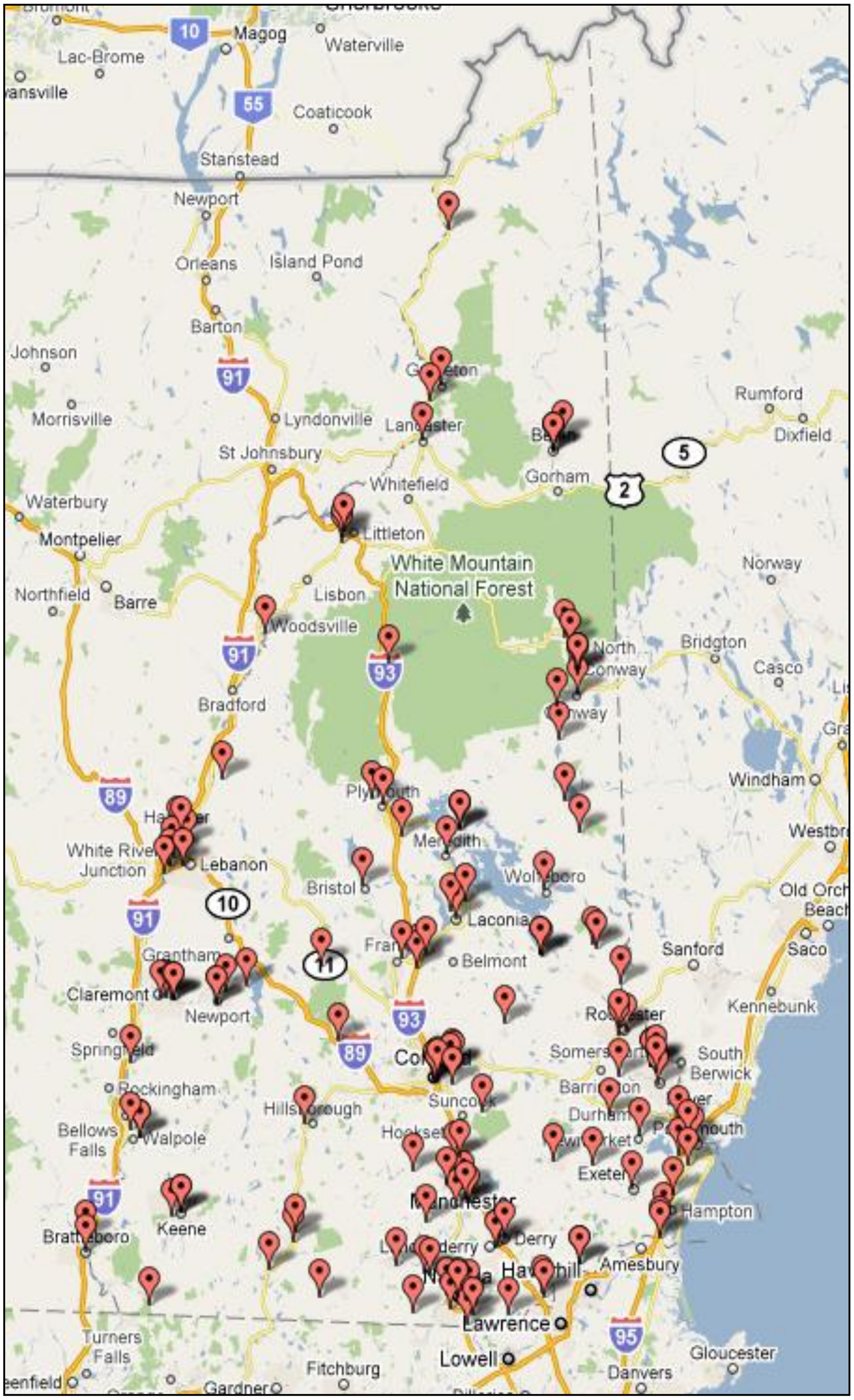

Figure 4.3. Map of New Hampshire Lighting Retailers Partnering with Utilities

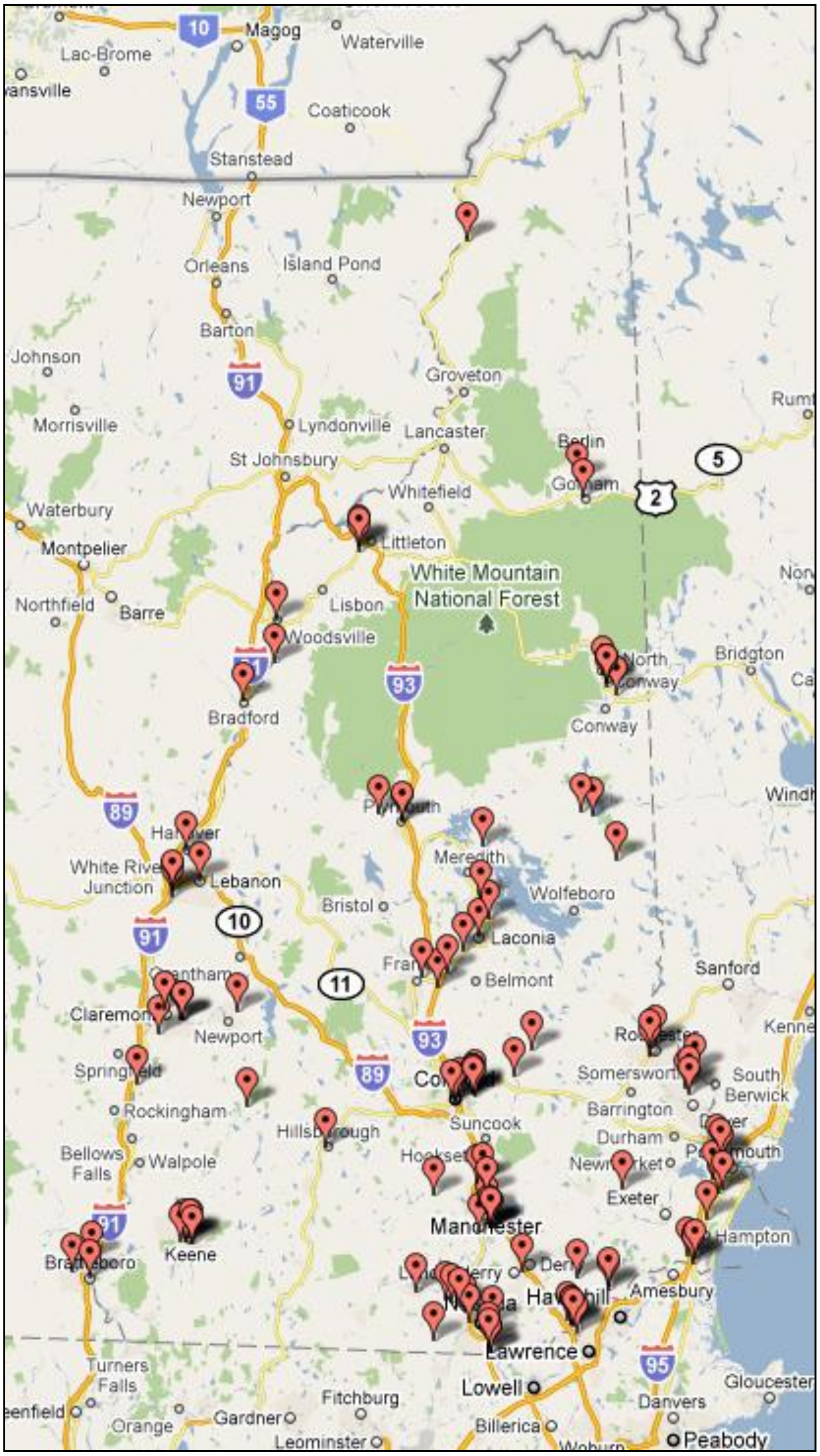

Figure 4.4. Map of New Hampshire Appliance Retailers Partnering with Utilities

The NHSaves catalog and online storefront (catalog.nhsaves.com) and the Energy Federation Inc. website (http://www.efi.org/) are additional resources available to help consumers select and purchase efficient retail products. The catalog is designed in collaboration with EFI and other utilities offering energy efficiency programs in the Northeast. The catalog pricing is offered at a discount and a variety of technologies and products are available including LED screw in bulbs and recessed can lights. Natural gas customers can purchase reduced cost thermostats through the catalog. The remaining 10% of the purchases are catalog sales. The intent of the catalog is primarily educational and also allows the utilities to promote new or higher quality technologies and products that may not be readily available at local retailers.

Room air conditioner turn-in events and refrigerator pick-up and replacement programs have been offered temporarily under the Re-CORE programs, funded by the Regional Greenhouse Gas Initiative. Some utilities have also received RGGI funds to supplement funding for the ENERGY STAR lighting program.

The State Energy Efficient Appliance Rebate Program (SEEARP) was created under the Federal Energy Policy Act of 2005 and received funding through the American Recovery and Reinvestment Act in February 2009. The New Hampshire program offered residential consumers rebates for the replacement of existing hot water heaters, boilers, and furnaces to more energy efficient models.

Outreach and marketing for efficient product promotions are offered through the NHSaves website[51] and utilities' websites, as well as through cooperative marketing with participating retailers and point of purchase (POP) material.

New Hampshire retailers participating in the Efficient Product CORE Programs are visited by circuit riders who help promote ENERGY STAR appliances and lighting by placing collateral materials in store and by training retail employees and customers about the features and benefits of ENERGY STAR qualified products. This service is contracted through the CORE program and has been provided since 2002 by Applied Proactive Technologies Inc. (APT) through contracts with the utilities. Mail-in and instant rebate redemption is done centrally for all utilities through EFI. The utility circuit rider updates displays and train sales staff on selling ENERGY STAR products. CORE program contractors recruit and retain participating stores and also process the rebates.

Program Results and Market Development

On an annual basis New Hampshire invests over $2 million dollars per year in the lighting and appliance programs to offset the incremental cost of more efficient technologies. Detailed program funding can be found in Tables 4.17 and 4.18.

[51] http://catalog.nhsaves.com/

Table 4.17. ENERGY STAR Lighting Program Budgets, Goals, and Savings

Year	Budget	Budget Spent	Lifetime Goal (kWh)	Savings Goal Attained	Participation Goal (# of products)	Participation Goal Attained
2008	$1,353,907	80%	90,063,602	125%	305,687	135%
2009	$1,339,352	79%	90,960,835	99%	300,201	110%
2010	$1,227,960	88%	83,772,187	101%	337,934	115%
2011 plan	$1,108,700	NA	53,216,200	NA	242,595	NA
2012 plan	$1,198,100	NA	62,427,900	NA	284,039	NA

Table 4.18. ENERGY STAR Appliances Program Budgets, Goals, and Savings

Year	Budget	Budget Spent	Lifetime Goal (kWh)	Savings Goal Attained	Participation Goal (# of products)	Participation Goal Attained
2008	$891,903	105%	16,667,155	141%	13,340	98%
2009	$889,198	112%	19,545,785	172%	12,720	104%
2010	$1,009,080	107%	21,527,031	154%	14,309	125%
2011 plan	$1,089,800	NA	26,222,900	NA	16,402	NA
2012 plan	$1,159,500	NA	28,834,200	NA	18,111	NA

The lighting appliance programs account for about 25% of spending on residential programs and about 85% of savings of the residential portfolio for first year savings.[52]

- In 2010 the yield of the lighting and appliances programs combined together was $111/MWh, with yields of $67/MWh for lighting and $335/MWh for appliances.

Goals for upcoming years assume that the cost per energy saved will be higher than what was historically reported:

[52] Average of three years of program results (2008-2010)

- In 2011, a combined yield of $171/MWh is planned, with expected yields of $108/MWh for lighting and $426/MWh for appliances.

- In 2012, a combined yield of $159/MWh is planned, with expected yields of $99/MWh for lighting and $412/MWh for appliances.

The appliance program has consistently exceeded goals for the 2008 – 2010 timeframe. The lighting program exceeded goals in 2008 but was very close to the targeted goals in 2009 and 2010.

Administrative costs for the programs are grouped in the utility filings into internal and external administrative, customer rebates/services, internal implementation, marketing, and evaluation. As reported in CORE Reports filed with the NH PUC, in 2010 the ENERGY STAR appliance program had about 78% of program budgets going to rebates/services and ENERGY STAR lighting had about 55% of budget going to rebates/ services.

The CORE program efforts to promote ENERGY STAR products have been a success in many ways. The state has a high market share of ENERGY STAR appliances relative to the Northeast states as well as the nation as a whole (Table 4.19). This high market share is consistent across all appliance types and shows that the program has set the foundation for adoption of new and emerging technologies.

Table 4.19. ENERGY STAR 2009 Market Share[53]

Appliance Type	New Hampshire Market Share	Northeast: Market Share	National Market Share
Air Conditioners	43%	40%	36%
Clothes Washers	56%	52%	48%
Dishwashers	78%	72%	68%
Refrigerators	35%	35%	35%
Water Heaters	2%	2%	2%

The current lighting rebate provides more incentive depending on the number of bulbs purchased as opposed to the types of bulbs purchased. The Energy Independence and Security Act of 2007 (EISA) requires increased efficiency from light bulbs and will push the "baseline" from incandescent bulbs to standard CFLs in the 2012 timeframe. Efficiency programs need to prepare the market to accept more efficient bulbs including specialty CFL and LEDs. By only differentiating incentive levels by the number of bulbs in a pack, a key aspect of moving the lighting market toward emerging technologies is being overlooked in New Hampshire. That approach to the market does not increase availability in stores, a key aspect of developing a wider array of technologies being stocked in New Hampshire retail stores. Specialty CFLs and LEDs have higher incremental costs which could be proportionally covered by increasing rebates amounts specifically for these products. Specialty CFLs and LEDs are available through the NHSaves retail catalog at a reduced price. LED downlights qualify for the fixture rebate and can receive a $10 incentive. Due to the high incremental cost of LED bulbs as they enter the market, a $1/bulb incentive will not be sufficient to support the rapid adoption of this technology. With the rapid development of the lighting market, changes in federal standards, and increased saturation of standard

[53]ENERGY STAR 2009 Market Share http://www.energystar.gov/index.cfm?c=manuf_res.pt_appliances

CFLs in residential buildings, it becomes necessary to develop promotions that include products for sockets that are not been well-suited for standard CFLs (e.g. dimmable, 3-way, reflectors).

Recommendation

- **Encourage specialty and LED bulbs and fixtures** to be carried in retail locations through NCP programs or other partnerships

The New Hampshire CORE programs have developed an extensive network of retail stores serving the lighting and appliance markets which provide instant rebates. A way for the CORE programs to reduce costs and increase participation would be to start developing relationships further up the supply chain from retail vendors to distributors and manufacturers. Decisions concerning efficient products are required all along the supply chain - the manufacturer must make decisions about what products to manufacture and the retailer must decide what products to stock and promote.

Negotiated cooperative promotions (NCPs, also referred to as "product buydowns"), in which manufacturers and retailers mark down the price of qualifying efficient product (for example products labeled Energy Star, to support recognition the national brand) would be an important next step for the CORE programs. With NCPs, the incentive is paid directly to the manufacturer or retailer who then reduces the mark-up on the product. With supporting marketing and Point-of-Purchase material, NCPs can be easily designed to encourage customers to look for the Energy Star brand. NCPs result in lower retail prices and also reduce the administrative costs to the program and the retailer. Free-ridership issues have been successfully addressed by program administrators in other states by incorporating free-ridership rates in the savings assumptions. All neighboring states have had NCPs for lighting for several years and customers driving from out of state to purchase lighting product in New Hampshire is not expected to a be a major issue. In any case, like free-ridership, program spillover, and leakage across state borders can all be incorporated into savings assumptions. Savings claimed by utilities running NCPs in other states incorporate spillover, leakage, and free-ridership assumptions that are in many cases publicly available. Some leakage is likely to occur across state borders in both directions, with some New Hampshire customers purchasing products outside of New Hampshire, compensating for out-of-state customers purchasing products in New Hampshire. With NCPs, stores do not have to handle any coupons, which is often more attractive to small and independent outlets, thereby further increasing the network of participating retailers. If the NCP system is adopted, there will no longer be coupons requiring address and utility company data, which is now used to attribute savings to individual utilities. Lighting and appliance rebate data have however been collected for several years and could provide a useful database on which to build a model for savings distribution and allocation between utilities and municipalities. Overall, the program should establish methods for developing measure level savings claims, free ridership rates, and spill over rates. These values should be re-evaluated frequently as the market changes and baselines shift.

Recommendations

- **Offer Negotiated Cooperative Promotions** (NCPs, also known as buydown or markdown) for lighting products

- **Account for free-ridership and spillover for products purchased through NCPs in the program savings assumptions**

Efficient appliances are qualified as ENERGY STAR if they contribute to significant energy savings while meeting consumer expectations for quality and performance. In addition to ENERGY STAR, products are rated by the Consortium for Energy Efficiency and tiered into "Super-Efficient Home

Appliance" bins. The CEE work leverages a common foundation for evaluation as does ENERGY STAR, but seeks to further develop the market by identifying appliances that exceed ENERGY STAR by 10 - 30%. ENERGY STAR recently implemented a "Most Efficient" label as a pilot in May 2011. That label could also be used in differentiating appliances by tiers without confusing consumers with additional non-ENERGY STAR labeling. In 2011, recognition of the most efficient products under this "Most Efficient" label will be available, on a pilot basis, for clothes washers, heating and cooling equipment, televisions, and refrigerator-freezers.[54] The utilities' prior approach of reducing the clothes washer incentive rather than implementing a tiered rebate structure does not lead to a push towards more and more efficient products and the development of the market for products with the best efficiency. As shown by Table 4.19, the market share of ENERGY STAR appliances is very high in New Hampshire, which indicates a market which is prepared for more advanced technologies. Programs that promote CEE tiers increase incentives over ENERGY STAR levels to cover higher incremental costs of premium efficiency equipment and realize more savings per unit, therefore increasing yields. A program would expect to have fewer units being processed through the program at first, so budgets would not necessarily have to be increased to move towards market development for more efficient product

Recommendation

- **Offer tiered incentives for appliances where the ENERGY STAR market share is already large**. CEE tiers or ENERGY STAR "Most Efficient" labels could be used to determine tiers.

Consistent with the rest of the nation, New Hampshire residents are purchasing more home-entertainment equipment, telephones, electronics, and home-office equipment than ever before and recent studies have shown that plug loads are moving towards a larger segment of electric use. Consumer electronics make up about 12% of residential electricity and 50% of miscellaneous electric load energy. The average household has 20 to 25 devices, with five or six of them consuming over 80% of the electricity. The number of consumer electronic devices in homes has increased ten times in the past ten years. Many of these new products use more electricity than the items they are replacing or feature power supplies that are not only inefficient but are continuously 'on.' Overall, there is an energy savings potential of about 50% by replacing the existing installed consumer electronics with currently available energy efficient devices[55].

Currently, the programs in New Hampshire provide incentives for "Smart Strips" which help reduce phantom loads of consumer electronics. However, this is the only item promoted to reduce electricity consumption in this growing market segment. Because there is little or no price premium for most efficient models of consumer electronics, promotions could be based on innovative marketing and customer education strategies rather than providing consumer incentives. Any program should explore promotion of computers, monitors, set-top boxes, and other electronic equipment.

Another market segment not represented in the portfolio of promoted technologies are pool pumps and pool pump timers. In other New England states with similar climates, pool pumps have been found to have significant net benefits and potential as an efficiency measure (e.g. Massachusetts, Vermont).
The existing design of the lighting and appliance programs could increase efforts in both consumer electronics and pool pumps and timers. Program expansion would rely on the existing network of circuit riders for recruiting participating retailers, training their staff, implementing special promotions and events, placing point-of-purchase material, and conducting periodic price and shelf surveys. The utilities

[54] http://www.energystar.gov/index.cfm?c=partners.most_efficient_criteria
[55] Efficiency Trends in Consumer Electronics. Presentation at Automated Home Management Experts Meeting by TIAX. October 1, 2009.

circuit-riders already perform some of these functions and their scope of work could be extended to additional products, services, and retailers.

Recommendations

- **Offer education and marketing campaigns for consumer electronics**.
- **Consider offering pool pump programs**. This measures screen in neighboring states and may be appropriate for the New Hampshire market.

Conclusions

Overall the residential program for retail products has been successful and offers a diversity of products in partnership with an impressive number of retail partners throughout the state. Educational material and specialty products are also available through a catalog and on websites, allowing access to a multitude of efficient products by virtually anyone in the state. Lighting programs have however not reached their full potential as there has been no upstream program in partnership with manufacturer and distributors. Appliance and consumer electronics programs offer incentives on a diversity of products but the programs could go further in promoting market transformation and promoting the most efficient and latest technology.

4.5. CORE Programs Residential Heating Ventilation and Air Conditioning (HVAC)

There are an estimated 592,000 housing units in New Hampshire with the majority of them having their own heating system.[56] If the useful life of heating equipment is 15 or more years, that means that about 30,000 units of heating equipment are replaced each year in the state. The choices made when replacing heating equipment are clearly long lasting. Most New Hampshire residents use fuel oil to heat their homes and air conditioning use, although still low relative to national values, is increasing throughout the state.

Market Barriers to Increased Use of Energy Efficient HVAC Equipment

A variety of market barriers exist in New Hampshire (and many other jurisdictions) that limit widespread sales and use of energy efficient heating, ventilating, and air conditioning equipment in residences. These include, for example:

- **Limited contractor network:** There is still a limited contractor network in the state that is familiar with high efficiency equipment and understands how the equipment (including ducts) should be properly sized and installed.
- **Small number of contractors and retailers actively marketing the equipment.** Since HVAC equipment is more complex than other household devices and products, such equipment is usually introduced to the customer as a product available through the contractor, who advises its use. Thus it is effectively “sold” by the contractor, rather than “bought” by a homeowner as if it were an appliance in a retail store; the customer does not typically visit a retail location to select HVAC equipment but rather discusses options with a contractor/ installer.

[56] Table HC11.4 Space Heating Characteristics by Northeast Census Region, 2005. 81% of homes in New England have heating unit used by one unit.

Goals and Characteristics of Successful HVAC Programs

Typically, the goals of energy efficient HVAC programs are to:

- Ensure contractors and consumers understand the benefits of high-efficiency HVAC equipment for all fuel types and applications;
- Provide consumer education that results in inquiries about high-efficiency HVAC equipment by customers when talking with contractors;
- Provide contractor education to emphasize "right-sizing" systems and the relationship of HVAC systems to whole-house weatherization;
- Ensure that high-efficiency equipment is readily available for all fuel types; and
- Leverage regional initiatives that target upstream market players.

Successful programs focus on developing a network of trade allies who are able to educate a homeowner to purchase a higher efficiency unit than they otherwise would have based on initial price. Unlike most efficient retail products which have an incremental cost of a few dollars, the incremental cost of higher efficiency HVAC equipment can be significant. This creates a more difficult sales environment for contractors who are trying to close the deal, win the job, and complete it with some margin for profit. Another barrier for the contractor, who wants to avoid call backs, is the issue of proper sizing. Contractors should be trained to properly size and install equipment.

There are several additional market channels to consider when designing an HVAC program. Equipment manufacturers are at the top of the chain followed by distributors, trade associations, and contractors. The program should also engage the major equipment manufacturers in some method of providing them an incentive payment to increase their sales of higher efficiency equipment. There are significantly fewer equipment manufacturers than contractors so reaching the upstream players to increase high efficiency market share of equipment to New Hampshire is a key issue in HVAC program design.

A statewide, coordinated approach to HVAC market development could lead to more effective and less costly:

- Contractor recruitment and outreach;
- Contractor technical and sales training support;
- Contractor collaborative marketing efforts;
- Setting and managing customer expectations, particularly relative to the quality of installation and the relationship to home comfort and performance;
- Benchmarking cost and savings;
- Consistent evaluation, measurement, and verification; and
- Enhanced offerings that include financing, advanced load controls, and others.

HVAC services should support the ENERGY STAR brand, Consortium for Energy Efficiency (CEE) tiers, Air Conditioning Contractors of America (ACCA's) installation specifications and North American Technician Excellence (NATE) and Building Performance Institute (BPI) certifications for HVAC contractors. An effort should be made to coordinate with similar programs throughout the region to take advantage of economies of scale and to negotiate more effectively with other players in the residential markets.

The technologies promoted should span all fuel types and HVAC equipment to include oil, natural gas, propane, fuel oil, electricity, and wood high-efficiency space heating and domestic hot water (DHW) equipment, as well as high-efficiency cooling equipment, including the following:

- **Gas and oil furnaces with efficient furnace fan**– when providing incentives, require both a higher AFUE than ENERGY STAR and an efficient furnace fan (electric commutated motor). **Boilers – when** providing incentives, require a higher AFUE than ENERGY STAR

- **Central air conditioning and ductless mini-splits**–higher efficiency equipment, properly sized according to Quality Installation Verification (QIV) standards.

- **Air source heat pumps**– for homes that use electric space heating and/or cooling, the conversion to air source heat pumps as a primary heating/cooling source can provide savings over electric resistant heat.

- **Electric heat pump hot water heater**– for homes with electric domestic hot water.

- **Wood and wood pellet furnaces and boilers**– for comprehensive, fuel neutral, program offerings.

Marketing should focus on educating the trade allies on the incentive program and available equipment. This would be done through a combination of in-person meetings, training, and mailed marketing packages. Given that many of the trade allies who sell and install heating and hot water equipment also install central air conditioning, a comprehensive and fuel neutral program structure would allow budgets to go further. Coordination with other programs including Home Performance with ENERGY STAR would also help increase program participation.

CORE GAS HVAC Programs in New Hampshire

Residential HVAC programs offered in New Hampshire are designed and managed by the gas companies and have changed throughout the years. The programs have modified their names and technologies offered over time. At this point in time, one program currently targeting the HVAC market in Unitil and National Grid territory. Technologies supported through the program are listed in Table 4.20.

Table 4.20. Natural Gas Heating and Hot Water Equipment Rebate Program

Measures Offered	Eligibility	Key Characteristics
High efficiency natural gas Furnaces with ECM Boilers Combined boiler and hot water heater units Indirect hot water heaters After-market boiler reset controls Programmable Thermostats	All gas utility customers	Mail in rebate; The rebates are designed to cover the incremental cost of energy efficient equipment for end of life equipment, not to cover the cost of replacing existing working inefficient equipment

The program is administered by the gas utilities. A third party (GasNetworks, a collaborative of natural gas companies serving customers in New Hampshire, Maine, and Massachusetts) processes the rebates. The program focuses exclusively on natural gas equipment and offers mail in rebates to consumers. The rebate form and supporting information are provided by contractors, supply houses, and found on line. GasNetworks is responsible for program education to residential customers, builders and contractors promoting awareness about the benefits of high efficiency technologies through training events in collaboration with the gas companies. Technical training for trade allies and contractors includes proper sizing, installation and maintenance practices for high efficiency equipment. Additional outreach and education efforts target building managers, engineers and architects at regional conferences, site visits and mailing.

Program Results and Market Development

In the past, the gas programs followed a different planning cycle than the electric CORE Programs. For 2010, both Unitil and Nations Grid shifted the planning time frame to align with the electric programs. Program budget and savings are summarized in Table 4.21.

Table 4.21. Natural Gas Heating and Hot Water Equipment Rebate Program Budgets, Goals, and Savings[57]

Year	Budget	Lifetime Savings Goal (Therm)	Reported Savings (Therm)
2006-2007	$411,996	2,879,185	4,994,380
2007-2008	$406,064	2,845,605	5,538,380
2008-2009	$491,334	2,978,725	6,344,834
May 2009-Dec 2010	$419,335	NA	NA
2011	$576,423	NA	NA
2012	$517429	NA	NA

GasNetworks provides services for the utilities providing outreach, training and rebate processing but only focuses on natural gas territory of National Grid and Unitil which serves approximately 18% of the homes in New Hampshire. There remains a large and untapped market of oil, propane, and wood users.

The program currently doesn't offer market services for central air-conditioning which would provide significant savings from this sector. The program could utilize the CEE three tiers of efficiency to design rebates. The core programs could leverage regional initiatives that have already developed relationships with manufacturers and distributors to bring high efficiency equipment to New Hampshire. Customers

[57]Based on information available in annual efficiency program filings

that qualify for the HPwES program may be eligible for a HVAC rebate through that program if that measure is recommended as part of the HPwES audit.

Recommendations

- **Expand heating technologies promoted across all fuel types including oil and wood.** The program should expand to offer services throughout the state and across all fuels, including oil and wood for heating. Central air conditioning, ductless mini-split system heat pumps (mini splits) and duct sealing should be included in an expanded program.[58]

- **Offer training on proper sizing and quality installations** for the additional technologies/ fuels at the same time as the new program is launched.

- **Expand program to include cooling technologies and include contractor training** on proper sizing and quality installations

- **Continue regional coordination (similar to GasNetworks) to cultivate industry partnerships.** This is an important strategy to continue to cultivate industry partnerships throughout the supply chain for the new technologies promoted.

Conclusions

Under the current structure, a HVAC program offered by New Hampshire's utilities addresses the natural gas market. Other fuels, such as fossil fuels and woods would benefit from a similar efficiency program. As mentioned in Chapter 3, a stable funding mechanism for all fuels, or a long-term fuel neutral program would need to be implemented.

4.6. CORE Educational Programs

This section provides an overview of educational programs funded by the System Benefits Charge and offered through the CORE programs. While other educational programs are offered in New Hampshire through other funding sources (e.g. RGGI, ARRA), those programs are discussed below. The general goal of education programs is to engage a range of market participants and address a variety of barriers across many markets. This is done by establishing key partnerships with individuals, businesses, households, institutions, organizations, and communities engaged in activities that cross defined market boundaries. A key component of the development of robust energy efficiency markets in New Hampshire is creating a network of informed service and product suppliers. This goal can be met not only through traditional marketing material, but also by organizing conferences and trainings, providing education programs in schools, organizing community-based energy projects, coordinating Energy Code activities, etc.

Generally educational programs (in New Hampshire and elsewhere) may include a wide range of programs and program designs, for example:

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[58] According to the U.S. Department of Energy, mini-splits "make good retrofit add-ons to houses with 'non-ducted' heating systems, such as hydronic (hot water heat), radiant panels, and space heaters (wood, kerosene, propane)..." For more information, see http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12630.

School educational programs may include programs such as:

- Science-based classroom presentations and teacher training on electricity, energy efficiency, and renewable energy
- Collaborations on student-based projects that deliver near-term electrical savings
- Energy efficiency information distributed to students, who then bring home materials and ideas, educating their parents
- Leveraging interactions with students to promote efficient products and generate subsequent savings in both the residential and business sectors

The Energy Code may be promoted through direct training of trade partners during workshops and classes and through brochures. Assisting with code compliance through a resource center creates opportunities to influence residential and business market actors. Directing customer inquiries to a highly trained and well qualified call-in center can also be helpful in:

- Engaging in new construction projects early in the design process
- Offering an opportunity to inform designers and builders of energy code standards, advancing their knowledge and skills, and encouraging practices that go beyond code.
- Informing customers, design professionals, and trade allies about the direction of codes and standards development
- Ensuring that efficiency providers have an excellent technical understanding of baseline building practices, to better develop savings estimates for advanced building practices.

Community-based projects involve local businesses, schools, retailers, civic clubs, and the municipal government. These projects may address informational, financial, and product availability barriers all at once. The media attention and resulting awareness from events can also have lasting impact and may result in the building of lasting community infrastructure and increased public awareness of the benefits of energy efficiency. Involvement in community-based projects allows energy efficiency providers to:

- Educate the public about actions to reduce their individual energy use
- Secure energy savings in hard-to-reach markets
- Leverage additional resources
- Use the experiences of these communities to be a model for others
- Generate media focus on energy efficiency
- Community-based approaches may be used to target stressed utility distribution system areas

Many other education, partnerships, and training opportunities are available to promote the advancement of energy efficiency. An understanding of where education is most needed and a vision of how a particular mix of educational programs will advance the development of the efficiency market are paramount in determining what mix of educational programs are most likely to achieve the desired goals.

Through the CORE programs, utilities can have an active role helping communities and consumers understand their options for increasing energy efficiency, thereby helping the utilities meet their stated goals while also stimulating the local economy and helping to achieve state energy and climate change mitigation goals.

CORE Education Programs Offered by New Hampshire Utilities

A variety of educational programs are offered by New Hampshire utilities as part of their CORE programs. Some are directed at the residential sector while others are directed at the commercial and industrial sector. They are discussed jointly, below, consistent with the way information on the programs is filed by the NH PUC. Information on the CORE educational programs is presented in this Chapter since a majority of the funds are directed at K-12 energy education that would most likely be educating residential energy consumers. CORE educational programs include:

- **Energy Education for Students in Grades K-12**
- **Energy Code Training Classes**- (every year since 2002) for builders, architects, engineers, designers, contractors, building science students, and code officials; workshops are free. As part of the Energy Code training, the utilities have incorporated a "beyond code" component that highlights the opportunities for more efficient equipment (ENERGY STAR Homes, C&I New Equipment & Construction Programs). CORE Program Administrators, Account Executives, Energy Service Representatives, and several engineering firms are available to provide technical assistance for customers with Energy Code assistance needs.
- **Collaborative Seminars** (2008 and 2009): partnerships with trade allies to encourage and sponsor energy efficiency seminars and presentations for New Hampshire businesses
- **Commercial Energy Auditing Class** (Included under CORE educational programs in 2010, under C&I educational programs in 2011 and 2012)
- **C&I Customer Education**

Success of these activities is based on customer satisfaction as assessed via informal feedback from instructors and participants as well as customer satisfaction surveys. Educational classes are presented by industry specialists.

Educational program funding has fluctuated between $171,000 and $233,000 over the recent years (Table 4.22), however the actual budget spent has declined from 2008 to 2010 (Figure 4.5). The percentage allocated to each program has increased for Energy Code Training from 8% to 24% of the total Educational Program budget. The share of the budget attributed to C&I customer education and Energy Education K-12 has remained relatively constant (Table 4.23). The budget actually spent has decreased over the years and is now close to one-half of what was budgeted for 2010. The utilities do not report details on how each educational segment performed in their CORE program filings.

Table 4.22. Budget Allocated to Educational Programs

Educational Budget by Program	2008	2009	2010	2011	2012
Energy Code Training	$15,300	$15,800	$50,000	$40,000	$45,000
Collaborative Seminars/ Commercial Energy Auditing Class	$20,260	$20,760	$15,000	NA	NA
C/I Customer Education	$35,040	$35,540	$58,640	$31,500	$31,500
Energy Education K-12	$106,706	$108,291	$118,928	$102,393	$110,208
Total Budgeted	$184,451	$171,783	$233,073	$173,893	$186,708
Total Budget Spent	$204,216	$144,262	$131,160	TBD	TBD

Table 4.23. Share of Budget Allocated to Educational Programs

Percent of Educational Budget by Project	2008	2009	2010	2011	2012
Energy Code Training	8%	9%	21%	23%	24%
Collaborative Seminars/ Commercial Energy Auditing Class	11%	12%	6%	NA	NA
C/I Customer Education	19%	21%	25%	18%	17%
Energy Education K-12	58%	63%	51%	59%	59%
Total Budget Spent	111%	84%	56%	TBD	TBD

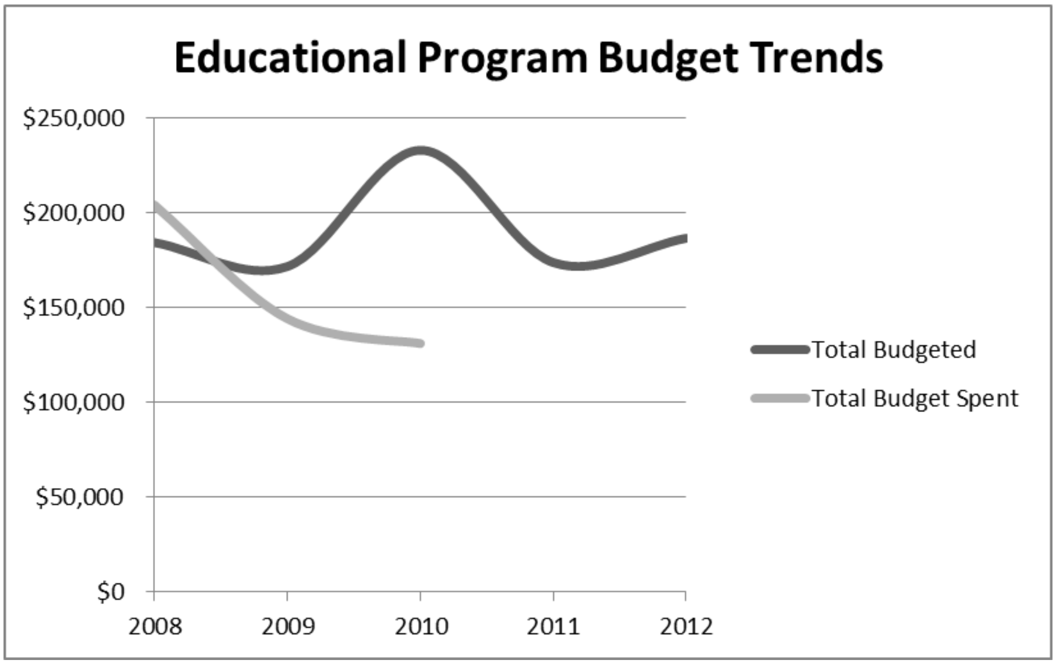

Figure 4.5. Short Term Trend in Educational Program Budgets

Additional educational programs are offered through websites, and through marketing associated with other CORE programs. Education and outreach of C&I customers occurs through several initiatives generally associated with CORE programs:

- CORE Utilities' program websites
- Training seminars for large commercial and industrial customers and service providers: for example: PSNH offered sessions on lighting, motors, HVAC, compressed air, and wastewater pumps, and a LED lighting seminar for vendors, installers, designers and customers that drew 230 people[59]
- Seminars and home shows

[59]Gil Gelineau of PSNH, May 11, 2011

- Outreach to energy service companies (ESCOs), third party service providers, electric distributors, manufacturer representatives, and specialty trade shows.

- Program marketing to leads generated from referrals to customer service or Energy Service Representatives

- Direct mail to small business customers in addition to other C&I marketing

- Marketing in the form of energy awards (offered by some utilities). For example, PSNH offers an Energy Rewards Program, with an annual bidder's meeting for all large companies interested in participating.

- PSNH has a C&I education program in which they partner with up to five customer groups to provide focused education to members on energy efficiency technologies and opportunities available in NH. Format for this program is intentionally left open to accommodate a wide range of proposals. For examples, PSNH has partnered with the New Hampshire Restaurant and Lodging Association to provide a series of webinars on energy issues and sustainability. Funding for this program has been consistent at around $30,000, but the budget actually spent has varied ($20,000 in 2008, $35,000 in 2009, $14,000 in 2010).

Gas utilities do not report a stand-alone educational program similar to the electric utilities' Educational CORE Program. Gas utilities offer education through many of their efficiency programs, such as their website, brochures, direct mail pieces, bill inserts, educational literature, call-center trainings, etc. Gas utilities also offer trade ally training, especially through GasNetworks. The budget for the trade ally training program is included within each program's budget. Additional education is delivered through events as they present themselves: through personal contact at home shows, trade shows, community events, landlord events, new homeowner workshops, energy information fairs, and energy. In the future, utilities plan to continue offering the Building Operator Certification (BOC) sessions. For example, the CORE utilities sponsor a Building Operator Certification (BOC) class that meets for eight sessions. This BOC class has been offered once or twice a per year for the last three years and includes a segment where the attendees must put together a proposal for an efficiency project and present it to the class as though they were going to present it to the management of their own company.[60]

Additional educational opportunities should also be explored, such as active collaboration with community-based energy projects, which have been demonstrated to be effective in leveraging external funds and in reaching a large a diverse segment of the community. Several Local Energy Committees have been formed throughout New Hampshire and teaming up with them could prove to be a highly effective targeted strategy. While utilities have worked with cities, towns, PAREI communities, and local energy committees, the extent and results of this effort cannot be teased out of the annual reports. Therefore, the success of these initiatives cannot easily and regularly be evaluated.

Recommendation

- **Continue collaborating with community-based energy projects** and local energy committees and report on the success of these collaborations.

[60]Gil Gelineau of PSNH, May 11, 2011

Investing in Energy Code education is very important and New Hampshire utilities offer a program that covers trade ally trainings. In addition to direct training in the form of classes, opportunities such as partnerships for the further development of the on-line training center, and the greater involvement of utilities as a central resource for energy code related questions could be investigated.

Recommendation

- **Invest in Energy Code training and education.**

Program Results and Market Development

The success of educational programs offered as part of the utilities CORE programs is difficult to assess. The utilities' measurement of success is reported to be evaluated based on customer satisfaction. While customer satisfaction is important, other metrics could be reported to indicate how well programs are reaching their targeted market. Success could be evaluated in terms of the number of participants reached, number of seminars presented, number of hours of school educational programs delivered, number of builders and contractors following building code training, etc.

Recommendations

- **Report in more details in the annual filing how the educational budget was spent.**

- **Define success of each CORE educational program in term of metrics that can be reported and tracked.** This is necessary to evaluate the success of each educational program against well-defined goals and to adjust program design if market transformation goals are not being achieved.

Several of the residential programs reached their targeted participation and programs seem to be advertised sufficiently to reach that goal given the incentive level. Generally, the residential markets could benefit from more general consumer education which will further development of the demand for efficiency products and services in the long-term. More specifically, marketing and outreach to residential customers may benefit from strong emphasis on the benefits of improving home comfort and reduced energy bills.

Conclusions

New Hampshire utilities have developed educational CORE programs that are targeted to a range of key market players. In order for the educational programs to be most effective, it could be beneficial for the utilities to develop and report a clear vision for their educational programs as a whole, as well as report clearly defined short-term and long-term goals for each educational program.

It is recommended going forward more details be reported annually regarding the specifics of how educational budgets are spent, and on participation in each outreach program. There is no reporting of education and outreach at the project level in the CORE program filings. It is difficult to assess the success of the educational programs on an on-going basis if such information is not reported by all utilities in a single filing, as are other quarterly CORE program filings. Setting and reporting a long term vision and participation goals for these program are necessary for the evaluation of the success of the programs and continued progress toward market development.

4.7. Conclusion and Summary of Recommendations CORE Programs Residential Sector

Overall New Hampshire residents are well served by the utilities' energy efficiency programs. Programs have been designed to target each major residential market segment. Program implementation is a constant challenge that can always be improved and refined. Goals should constantly evolve as new technologies emerge and the market develops. While residential efficiency programs have done a good job of saving New Hampshire's residents energy and money, we have identified a few issues that should be addressed to encourage more rapid market development. Summarized below are the recommendations for the residential CORE programs discussed in more detail above.

Monitor and Revise Financial Incentives - Residential Existing Homes Market Segment, HPwES *Recommendation 4.1; Chapter 4.2*
• Reduce the maximum incentive level to make program dollars extend further through the year and to prevent "stop and start" market effects.
• Consider channeling appliances and fixtures rebates through the retail products program to increase the funds available through HPwES.
• Drive program participation through marketing, education, and through contractor incentives and salesmanship training.
• Drive participation in the program through education and a marketing campaign that more strongly emphasizes the benefits of improving home comfort and reduced energy bills.

Develop Contractor Market Further - Residential Existing Homes Market Segment, HPwES *Recommendation 4.2; Chapter 4.2*
• Clearly develop and state the long term vision to develop the contractor market.
• Transition to more open market model for contractor recruitment.
• Revise model to allow contractor prices to be dictated by the market.
• Offer more support to develop the contractor market, such as contractor incentives and salesmanship training targeted at selling energy efficiency measures.

Improve Reporting and Evaluation - Residential Existing Homes Market Segment, HPwES *Recommendation 4.3; Chapter 4.2*
• Report savings from the fuel-neutral pilot disaggregated by fuel types.
• Conduct evaluations of the HPwES program more frequently.

Improve Statewide Coordination Further - Residential Existing Homes Market Segment, HPwES *Recommendation 4.4; Chapter 4.2*
• Ensure that utilities use the same modeling software statewide.

Continue Adjusting for Market Change - Residential New construction Market Segment, ENERGY STAR Homes *Recommendation 4.5; Chapter 4.3*
• Continue coordination between gas and electric utilities.
• Prepare contractor market for ENERGY STAR Homes Version 3.0.
• Report the demographics of builder participating in programs and in trainings.
• Evaluate the potential for offering a statewide geothermal and heat pump program.

Offer Upstream Promotions for Lighting - Retail Products Program *Recommendation 4.6; Chapter 4.4*
• Transition lighting program to upstream incentives.
• Account for free-ridership and spillover in the program savings assumptions.
• Encourage specialty and LED bulbs and fixtures to be carried at retail locations.

Offer Tiered Promotion and New Product Promotions - Retail Products Program *Recommendation 4.7; Chapter 4.4*
• Promote CEE or ENERGY STAR "Most Efficient" appliance tiers.
• Expand technologies promoted to include consumer electronics and pool pumps.

Expand Residential Heating Ventilation Air-Conditioning (HVAC) Program *Recommendation 4.8; Chapter 4.5*
• Expand heating technologies promoted across all fuel types including oil and wood.
• Offer training on proper sizing and quality installations for other fuels.
• Expand program to include cooling technologies and include contractor training on proper sizing and quality installations.
• Continue regional coordination to cultivate industry partnerships.

Improve Reporting - Educational Programs *Recommendation 4.9; Chapter 4.6*
• Develop clearly defined short and long term goals for each education program.
• Improve reporting on continued collaborating with community-based energy projects and local energy committees.
• Invest in energy code outreach and education.
• Develop more thorough reporting and tracking of program success towards well-defined goals for Education programs.

Chapter 5: Commercial & Industrial Energy Efficiency CORE Programs Review and Assessment

5.1. Introduction

The commercial & industrial (C&I) sector in New Hampshire uses approximately 57% of all electricity consumed in the state, 22% of fuel oil use and 68% of natural gas use.[1,2] There are an estimated 36,000 businesses and industries in New Hampshire. For purposes of the CORE programs, C&I customers are generally grouped into two major categories. There are an estimated 1,400 Large C&I customers, defined by the electric utilities as customers with greater than 100 kW demand, and defined by Unitil as greater than 200 kW. The remaining 34,600 C&I customers are referred to as Small C&I customers, and are defined by the electric utilities as customers with less than 100 kW demand, and defined by Unitil as less than 200 kW.

Businesses and industries offer great opportunities for cost effective energy savings. Savings for commercial and industrial customers are typically less expensive on a dollar per megawatt-hour ($/MWh) or therm saved basis than residential savings. Because the scale of homeowner usage is smaller per household, and the hours of operation are normally less for household lighting and appliances than for business and industrial equipment, savings can generally be more cheaply realized in commercial and industrial projects.

In New Hampshire, the regulated utilities supplying electricity and natural gas are required to offer a range of energy efficiency programs services to their customers. Referred to as the CORE programs by Commission staff and others, these programs are designed to provide important energy savings benefits to both the utilities and their customers. Presented below is a description of the CORE efficiency programs currently offered to C&I customers in New Hampshire, as well as a review and assessment of the programs conducted for purposes of this study. The program assessment focuses on characteristics of the programs that are working well in meeting state policies and goals, and identifies areas in which even greater public and private benefit could be achieved through further program enhancements and modifications.

The discussion below is organized by the different market segments of the C&I sector that the various CORE programs are designed to serve. Those market segments include:

- C&I existing facilities (for small facilities);
- C&I existing facilities (for large facilities);
- Specialty retrofit programs (directed at certain types of businesses and industries); and
- C&I new construction.

The four major electric utilities serving New Hampshire administer and deliver efficiency programs to businesses and industries in the state. These include Public Service of New Hampshire (PSNH), National Grid, Unitil, and New Hampshire Electric Co-op (NHEC). Overall, the electric programs are well aligned among the utilities, with only minor differences in program design between utilities. For this assessment,

[1] In this report, the C&I sector is defined as all non-residential energy consumers in the state. This is consistent with the definition of C&I used by utilities in the state for their CORE energy efficiency programs.
[2] Energy Information Administration, State Energy Profiles: http://www.eia.gov/state/state-energy-profiles-data.cfm?sid=NH#Consumption

the electric programs are discussed as a group unless there is a reason for discussing one program from a specific utility.

The two major gas utilities serving C&I customers in New Hampshire also offer efficiency programs. These include National Grid and Unitil. The gas utility programs have been quite different from each other and from the C&I programs offered by the electric utilities. Beginning in 2011 and 2012, state regulators requested a move towards increased alignment between the gas and electric programs.

Energy efficiency programs offered to C&I customers by the electric utilities are discussed separately from the gas programs below. Unitil recently reported results for May 1, 2009 through Dec 21, 2010 which makes it challenging to compare the 20 month period contained in the report to other annual reports.[3] Previous gas filings were also reviewed by the study team. Information presented in the filings did not lend itself well to the review and assessment done for this study as the various programs did not directly align between utilities. Starting in 2011, the gas programs will better align with each other and with the electric programs.

5.2. Energy Efficiency Opportunities in the C&I Sector

Case Study: Southeastern Container - Bottle Manufacturer

Southeastern Container owns ten bottling plants throughout the United States, and makes plastic "PET" bottles in sizes from eight ounce to two liters for Coca Cola. In 2002, before the CORE programs were in place, the Hudson, New Hampshire bottling plant was the least cost effective plant of all ten plants in the nation (with cost effectiveness determined by the company based on dollars spent per liter of bottle produced). After embarking on an aggressive energy efficiency program, eight years later the New Hampshire plant now has the lowest cost per liter of bottle produced of all the plants and serves as a model for the company. John Fischer, the general manager of the Hudson plant, is now the Sustainability Team Chairman for all ten plants nationwide and shares what they have learned in New Hampshire with company personnel.

The story of this New Hampshire bottle manufacturing plant is an example of how efficiency programs can contribute to a state's economic vitality by making business stronger and more profitable. A plant that is producing bottles most efficiently and inexpensively, and helping plants in other states to save money, is not as likely to face cutbacks or even a possible closure during economic downturns.

The C&I sector includes a wide range of businesses and industries, ranging from small "Mom and Pop" general stores to large manufacturing plants with hundreds of employees. A primary purpose of a business or industry is to make money, and improving efficiency is an excellent way to become more profitable. Profitable companies stay in business and continue to provide economic benefits to the community and the state. By participating in an efficiency program, a business can increase its profit by using less energy per unit of production, and therefore become more competitive. The New Hampshire bottle manufacturing plant provides a good example in the case study above.

[3] 2009-10 Unitil Gas report.

Designing and delivering effective energy efficiency programs to this sector provides both challenges and opportunities. In addition to typical electrical usage, lighting, and heating, ventilating, and air conditioning (HVAC), a manufacturer usually has specialized equipment required for the manufacturing process. The manufacturer probably also has different patterns and hours of usage than a general store, office building, school, wastewater plant, or ski area (for example) which also differ from each other. The ideal efficiency program serves every customer equally, offering technical assistance specific to each customer's needs. In reality, choices must be made about where to spend limited time, money, and other resources while both providing an acceptable level of service to customers and meeting savings goals cost effectively.

In general, the trend in C&I energy efficiency programs nationally is to:

- **Design programs around specific technologies and business types;**

- **Offer prescriptive services to smaller businesses** and business types that have similar energy use (such as a lighting retrofit program for retail stores, schools, and office buildings, for example);

- **Offer custom services to larger C&I customers** and customers who have highly variable energy use based on their type of operation (such as manufacturing plants, for example); and

- **Assign an Account Executive (or Key Account Manager) to larger C&I customers**. Because the energy savings potential is often quite significant among the largest C&I customers, having an assigned Account Executive for each customer enables a customized and personalized approach and can lead to significant energy savings for both the utility and the customer.

Market Barriers to Increasing Energy Efficiency in the C&I Sector

There are many market elements that must be in place for an efficiency opportunity to turn into a completed project. While each business has its own set of challenges, or barriers, the following list is typical:

- The customer must know about the efficiency program and what help it may offer;
- The opportunity must be identified;
- The opportunity must be quantified for savings and cost;
- Other benefits resulting from the opportunity must be evaluated (for example: a reduction in maintenance requirements or an improvement in light quality);
- The opportunity must be cost effective;
- Capital or financing must be available;
- The customer must have the time and motivation to make a decision and take action;
- Materials or equipment must be available in a timely manner to complete the project;
- Personnel must be available to install and properly commission the equipment; and
- Decision makers must be informed and convinced that the opportunity makes sense for their business.

Certain customers may face additional barriers due to the number of decision makers who must be involved. Examples include schools, wastewater plants, and local government where decisions must be made by the consent of multiple parties with different priorities.

Each element listed above is a potential hurdle or barrier that must be cleared. It takes just one hurdle to stop a customer, and for an efficiency project to stall or die. An efficiency program can and should play a part in all of these elements, especially in a new market. And as the market develops and matures, the efficiency program should be able to step back and play less of a role in each element over time, as the market performs more and more on its own, through direct private transactions.

Characteristics of a Well Developed Market

A well-developed C&I energy efficiency market features the following traits:

- **Customers are fully aware of the efficiency programs** and services offered by the utilities, and consult their utility representative with questions pertaining to efficiency opportunities and equipment purchases.

- Efficient **electric and gas equipment is readily available from vendors**, who are knowledgeable about the efficiency programs and products offered through the programs.

- Commonly purchased efficient **equipment can be purchased locally**, at competitive prices with limited or no paperwork or hassle for the customer.

- Because new equipment is periodically being introduced to the market, education and **incentives help offset higher incremental costs of emerging technologies**.

- **Incentive levels** are set at levels that leverage and maximize customer investment.

- **Utilities are appropriately incented** based on program results and measured savings.

5.3. Overview of Energy Efficiency Programs for Electric Utility C&I Customers

A variety of energy efficiency programs are offered for small C&I electric customers in New Hampshire. The programs seek to inspire businesses and industries to modify or replace their current equipment and/or operations in order to save energy. A key challenge is to inspire customers to make a change, even though nothing is broken or necessarily in need or replacement for other, non-energy related reasons. As such, the customer must be convinced that a change will be beneficial in some way, or they will not act. A common adage in sales is that customers won't make a change or buy a product, unless they are in "pain" in some way. The belief is that eliminating pain is a strong motivator in closing deals. Energy savings alone may often not be enough to motivate a customer. If it can also be demonstrated that an energy efficiency improvement will eliminate a source of pain, then it is more likely a project will move forward. Successful C&I efficiency programs recognize this dynamic and work towards uncovering sources of pain, and then work with customers to provide solutions. Are there problems with poor lighting or air quality? A retrofit can solve those problems, and save energy as well. Are there quality control issues because of fluctuating compressed air pressure? Fixing air leaks and eliminating inappropriate uses of compressed air can solve those problems, and improve the profitability of the company. Successful C&I efficiency programs must not only overcome market barriers, but must align the program with the needs of customers. Quite often it is not energy savings that sell a project, but other benefits.

5.4. Retrofit Program for Small C&I Electric Customers

The Small Business Energy Solutions Program directed at small C&I electric customers in New Hampshire offers an audit (at no charge) to look for opportunities for energy savings using the following technologies:

- Lighting;
- Occupancy sensors;
- Programmable thermostats;
- Controls, fan motors, and economizers for walk-in coolers;
- Photocells for outdoor lighting and time clocks (for National Grid customers only);
- Electric hot water; and
- Custom projects.

The result of the audit is a report that details recommended retrofit equipment, energy savings, incentives and project costs. PSNH specifies that projects can be completed either by an approved contractor or by a contractor of the customer's choosing. The four utilities offer slightly varying rebates:

- Up to 50% for PSNH customers using PSNH's contractor;
- 50% for NHEC customers;
- 50% plus 50% financing for National Grid customers;
- 50% for Unitil customers.

Custom projects identified through the audit are eligible for rebates by all four utilities. PSNH calculates incentives for custom projects on a case by case basis, but the website offers offers up to 35% or one year payback for a PSNH approved or customer contractor.

Outreach and leads that precipitate audits come from a variety of sources. There are a few Energy Service Representatives who work directly with the customers, mainly as a result of referrals from calls to customer service or utility technical assistance. Other leads come from the utility websites or referrals from a range of trade allies such as tradespeople, ESCOs, and equipment distributors. The utilities also do some direct mailing of NHSaves catalogs; participate in trade shows, and energy fairs to further distribute catalogs. PSNH has a program to partner with trade organizations such as the New Hampshire Lodging and Restaurant Association, which is designed to both educate customers and bring in opportunities. The utilities also hold a number of other training sessions on topics such as LED lighting, motors, and compressed air.

Program Results and Market Development

The Small Business Energy Solutions Program accounts for about 16% of the total statewide efficiency budget, and accounts for about 15% of lifetime savings. This program serves an average of 676 participants annually (2008-2010 average; ranging from 583 participants in 2008 to 764 participants in 2010**).** The range of program yields are summarized below:

- For the program overall, the yield is $0.025/ kWh lifetime savings.
- For PSNH, the program yield is $0.023/kWh lifetime savings.
- For Unitil, the program yield is $0.029/kWh lifetime savings.
- For NHEC, the program yield is $0.043/kWh lifetime savings.
- For National Grid, the program yield is $0.054/kWh lifetime savings.

The Small Business Energy Solutions Program as a whole typically meets goals for savings and participation, and uses nearly all the available budget. PSNH has consistently met or exceeded their goal over the last three years. National Grid reduced their goals from 2008 to 2010 by 38%, and achieved one half of their goal in 2010. Presented below is a statewide summary of past performance as well as the goals for 2011 and 2012.

Table 5.1. Small Business Program Budgets, Goals, and Savings

Year	Budget	Budget Spent	Lifetime Savings Goal (kWh)	Savings Goal Attained	Participation Goal (# of units)	Participation Goal Attained
2008	$ 3,194,294	80%	105,895,911	105%	612	95%
2009	$ 2,938,614	98%	102,703,290	121%	528	129%
2010	$ 3,012,540	94%	113,157,177	99%	583	131%
2011 plan	$ 3,263,600	NA	113,538,200	NA	678	NA
2012 plan	$ 3,584,300	NA	117,850,100	NA	764	NA

This program budget shows increases for 2011 and 2012 of 8% and 19% respectively over 2010 levels. Actual participation in 2010 was 764 customers, or about 3% of the estimated total of 34,600 small businesses in the state. The goal for participation in 2011 is 678 customers, which is lower than actual participation in 2009 and 2010. The savings goal for 2011 is close to the 2010 goal and reported savings. The planned goals for savings and participation do not show an increase proportionate to the increased budget. As shown in Figure 5.1., savings and goals for this market segment have remained fairly consistent and flat over time.

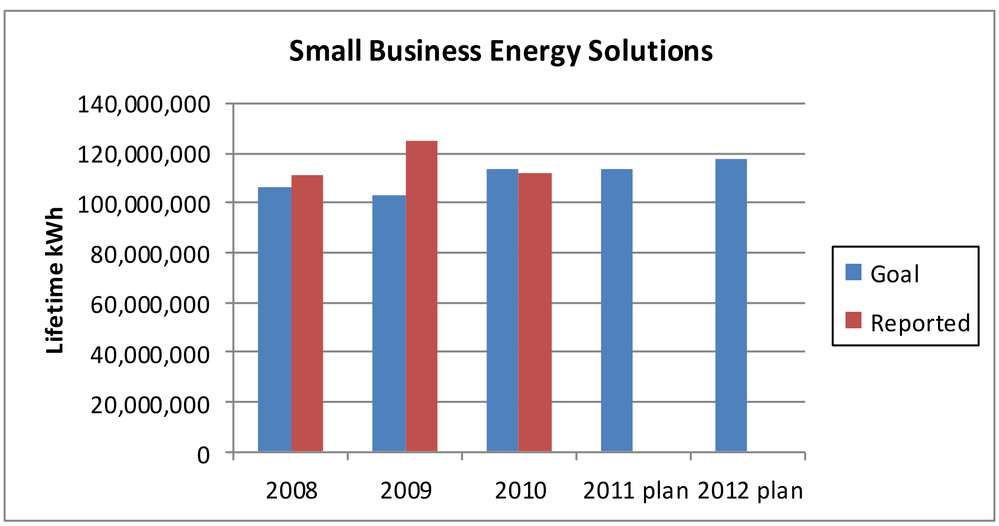

Figure 5.1. Small Business Program Goals and Savings

A survey of small C&I customers conducted in 2008 indicates 60% were aware of the utility energy efficiency programs, and 30% had participated.[4] A subsequent study reported the following:

- Retail establishments - 43% of customers were aware of utility programs;
- Grocery stores - 46% were aware;
- Health care facilities - 46 % were aware; and
- Restaurants - 80% were aware.

These figures indicate additional opportunities exist for increasing the awareness of and participation by small C&I customers in New Hampshire in energy efficiency programs moving forward.

Recommendations

Experience in other jurisdictions indicates the following program features can lower the cost per MWh of saving, while also stimulating participation:

- **Require pre-installation inspections or approval, or post installation inspections only as needed to verify questionable projects, as spot checks, or when such an inspection is probable to uncover further opportunities.** Such inspections and approvals prior to the project can result in delays, scheduling issues, and paperwork that become barriers to customer participation and add cost for the utility. Instead, inspections could be required only after the equipment has been installed, or on a percent of jobs completed once the market is mature enough to have qualified and experienced vendors and contractors.

- **Offer prescriptive rebates for a wider range of technologies and products.** Below are examples of cost effective programs offering prescriptive small business rebates beyond lighting, refrigeration, and thermostats. Most require random or representative inspections of installed equipment. Invoices are typically sufficient to claim an incentive.

    - **Southern California Edison:** Small business prescriptive rebates are offered for air conditioning, food service equipment, refrigeration, agricultural equipment, premium efficiency motors. The utility does random inspections.[5]
    - **Efficiency Vermont:** Prescriptive rebates are offered for compressed air, HVAC measures, VFDs for heating and cooling circulation pumps, HVAC fans, and motors. Efficiency Vermont also does random inspections.[6]
    - **Oregon Energy Trust:** Prescriptive rebates are offered for heat pumps, gas space and water heaters, insulation, refrigeration, cooking equipment, compressed air, data center measures. Oregon may require a post-install inspection if the incentive is over $5000.[7]
    - **Excel Minnesota:** Prescriptive rebates are offered for compressed air, cooling, data centers, controls, VFDs, motors, and re-commissioning. Studies and some measures require pre-approval.[8]

- **Clarify the role of contractors hired by the utilities**. The use of contractors hired by the utilities can be a barrier. Some companies and government entities are required by internal procurement rules to obtain more than one quote for a project, and to use the low cost bid, and

[4] Additional Opportunities for Energy Efficiency in New Hampshire, p. 53-54, tables 37 and 38.
[5] http://www.sce.com/business/ems/express_solutions.htm
[6] http://www.efficiencyvermont.com/for_my_business.aspx
[7] http://energytrust.org/business/forms/existing-buildings-forms.aspx
[8] http://www.xcelenergy.com/SiteCollectionDocuments/docs/ConservationProductSummaries-long.pdf

therefore see the involvement of a utility hired contactor as a sole source issue. New Hampshire State Government is one example of a customer who feels that their procurement regulations do not mesh well with the small business program.[9] If the use of the utility contractor is not required for implementation of the project, and the customer is free to put the implementation of the project out to bid and use the low bidder or a preferred contractor, then this flexibility needs to be effectively communicated by the utilities to the customers.

- **Provide targeted outreach by customer type.** Opportunities exist for implementing more proactive outreach to stimulate interest among small C&I customers. A marketing campaign targeted towards specific customer types and that presents a customized suite of efficiency opportunities for that customer type can be effective. Efficiency Vermont recently launched a marketing campaign directed towards small grocery stores and delis which is proving to be highly successful, for example.[10]

5.5. Retrofit Program for Large C&I Electric Customers

The Large C&I Retrofit Program offered by electric utilities in New Hampshire has a comprehensive array of offerings over a range of technologies. Custom incentives are available for all cost effective electric and natural gas saving equipment. Incentives for custom applications are the lesser of 35% of the total installed cost or buy down to a one year pay-back. National Grid pays up to 50% for custom projects due to market saturation in its territory.[11] Primary outreach to the large customers is provided by Account Executives working for the utilities. Additional outreach is through market actors such as energy services companies, engineers, architects, electricians, and equipment distributors and manufacturers representatives. A series of training sessions and seminars highlight various technologies and where efficiency opportunities exist. Prescriptive rebates are available for:

- Lighting conversions and controls;
- Energy efficient motors;
- Variable frequency drives (VFDs);
- LED traffic lights; and
- Air compressors and associated equipment.

Technical services include:

- Detailed electrical energy audits, including technology specific audits such as for lighting or compressed air systems;
- Selection of energy efficient equipment; and
- Educational programs and seminars.

Program Results and Market Development

The Large C&I Retrofit Program accounts for 18% of the total statewide energy efficiency budget, and 34% of lifetime savings. The program serves an average of 232 participants annually (2008-2010 average). It is the most cost effective of the C&I programs at $0.012 per lifetime kWh. Budget and savings goal projections show cost per lifetime kWh costs for 2011 and 2012 rising to $0.016/kWh. Historically, the savings have been 12% to 65% higher than the goals. The goals set for 2011 and 2012

[9] Karen Rantamaki, Personal Communication, May 5, 2011.
[10] http://www.efficiencyvermont.com/stella/filelib/GreenGrocer_2010_FINAL.pdf
[11] Footnote 18, page 39 of the 2011-2012 plan.

are lower than the 2010 goal by 11% and 9% respectively. The budget for this program is reduced from 2010 levels by 9% and 4% for 2011 and 2012, respectively. While the program has consistently exceeded its goals in the past, goals for 2011 are 26% lower than the actual 2010 savings claim.

Table 5.2. Large C&I Retrofit Program Goals, Budgets, and Savings

Year	Budget	Budget Spent	Lifetime Savings Goal (kWh)	Savings Goal Attained	Participation Goal (# of units)	Participation Goal Attained
2008	$3,234,760	103%	212,712,289	131%	195	129%
2009	$3,038,634	99%	165,209,310	165%	168	148%
2010	$3,421,767	90%	225,550,342	112%	277	71%
2011 plan	$3,110,400	NA	199,865,800	NA	203	NA
2012 plan	$3,289,800	NA	206,040,800	NA	213	NA

A survey in 2008 found that 86% of large companies were aware of the energy efficiency programs offered by the electric utilities, and 86% had participated.[12] The survey also identified those large customer types that were least aware of the utility programs.[13] These include:

- Retail establishments who were 60% aware; and
- Restaurants who were 75% aware.

The goals and reported savings for this market segment are summarized in Figure 5.2.

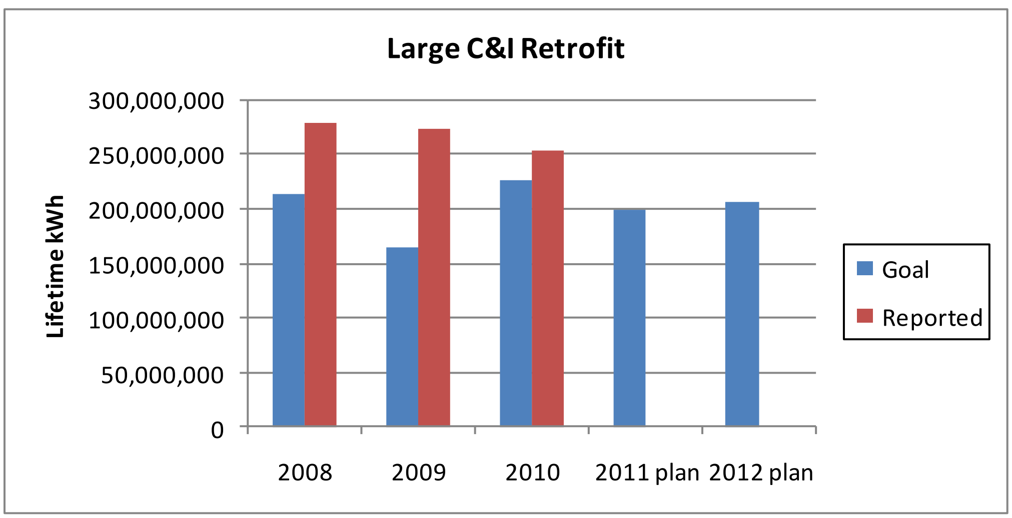

Figure 5.2. Large C&I Retrofit Program Goals and Savings

[12] Additional Opportunities for Energy Efficiency in New Hampshire, p. 53-54, tables 37 and 38.
[13] Additional Opportunities for Energy Efficiency in New Hampshire, Table 71, page 130.

Conclusions and Recommendations

The Large C&I Retrofit Program is working well overall, with satisfied customers and cost effective savings. This program overcomes a number of market barriers by providing an increased level of service through Account Executives. The Account Executives help identify projects, run payback and cost effectiveness calculations, assist with obtaining vendor quotes, provide information to help the decision makers make a decision, and assist with paperwork. The educational aspects of the CORE programs are also focused on topics of interest to larger customers.

Custom incentives currently are designed to pay for 35% of the project cost or provide as short as a one year payback. While this approach is certainly enjoyed by the C&I customers, it is not clear why incentives are being offered at this high a level. Anecdotal information from a few C&I customers indicates they typically consider improvements (of any type) that will payback in two to three years (after or without incentives). One customer suggested a sliding scale for custom incentives instead of a fixed percentage of the cost of the project. The as-low-as one year payback approach for the current programs may be more generous than needed to stimulate C&I efficiency improvements. In addition, setting the expectation that one should expect a one year payback before making an efficiency improvement could become a barrier itself over time if all projects end up being judged by this standard.

- **Increase the length of simple payback to 1.5 years or greater, or eliminate mention of simple payback altogether.** This program could be made even more cost effective by reducing incentive levels and increasing the simple payback to be longer than one year. For example, Efficiency Maine typically does not provide incentives for projects with a 1.5 year simple payback or shorter, or will only offer enough incentive to bring the project payback down to 1.5 years. Efficiency Vermont does not publish any payback criteria prior to making an incentive offer in order to prevent the establishment of expectations, and to move the conversation away from simple payback. Making customers aware of a gradual reduction in incentives over time may also create a sense of urgency for them to do projects sooner rather than later.

  - Customers may claim that they require a simple payback of one year or less to look at a project. This may be a negotiating strategy used to maximize the incentive from the utility. There may also be other persuasive ways to present a project that does not involve simple payback, but that will cause the project to happen with a lower incentive cost to the utility. Looking at cash flow, at the internal rate of return, or other financial metrics may be sufficient to obtain approval for a project from management. In fact, one customer specifically stated that they looked for a 22% return on investment or a 2.5 year simple payback to evaluate projects. Alternatively, looking at the costs to the company by not doing a project may also be persuasive.

- **Assign a single account executive to companies with facilities in multiple utility jurisdictions**. Reconsider the way businesses are assigned Account Executives. For example, the New Hampshire State Government has more than 500 locations or meters in multiple utility jurisdictions and is the largest electricity user in the state. The State is clear about who their Account Manager is with one of the utilities, but is not clear with the other utilities. And service to the customer is not coordinated across the utilities. This is significant. For any entity that is a significant electricity or gas company with multiple locations scattered throughout the state, it would be ideal to have one Account Executive assigned for all of the customer's accounts and assets to streamline the service and eliminate redundancy. This is not currently how it is done in New Hampshire. While it clearly could be a coordination challenge to provide seamless service for both gas and electricity to such large customers, and to claiming credit for completed projects, this is an area worthy of greater attention in the future.

- **Assign more Account Executives.** The Account Executive approach for informing and supporting large customers is an effective approach in general and seems to be working well in New Hampshire for most large customers. PSNH has seven Account Executives for approximately 1,200 large C&I customers. NHEC has two and National Grid has one Key Account Manager to support their customers in New Hampshire. Adding more Account Executives could help reduce the workload per executive, allow for increased focus and outreach for customers who are not as actively involved with the programs, and enable the ability to go after large customers who have not participated in the programs yet. While the salary of an Account Executive is significant, this program's cost effectiveness should be enough to justify the addition of more executives. Moreover, the value of an efficiency program is not measured solely in the quantity of incentives, but also in the value provided to the customer. By providing technical assistance to customers and helping to prevent costly energy choices, Account Executives can provide value to the customer in excess of what would be available in incentives had they not been hired. Most importantly, they can help prevent customers from making costly energy mistakes.

- **Set higher goals.** It is notable that although this program consistently exceeded goals for the last three years, the goals for 2011 and 2012 are lower than the savings recorded in the previous three years. This one program accounts for one third of all statewide savings. If the goals do not increase in this program, it is a significant indicator of a lack of future growth in statewide savings and increasing costs. This is in stark contrast to the general trend in efficiency programs to increase goals aggressively. A recent ACEEE paper lists a number of state programs that either show large planned increases in the depth of savings, or significant total accumulated savings over time. For example, Massachusetts plans to increase total electric savings as a percentage of sales from 1.4% in 2010 to 2.4% in 2012. Rhode Island plans to achieve similar numbers. Maine plans to increase electric savings from 1% to 1.4% from FY 2011 to FY 2013.[14] As the most cost effective electric program in the State of New Hampshire, the goals for the Large C&I Retrofit Program should be set higher than past performance, and the program should be funded to achieve those goals, if the state hopes to increase savings.

- **Increase the limit on the maximum term of an energy performance contract to be more than ten years.** New Hampshire State law limits the term of an energy services performance contract to ten years or less.[15] This reduces the availability of options to finance large capital projects for longer terms. A paper published by Lawrence Berkeley National Labs identified short contract terms as a barrier to larger, long payback projects such as chillers, boilers, or renewable energy systems. Other states allow longer contract terms and have seen greater activity. For example, Massachusetts allows a maximum contract term of 20 years, and New York allows 35 years.[16]

[14] Energy Efficiency Resource Standards: A Progress Report on State Experience, Figure 2,
[15] Title 1, Chapter 21-I:19-d (d)
[16] Berkleley Lab, Performance Contracting and Energy Efficiency in the State Government Market, Table 22

5.6. Specialty Retrofit Programs for Electric C&I Customers

Smart Start Program

PSNH offers a specialty program for local, federal, and state government customers referred to as the Municipal Smart Start Program. Municipalities may elect to finance all eligible retrofits so that no capital is required. PSNH provides rebates and capital for the equipment and installation. The capital is repaid by the customer through a monthly charge on their bill. The monthly charge is calculated to be less than the calculated monthly energy savings, so the project stays cash flow positive.

NHEC offers a commercial version of the Smart Start Program, which has the same terms as described above, and is offered to businesses in addition to municipalities.

The Smart Start programs run by NHEC and PSNH used 21% of their budgets in 2010. Budgets and participation have declined since 2008. In 2010, no NHEC customers participated in the program, and 32 PSNH customers participated. Although the number of participants has declined, municipalities in PSNH territory are financing larger projects through the program. The average amount financed increased from $13,800 in 2009 to $23,600 in 2010. PSNH currently has a six month waitlist of customers who would like to finance projects but the revolving loan fund is fully committed.[17] The utilities impose a 5% bad debt fee on Smart Start Loans.

Recommendations

- **Fund the Smart Start Program so that there are adequate funds to meet demand.** Reconsider the bad debt fee, as that is viewed by some as a barrier to program participation. Consider whether state regulation RSA 374:61 (which reinforces the ability of the utilities to finance energy efficiency and renewable energy investments through on bill financing) could be implemented in some way.[18]

Energy Rewards Program

PSNH runs the Energy Rewards Program, which was also known as the RFP Pilot previously. For this program, Large C&I customers bid for incentives by putting together a proposal for a project and request an incentive. The customer must demand at least 350 kW to participate. The size of the proposed project must exceed 100 MWh and the cost of the project must be greater than $150,000 to qualify. The budget for this program is about $500,000 each year. Companies are selected as winners based on a number of criteria including project cost, the percentage of incentive requested as compared to project cost, the benefit to cost ratio, and the comprehensiveness of the project. Unsuccessful bidders can seek to fund their projects through the regular CORE programs.

Usually 20-30 companies attend the mandatory bidders meeting, about six to twelve companies submit bids, and between two and four companies are awarded incentives. This program has served nine participants in three years (four in 2008, two in 2009, and three in 2010). Company requests have ranged from 10% to 59% of the project cost in incentive money as part of their bid, with an average request of 41%. The program averaged about 5% of the C&I lifetime savings during 2008-2010.

One intent of the program is to enable very large, comprehensive energy efficiency projects. Another is to see what the market will bear for incentives. In other words, the low incentive bid wins. Average cost has

[18] http://www.gencourt.state.nh.us/rsa/html/XXXIV/374/374-61.htm

been $0.017 per kWh lifetime savings. Budget and savings goal projections show cost per lifetime kWh for 2011 and 2012 staying the same. Overall the budget declines 6% in 2011 and increases 2% over the 2010 level for 2012.

PSNH's Energy Rewards Program was designed to foster competition for incentive money. The theory is behind the program design was that competition would drive incentive levels down, and inform the setting of incentive levels in other programs. However, it does not appear the first three years informed other incentive levels as anticipated. The average bid has requested incentives of 41% of the cost of the projects. This is higher than the standard 35% incentive levels offered by the C&I programs. In other words, it appears the bids are influenced by and are reflecting the programs, instead of the RFP bids informing and perhaps justifying lowering the programs' incentive levels.

Recommendations

- **Increase competition by limiting awards**. While there are other important benefits to this program, such as the completion of more comprehensive projects, one way to continue progress towards the intent of reducing incentives is to increase the level of competition. This could be done by holding the budget at its current level and limiting the number of awards to the best one or two proposals. Any money not awarded could be rolled into the Large C&I program, which is a more cost effective program. By limiting the number of winners, this should drive the participating companies to provide more competitive bids.

5.7. New Construction and Market Opportunity Program for Electric C&I Customers

Whenever a business or industry builds a new facility, undertakes a major renovation, or needs to replace failed equipment, there are "market opportunities" for increasing their energy efficiency. New construction and major renovations also represent a rare opportunity to make changes to long life measures such as insulation and windows. Some equipment lasts a decade or less, but insulation and windows may be in service for multiple decades. Windows and insulation are difficult and expensive to retrofit, so maximizing efficiency from the start is critical. Decisions regarding these measures have a greater impact on energy consumption than shorter life measures.

In New Hampshire, the energy efficiency program designed to address this market segment is referred to as the New Construction and Market Opportunity Program. An important objective for new construction and market opportunity programs is to help customers overcome the first cost and perception of risk barriers. A combination of incentives and education is critical to success, as is engaging trade allies. If a customer does not have the option to purchase more efficient equipment, or is discouraged from doing so by a vendor who places doubt in the customer's mind, then no amount of incentives or education will be sufficient. Coordination and involvement with the gas programs is also very important for this market segment.

In New Hampshire, the New Construction and Market Opportunity Program is open to both large and small customers. Custom projects are eligible for the lesser of 75% of the incremental cost or a one year payback. Custom incentives are available for any cost effective new electric and gas equipment. In addition to custom projects, there are prescriptive rebates for:

- Energy efficient lighting and controls;
- Energy efficient motors;
- Variable frequency drives (VFDs)

- HVAC equipment and chillers;
- Air compressors and associated equipment; and
- Commissioning.

Technical services include:

- Design reviews;
- Selection of energy efficiency equipment; and
- Educational programs and seminars.

Marketing and outreach methods include: Account Executives and Energy Service Representatives, vendors, ESCOs, and Economic Development staff working with new or relocating businesses. Some direct marketing may be used for specific measures or initiatives. The 2011-2012 Plan mentions that the building development community, real estate professionals, and town permitting offices are potential allies as well.

Program Results and Market Development

The New Equipment and Construction program accounts for about 14% of the total budget share, and lifetime savings are about 18% of the total. This program serves about 183 participants annually (2008-2010 average). Average costs for 2008-2010 is $0.018/lifetime kWh. Because of the variable nature of new construction and equipment purchases, the yields are really inconsistent from year to year within and among the programs. Budget and savings goal projections show cost per lifetime kWh for 2011 and 2012 rising to $0.023 and $0.024 respectively. The 2011 savings goal is set at 12% below the 2010 goal, and at 37% below 2010 claimed savings. The 2011 goal for participation is set at 173 customers, which is 19% lower than 2010 actual participation. Program budgets, goals, and reported savings are summarized in Figure 5.3.

Table 5.3. New Construction and Market Opportunity Program Budgets, Goals, and Savings

Year	Budget	Budget Spent	Lifetime Savings Goal (kWh)	Savings Goal Attained	Participation Goal (# of unit)	Participation Goal Attained
2008	$2,771,151	97%	108,803,809	152%	196	92%
2009	$2,587,328	94%	97,633,457	122%	151	134%
2010	$2,570,843	95%	104,493,385	141%	214	77%
2011 plan	$2,162,400	NA	92,278,800	NA	173	NA
2012 plan	$2,313,500	NA	95,601,800	NA	188	NA

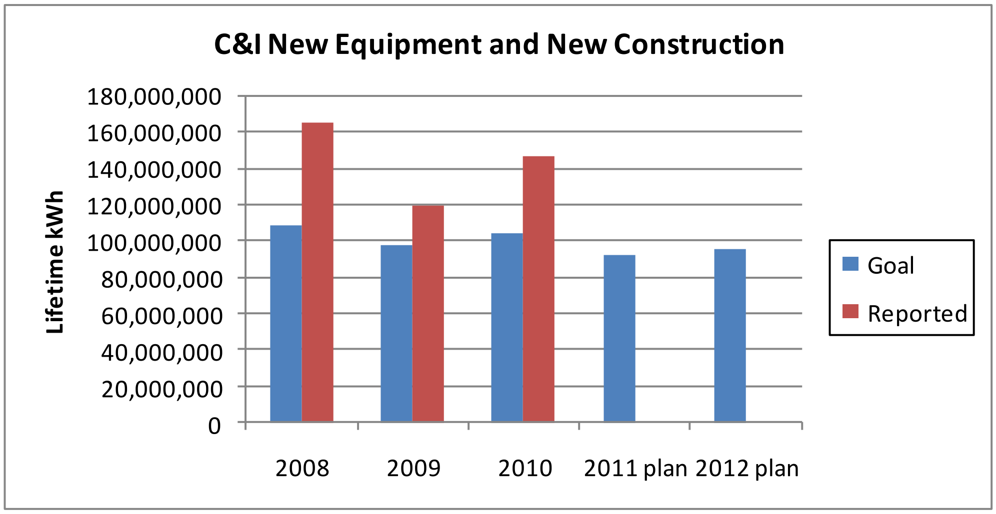

Figure 5.3. C&I New Construction and New Equipment Program Goals and Savings

It is encouraging that savings increased in 2010, indicating some rebound in investment after the economic crash of 2008.

Conclusions and Recommendations

The New Construction and Market Opportunity program is exceeding its goals. PSNH recognizes that education is a vital part of market development, and provides a number of seminars on various technical topics for the C&I sector. The programs require post inspections and preapprovals for most measures, and involve a fair amount of paperwork as part of the process. These inspection and preapproval requirements can be a barrier to projects and drive up the utility's cost of savings. Successful programs in other jurisdiction run prescriptive rebate programs that reduce the required paperwork and required inspections only after the equipment is installed, and sometimes just on random jobs.

- **Adequately fund the program to meet demand**. If preapproval is required to ensure that funds are available, then that is an issue best addressed on the funding side to ensure consistent funding for the program.

- **Track market transformation metrics**. It is difficult to assess the impact the program is having on market development overall. Information is not currently available for the number of vendors providing equipment, who is attending the various seminars provided, etc. Are there one or two vendors participating from year to year, or is the number growing over time? Are more architects and engineers participating in the programs? In order to recruit more trade allies, are there training seminars designed just for the vendors or for other market actors as well? Additional tracking and reporting about the program features would help assess its impact on market development overall.

- **Provide upstream incentives for commonly purchased equipment.** Upstream incentives reduce barriers for the customer, recruit the distributors as partners, and better capture market opportunity transactions. The customer just sees a lower price for efficient equipment such as lighting and HVAC measures.

5.8. Overall C&I Electric Program Conclusions and Recommendations

As a group, the utilities are meeting and exceeding their C&I program savings goals, sometimes by significant margins, while the budget spent is typically in the middle 90% range. The one notable exception is NHEC who achieved 40% of their lifetime savings goal and spent 56% of their budget in 2010.

Using the Navigant report as a basis for comparison, it is possible to assess how New Hampshire's programs performed in 2008 (the comparison year in the benchmarking study). 2008 is an appropriate year for doing such a comparison, because it was a good year for business as it was prior to the most recent economic downturn. This is reflected in New Hampshire's lifetime C&I savings claims which peaked at 597,500 MWh in 2008, and declined to 529,000 and 538,000 MWh for 2009 and 2011.

Dollars spent per lifetime kWh savings for C&I programs is very good for all NH utilities at an average $0.016/kWh. This is well below the Navigant Level 3 benchmarking for C&I programs at IOUs which was $0.028.[19]

Market Segments Not Specifically Addressed Through Current CORE Programs

Certain types of customers are hard to reach, and even when contacted, there are multiple barriers to completing efficiency projects. While New Hampshire is completing projects with all of these customer types, other efficiency programs have found that with additional targeted support and technical help, they can reach more of these customers. Below are some examples of what other programs are doing to overcome barriers and complete more projects. These specialized services are advertised clearly on the various program websites.

K-12 Schools: K-12 schools are an example of a customer that faces many difficulties. Schools use a diversity of technologies (lighting, HVAC, controls, refrigeration, kitchen equipment, and perhaps even pools or ice rinks) requiring expertise in many disciplines. The people charged with maintaining the school normally do not have experience with improving efficiency, nor is it normally a priority to save energy. The facilities people probably do not even see a utility bill. School budgets are typically tight, and obtaining funding for capital projects, assuming it passes the board's approval, can involve the voters in a bond vote. New Hampshire recognizes that schools face special challenges and has the Energy Efficient Schools Initiative that provides enhanced incentives, of up to 100% of incremental cost, for new construction and market opportunities. However, assuming there are many more existing schools than new schools, a retrofit program or initiative that targets schools to help them identify opportunities, quantify savings, overcome technical issues, navigate the financing barriers, and complete projects would serve New Hampshire taxpayers well. It would appear that the PUC's EnergySmart Schools program would meet some of these needs.

The New Hampshire Public Utilities Commission, in conjunction with the New Hampshire Department of Education, offers the EnergySmart Schools Program. It is not a CORE program. This program provides free benchmarking using the EPA Portfolio manager as the primary tool, as well as other metrics. Participating schools receives a report with the score for their building, how their score compares to New Hampshire schools overall, and recommendations and information for taking action to improve their score and save energy.[20] There may be opportunities for increased coordination between the utilities and this program, moving forward.

[19] Benchmarking of Vermont's 2008 Electric Energy Efficiency Programs, Table 0-4, page 11
[20] http://www.nhschoolbenchmarking.com/Default.aspx

Oregon and Wisconsin are two examples of states that provide additional help for schools. Wisconsin and Oregon provide a comprehensive package of support and resources for K-12 schools with a combination of free energy assessments and technical help, as well as grants, incentives, and loans for efficiency and sustainable energy projects.[21]

Water and Wastewater Facilities: Water and wastewater facilities are quite often the largest energy user in any municipality. Like with schools, there is typically a disconnect between the facility people who run the plant and who are primarily concerned with the process, and the clerk who pays the bill. Most people in government do not have water and wastewater expertise, and even fewer have specialized efficiency experience, so energy use is assumed to be a fixed cost and no one looks for opportunities for savings. Because water and wastewater are publicly funded like schools, all citizens benefit from reduced energy use in these facilities. A program or initiative that targets water and wastewater facilities to identify opportunities and overcome barriers would be beneficial to the citizens of New Hampshire.

NYSERDA provides a range of support and services to water and wastewater plants, including benchmarking, sub-metering, expert advice, and support for demonstration projects. They use a 10 step process to guide wastewater projects through to completion.[22] Their experience could help inform new program design in New Hampshire in the future.

Agricultural Programs: Some states also have specific agricultural programs to provide specialized support for this industry. Examples include initiatives that focus on dairy, poultry, irrigation, maple producers, and greenhouses. While farm programs can be expensive to run when compared to Large C&I for example, there are societal benefits as a result of supporting farms and farmers that can be enjoyed beyond energy savings. For example, supporting farms and other agricultural businesses can help preserve the character of New Hampshire, keep the food supply local, and increase tourism.

Farms use specialized equipment, and use standard equipment is unique ways. Wisconsin and Vermont have experts who can provide information and support specific to agricultural needs.[23] New Hampshire's Public Utilities commission is using RGGI funds to provide 25 audits to NH farmers, but the utilities are not involved this program. County conservation districts are acting as the facilitator between the farmers and the utilities. A more unified approach, with more utility involvement, could potentially result in more support for farmers and more savings.[24]

Multifamily Buildings: The multifamily housing market is difficult for a number of reasons. Multifamily buildings can be as small as a privately owned and owner-occupied duplex, or as large as a 100 unit condominium complex. Unlike with a business or a single family home, there is typically a gap between the tenant, who lives in the building and who pays the utility bills, and the owner of the building, who would be responsible to investing in improvements. This disconnect between who pays the utility bills and who pays for improvements makes it challenging for efficiency programs to engage with multifamily housing. The multifamily market is also unique because it is a mix of business and residential uses, and quite often is not adequately addressed by either a business or a residential program. In addition, there is usually a big difference in sophistication and resources between the owner of a duplex and the owners of a much larger building who may have full time maintenance staff, which also presents challenges to program design.

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[21] http://www.focusonenergy.com/business/schools-and-government/
http://energytrust.org/public-sector/incentives/Schools/equipment-upgrades/
[22] http://www.nyserda.org/programs/Environment/muniwaterwwt.asp
[23] http://www.focusonenergy.com/Business/Agribusiness/
http://www.efficiencyvermont.com/for_my_business/solutions_for_me/agriculture_and_farms/general_info/overview.aspx
[24] http://www.ensave.com/new-hampshire-farm-energy-audits.html

The NH Housing Finance Authority runs a Greener Homes Program, launched in early 2011, that addresses many of these barriers. NYSERDA runs a similar Multifamily Performance Program that is working well.

Unitil offers a multifamily gas program for buildings with four or more units. National Grid serves multifamily customers through their Energy Audit with Home Performance Program. For comparison, Efficiency Vermont uses a combination of the standard business and residential rebates along with special help in the form of specific residential rental property rebates.[25]

Recommendations:

- **Provide specialized, targeted services to select, hard to reach customers.** While the CORE programs work with all the specialty customers outlined above, more of a focus on these customers' specialized needs will result in more projects.

Payback Expectations

Customer concern over payback is the number one barrier for C&I customers for doing efficiency projects.[26] The New Hampshire utilities' response to this concern is to reduce the possible payback for projects to as low as one year, which is low when compared to other state programs. Experience in other jurisdictions indicates it is usually best to avoid discussion of simple payback whenever possible, because although it is a simple metric, it usually does not adequately describe the benefits of a project. The New Hampshire utilities should work to move the discussion away from simple payback. An alternative approach is to use Internal Rate of Return (IRR), life cycle costs, or cash flow as a standard by which to incentivize projects. Most companies do not require an IRR of 100% to invest in a project. Three large New Hampshire C&I customers interviewed for this report specifically stated that their threshold for moving forward on a project was: two years, 2.5 years or a 22% ROI, and three years.

Recommendations:

- **Transform the market by using metrics other than simple payback to define projects.**

Customer Satisfaction

According to a 2008 survey of New Hampshire energy efficiency programs, 94% of Small C&I Customers and 98% of Large C&I Customers who participated in a utility offered energy efficiency program would do so again if given the chance.[27] The large businesses stated that the programs were easy to access, and their Account Executive was helpful and responsive. Overall, the NH CORE programs are doing a great job with the customers they are serving.

Recommendations:

- **Continue to provide a quality service to existing customers while cultivating new customers.**

[25] http://www.efficiencyvermont.com/for_my_business/solutions_for_me/rental_property/general_info/overview.asp
[26] Additional Opportunities for Energy Efficiency in New Hampshire, table 41, p. 57
[27] Additional Opportunities for Energy Efficiency in New Hampshire, p. 57

Section 5.9. Overview of Energy Efficiency Programs for Gas Utility Customers

Commercial and industrial customers account for about two thirds of all natural gas use in the state of New Hampshire. There are approximately 15,700 C&I gas customers in New Hampshire, who spent approximately $203 million on natural gas in 2009. There are no natural gas producing wells in the state, so the majority of the money spent on natural gas is exported out of state. Commercial use has been increasing, whiles industrial use has been decreasing. Residential use has been flat.

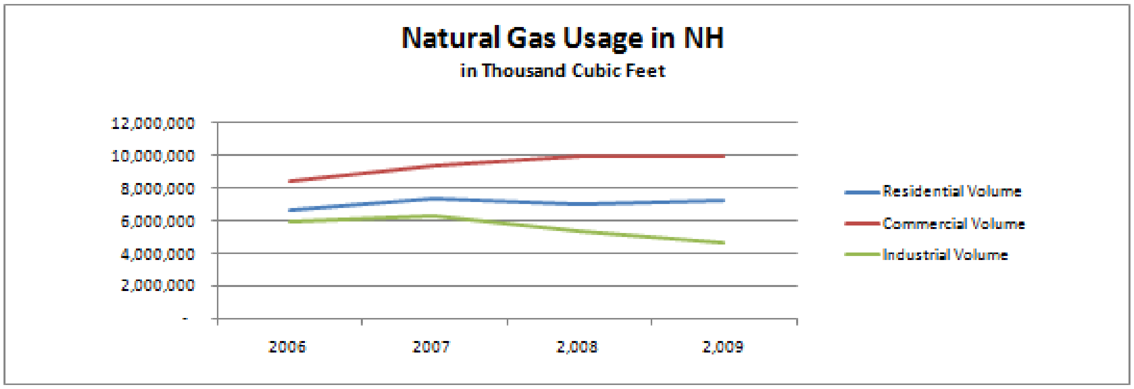

Figure 5.4. Natural Gas Usage in New Hampshire

The usage of natural gas does not seem to be directly tied to price, with the exception of industrial users, who are perhaps most sensitive to changes in price, and are best positioned to do something about their usage. Figure 5.5 illustrates the price of natural gas by customer type.

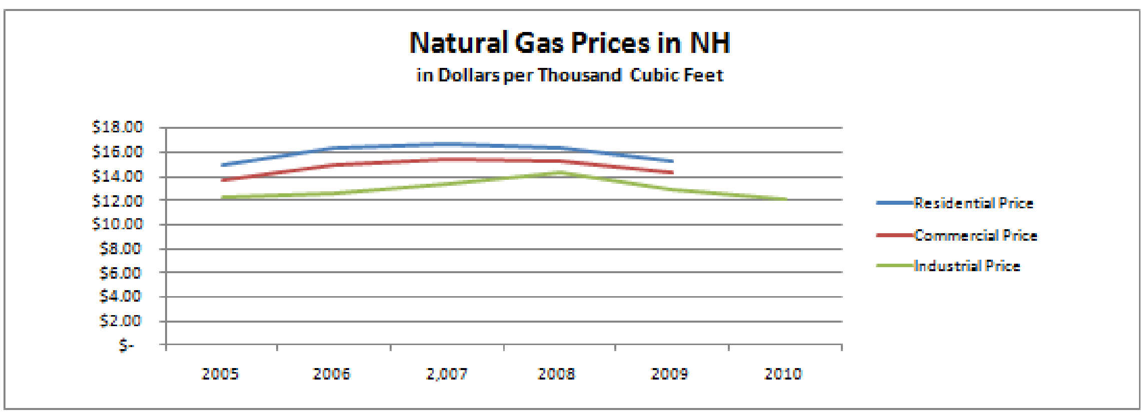

Figure 5.5. Natural Gas Prices in New Hampshire

Energy efficiency services are provided by the two utilities that sell natural gas in New Hampshire: Unitil and National Grid. The 2011-2012 Plan filed by the utilities indicates efforts are underway to better align the commercial and industrial gas programs with the CORE electric programs for the:

- C&I New Equipment and Construction Program;
- C&I Large Retrofit Program; and the
- Small Business Energy Solutions Program.

The same market barriers apply to gas projects as to electric projects. Customers must be motivated to take action, they must know about the utility efficiency program to participate in it, and the program offerings must align with the customer's needs. The 2011-2012 Plan filed by the gas utilities outlines the market barriers that must be overcome. These barriers include the customer's lack of knowledge and money, a focus on first costs rather than life cycle costs, and a reluctance to try new technologies. The plan also identifies the important role of plumbing and heating contractors in successful C&I gas efficiency projects. The means of promoting the C&I programs include all the market actors including developers and contractors, manufacturers and distributors, and customers who use natural gas. Outreach includes direct mailings, the utility websites, training events and seminars, and home shows. In addition, Unitil and National grid are members of the GasNetworks collaborative of New England, and use that website for promotion as well. Most importantly, the programs will be promoted to the customers through the utility Account Executives, Energy Service Representatives, and the Program Administrators. The gas program budgets are increased from $1.9 million for 2008-2009 to $3.9 million for 2012.

5.10. Retrofit Programs for Gas C&I Customers

Unitil and National Grid Programs

Small C&I Incentives Program: Small commercial and industrial customers using up to 40,000 therms per year qualify for an incentive of up to 50% of the qualified installed cost of identified energy efficiency upgrades, up to a maximum of $50,000 per master meter. Customers must be on a firm commercial rate.

Large Commercial & Industrial Incentives: Large C&I customers using more than 40,000 therms per year qualify for an incentive of up to 50% of the qualified installed cost of identified energy efficiency upgrades, up to a maximum of $50,000 per master meter. Customers must be on a firm commercial rate.

Multifamily Building Customer Program: For qualified multifamily building customers, Unitil shares a portion of the cost to design, purchase, and install any qualified energy efficiency upgrades for multifamily building customers. Unitil offers incentives that pay a portion of the qualified installed cost of measures. Unitil will pay 50% of the qualified installed cost, up to a maximum of $50,000 per master meter. Eligible multifamily buildings have four or more units, a master-metered account on a firm commercial rate, and must use gas for heat and/or hot water.

Specialty Retrofit Program - Building Practices & Demonstration Program (National Grid only): As described on National Grid's website, the intent of this program is to showcase the significant energy savings that can be achieved with new or under-utilized commercially available technologies.[28] The program is limited to 10 participants in New England per year, and participants must be willing to serve as a case study in order to promote successes throughout the region. Eligible technologies include:

- Energy recovery devices;
- Combustion controls;
- Building energy management systems;
- Desiccant units;
- Infrared space heating equipment;
- Infrared process heating equipment; and
- Any other equipment, process or technique.

[28] http://www2.nationalgridus.com/psbusiness/energy/building_nh_kednh.jsp

Special Retrofit Program - Economic Redevelopment Program (National Grid only): As described on the National Grid website, customers must be located in an economic zone and improvements must be made to existing buildings.[29] All improvement measures must exceed building codes, and customers must put up at least 50% matching funds.

5.11. New Construction and Market Opportunity Programs for Gas C&I Customers

Unitil and National Grid Program

New Equipment & Construction Program: This program offers incentives towards the installation of ENERGY STAR-rated high efficiency gas furnaces, hot water boilers and water heaters, as well as controls and food service equipment in commercial and industrial applications. The prescriptive and customer incentives offered can cover up to 75% of the incremental costs of qualifying energy efficiency measures. To qualify for this program: the customer must be a commercial, industrial or multifamily Unitil customer on a qualifying rate code with a planned new construction, major renovation, or failed equipment replacement project. Eligible equipment includes high efficiency heaters, furnaces, boilers water heating equipment, seven day programmable thermostats, and commercial kitchen equipment. Incentive amounts are posted on the GasNetworks.com and Unitil websites.

Program Results and Market Development

Presented below is an assessment of the gas C&I programs in aggregate. Information contained in utility filings does not enable a program by program assessment. For the assessment below, the programs are assumed to have spent all budgeted money. Whereas the first three years provide data for a 12 month period, the data from May 2009 to Dec 2010 includes 20 months. The reporting for 2011 and 2012 will include 12 months matching the calendar year. The changes in reporting periods make it challenging to compare performance over time.

Table 5.4. C&I Gas Program Budgets, Goals, and Savings (for all programs)

Year	Budget	Budget Spent	Lifetime Savings Goal (Therm)	Reported Savings (Therm)	Participation Goal (# of units)	Participation Goal Attained
2006-2007	$ 1,253,094	No Data	5,886,108	10,312,350	503	No Data
2007-2008	$ 1,097,158	No Data	9,073,230	20,011,948	524	No Data
2008-2009	$ 1,887,207	No Data	8,452,446	9,954,156	407	No Data
May 2009-Dec 2010	$ 4,242,566	No Data	25,275,620	22,609,100	618	No Data
2011 plan	$ 3,605,343	NA	13,022,150	NA	639	NA
2012 plan	$ 3,964,368	NA	14,365,140	NA	753	NA

[29] http://www2.nationalgridus.com/psbusiness/energy/economic_nh_kednh.jsp

A standard way to look at the cost effectiveness of savings is to look at the cost per unit of gas saved. Gas can be measured in British Thermal Units (BTUs) or therms. A therm is equal to 100,000 BTUs. The volume of a therm is approximately 100 cubic feet of natural gas. The energy contained in a single match is about equal to a BTU, so it is a small increment of energy. When talking about large amounts of BTUs, the term MMBTU is used to represent one million BTUs. Both therms and MMBTUs are used by the utilities for reporting purposes. For this analysis, all data was converted to therms.

A national review of costs savings by utility energy efficiency programs provides performance metrics for the lifetime savings of six states with gas programs. The median for the states included in the analysis was $0.33/therm, and the mean was $0.37. The range for the six states was $0.27 to $0.55.[30] By comparison, the C&I sector in New Hampshire achieved savings for $0.19/therm for those years, and both utilities averaged $0.21/therm for all programs (commercial, industrial, and residential). National Grid accounted for about 89% of the savings, and Unitil saved the remaining 11%. Commercial and industrial projects accounted for 64% of National Grid's savings, and for 53% of Unitil's during the time period for which there is data. National Grid's average cost of savings for C&I programs was $0.18/therm, and Unitil's was $0.19/therm.

Total C&I participation goals for both utilities range from 503 in 2006-2007, to a peak of 524 in 2007-2008, and 407 for 2008-2009. The C&I goals for 2011 and 2012 increase to 639 and 753 respectively. National Grid is planning to do the majority of the projects, with Unitil predicting 83 participants each year for 2011 and 2012. As of 2008, annual reports filed with the NH PUC list approximately 15,700 commercial and industrial gas customers. Assuming the utilities met their goals for participation in 2008, they served 3% of their C&I customers. The 2012 goal represents increased service to almost 5% of the C&I customers.

National Grid exceeded its goals for C&I programs for the period from 2006 to 2009, and achieved 94% of their C&I goal for the 2009-2010 twenty month period. Goals for 2011 and 2012 are more aggressive and the budget is increased. Unitil fell short of its C&I goals by 19% to 41% for the years between 2006-2010. Unitil's goals for 2011 and 2012 decline from past goals and are higher than past actual savings since 2006-2007. Combined, the two utilities have exceeded the state goals for all years since 2006-2007 (except for 2009-2010, during which they achieved 89% of the C&I goal).

Another way to assess savings is to determine how much savings is realized per each customer. There is no data on actual participation, so projected participation data is used instead. National Grid realized between 20,250 and 42,700 lifetime therms per customer for the years 2006-2009. National Grid's 2011 and 2012 goals are about 12,000 lifetime therms per customer, which is lower than past performance. By comparison, Unitil achieved between 15,800 and 21,700 lifetime therms per customer for the same time period. Unitil's goals project 25,400 lifetime therms per customer, appreciably higher than past performance.

[30] Saving Energy Cost Effectively, Page 7 Table 2

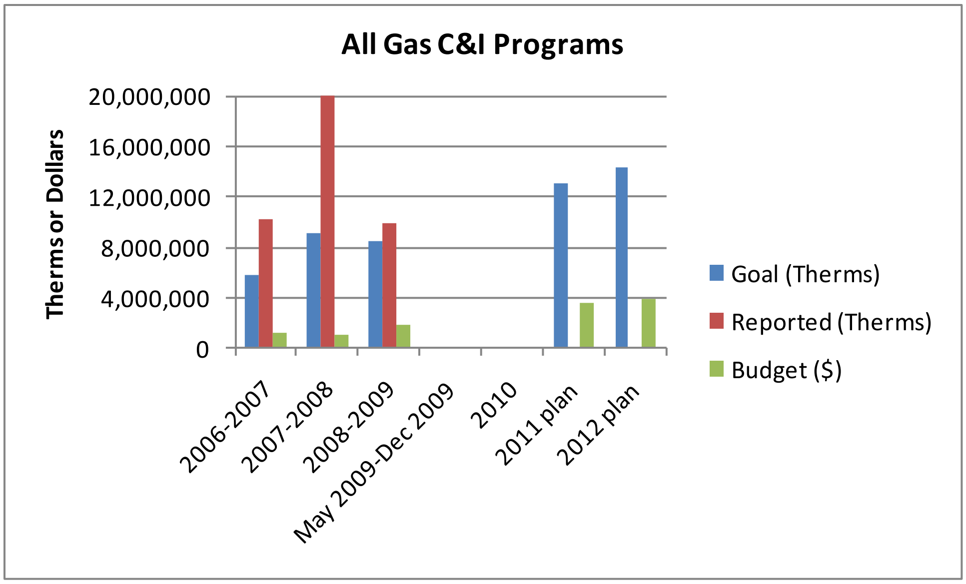

Figure 5.6. Gas Programs Goals, Savings, and Budgets

Conclusions and Recommendations for the Gas Programs

The gas programs are doing very well overall with respect to cost savings. Both C&I programs are cost effective and compare favorably to past benchmarked gas programs. However, performance fell off a bit during the last reporting period.

- **Track program performance with more metrics.** Due to a lack of data, it is not clear what program participation rates are. There is also no data on actual money spent. Better reporting, tracking actual participation rates and monies spent, using the standardized three categories (New Construction and Equipment, Small Business Retrofit, and Large C&I) as laid out in the plan for 2011-2012 would allow for comparisons and better tracking of program performance over time.

- **Leverage existing outreach opportunities such as the Account Executives and other market actors.** While the 2011-2012 plan outlines a number of ways to reach out to customers, it is unclear if the utilities have the people in place to execute the proposed activities to adequately reach all 15,700 customers as well as the trade allies and other market players. In addition, while the plan mentions plumbers and heating contractors as being critical trade allies, there are others who should also be recruited as trade allies. Commercial kitchen equipment vendors, industrial supply houses, architects and engineers all play a role in specifying and selling equipment that uses natural gas, or in specifying insulation levels, which impact natural gas usage.

    - As the current 3% participation rate indicates, there is a lot of potential for increased participation in the gas efficiency programs. At the yield rates the utilities are currently realizing, gas savings are an excellent value for New Hampshire. Better coordination and cooperation between the electric-only utilities and the gas programs is one way to reach more people. Hiring or contracting more people to provide outreach and education for the gas programs is another way that could be considered. Providing contractor and dealer incentives works well to leverage the existing infrastructure in the state, and also provides an added incentive for the people who are actually selling the equipment to promote the better option.

- **Improve program alignment and availability of information.** In other states where gas and electric programs are fully aligned, the alignment begins with sharing a common identity and then goes deeper. Delivery of efficiency services is fuel blind and the customer is eligible for both electric and gas efficiency improvements as part of a single, coordinated process. Each utility is able to claim their energy savings, and any transaction costs are dealt with internally (out of view of the customer). In New Hampshire, although program alignment between the two gas utilities has improved, there are still discrepancies that need to be fixed to avoid customer and market actor confusion. Both programs are using the regional collaborative GasNetworks program to provide services. However, there is not complete alignment yet:
    - National Grid is still promoting their old programs on their website.[31]
    - The GasNetworks rebate form is different from the one provided on the Unitil website for the New Construction Program.[32] [33]
    - While the NH utilities claim to provide rebates for cooking equipment, there is no indication on the GasNetworks website that there are cooking equipment rebates available to New Hampshire customers. The listed forms only apply to customers from other states.[34]

5.12. Conclusions and Recommendations for Electric and Gas C&I Programs

- **Increase funding for energy efficiency programs.** Increase the amount of funding for energy efficiency to increase the depth of efficiency as a percentage of overall state use of electricity and gas. New Hampshire is currently at 0.6 to 0.8% for electricity and 0.4% for gas all programs, depending on the year. The potential exists in the electric market for as much as 21% "Maximum Achievable Cost Effective" savings for 2018 usage in the C&I market sector.[35] The maximum achievable cost effective non-electric savings is 9% of 2018 usage in the C&I market.[36] Increasing funding will also reduce the likelihood of a program running out of funds, thus causing a program to shut down.

- **Set more aggressive program goals**. With the exception of Unitil's gas program, all utilities have exceeded past goals by wide margins. The electric utilities have exceeded their goals by an average of 29%, and National Grid has more than doubled their gas goals on average.

- **Coordinate between utilities on how savings are calculated and claimed.** Are savings for the same measure always calculated the same way regardless of the utility? Are load shape and hours consistent? Are interactive effects always dealt with the same way between utilities? Are baselines consistent? Increased consistency on how savings are calculated is needed.

- **Provide better oversight on verification of claimed savings.** The current process does only spot verification studies after the savings have been booked. Are there penalties or disincentives for over claiming savings? Independent, third party review and verification of claimed savings is advised.

- **Increase cooperation and coordination for account management among utilities.** Make better use of marketing and account management/customer service money by reducing

[31] http://www2.nationalgridus.com/psbusiness/energy/saving_nh_kednh.jsp
[32] http://www.gasnetworks.com/efficiency/pdf/GN-2011-NH-HEHE011011.pdf
[33] http://www.unitil.com/sites/default/files/Natural%20Gas%20Rebates%20%20lot%20a.pdf
[34] http://www.gasnetworks.com/efficiency/applications.asp
[35] Additional opportunities for Energy Efficiency in New Hampshire, pages 107 and 108.
[36] Additional opportunities for Energy Efficiency in New Hampshire, pages 107 and 108.

redundancy and increasing cooperation, especially between the gas and electric programs. Cross training will likely be necessary to achieve this.

- **Complete the alignment between gas and electric energy efficiency programs.** The electric utility programs are well aligned overall. The National Grid and Unitil Gas programs are moving towards alignment but still have work to do, both with each other and with the electric programs. The goal is to avoid unnecessary market confusion.

Table 5.5. Summary of Recommendations for C&I Energy Efficiency Programs in New Hampshire

Streamline and expand prescriptive offerings to increase participation and save money *Recommendation 5.1; Section 5.4*
• Do inspections of prescriptive projects only as necessary
• Offer more measures prescriptively

Outreach and clarify to increase participation in the Small Business program *Recommendation 5.2; Section 5.4*
• Clarify the role of contractors hired by the utilities
• Provide targeted outreach by customer type

Improve interactions with Large C&I customers *Recommendation 5.3; Section 5.5*
• Increase the length of simple payback, or do not talk about simple payback at all
• Assign a single Account Executive to entities with facilities in multiple utility jurisdictions
• Add more Account Executives to reach more customers and better serve existing customers

Make structural changes to increase savings *Recommendation 5.4; Section 5.5, 5.6 and 5.7*
• Set higher performance goals
• Increase the maximum possible length of a performance contract in New Hampshire
• Fund the Smart Start Program so that there is adequate funds to meet existing demand
• Increase competition by limiting awards in the Energy Awards Program
• Fund the New Construction program to meet demand
• Track market transformation metrics
• Provide upstream incentives for commonly purchased equipment

Continue to enhance the electric CORE programs *Recommendation 5.5; Section 5.8*
• Provide specialized, targeted services to select, hard to reach customers
• Transform the market by using metrics other than simple payback to define projects
• Continue to provide a high quality of customer service to existing customers while cultivating new customers.

Continue to enhance the gas CORE programs *Recommendation 5.6; Section 5.11*
• Track gas program performance with more metrics
• Leverage existing outreach opportunities to promote the gas programs
• Improve program alignment and availability of information in the gas programs

Continue to enhance overall CORE program funding and goals *Recommendation 5.7; Section 5.12*
• Increase overall funding for energy efficiency programs to achieve more savings
• Set more aggressive program goals
• Coordinate between utilities on how savings are calculated and claimed

Make changes at the state level to provide better continuity and coordination between utilities *Recommendation 5.8; Section 5.12*
• Provide better oversight on verification of claimed savings
• Increase cooperation and coordination for account management among utilities
• Complete the alignment between gas and electric energy efficiency programs

Chapter 6: Low Income Weatherization Assistance Programs Review and Assessment

6.1. Introduction

Low income weatherization programs provide energy efficiency services, as well as health and safety and some housing durability measures, to income qualified households at no charge to the customer. In New Hampshire, there are approximately 134,200 households (or approximately 25% of all households in the state) that meet the income eligibility criteria for these programs.[1] These households can rarely afford investments in energy efficiency improvements, and often live in poorer quality (i.e. less energy efficient) housing; thus, they represent a major opportunity for energy savings.

In addition to energy savings, low income weatherization programs also provide a range of non-energy benefits, or benefits other than direct energy bill reductions. Current and past national evaluations of the federal Weatherization Assistance Program (WAP) conducted by Oak Ridge National Laboratory quantify the effects of non-energy benefits. The last national evaluation report was released in 2002 and a new evaluation now underway will take a fresh look at the program's impacts. Generally, non-energy benefits are viewed from three perspectives: household benefits, utility benefits, and societal benefits.[2] Household benefits include increased affordability of housing, as well as health and safety improvements. Utility benefits include reduced bill arrearages – including lower bad debt write-off, reduced carrying costs on arrearages, and fewer notices and customer calls - as well as fewer utility shutoffs and reconnections (and their associated costs). Societal benefits are typically considered as the environmental benefits of reduced energy usage, and the local economic benefits of increased spending on energy efficiency upgrades (which are installed by a local workforce, using materials purchased through local retailers, etc.).

While some non-energy benefits can be hard to quantify effectively, many of the Weatherization Assistance Program's impacts are documented and are significant. Consequently, several states have chosen to include a low income "adder" to the cost effectiveness screening requirements for utility-funded low income programs. A report by the National Consumer Law Center found that non-energy benefits could justify adjustments anywhere from 17 to 300%.[3] An example of how this has been implemented at the statewide level can be seen in the Colorado Public Utilities Commission's direction of electric demand side management (DSM) programs to increase benefits included in the Total Resource Cost (TRC) calculation by 20%, "to reflect the higher level of non-energy benefits that are likely to accrue from DSM services to low-income customers."[4]

Presented below is a discussion of low income weatherization assistance programs in the State of New Hampshire. Background information is provided on the coordination of the federally funded Weatherization Assistance Program with residential energy efficiency programs offered by electric and gas utilities in New Hampshire, and recommendations are made for further enhancements in the future.

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[1] http://www.liheap.org/assets/fact_sheets/liheap-NH-2011.pdf
[2] http://weatherization.ornl.gov/pdfs/ORNL_CON-484.pdf, page vi
[3] Howat and Oppenheim, 1999, page 23.
[4] Colorado PUC, Docket No. 07A-420E, Decision No. C08-0560, page 43

6.2. Common Elements of Success

Our research and experience have identified some common elements of success. The most successful low income energy efficiency programs:

- **Are comprehensive in their services** - home energy use is addressed holistically, individually (not one-size-fits-all), and in a fuel-blind manner.

- **Have a diversified funding mechanism** - which increases the number of customers served, helps ensure stability of overall funding, and helps increase the likelihood that multiple energy saving measures will be installed in each home served.

- **Partner with other low income service providers and programs** - in order to increase the ability to serve more households and to direct households to other services which they can benefit from.

- **Have a highly trained network of service providers** – especially those which have developed comprehensive field quality standards and administrative/management policies and procedures.

- **Have a centralized administrative structure** – which facilitates production planning that effectively integrates all funding streams, provides one point of entry for customers to avoid confusion or duplication of services, and coordinates training, quality assurance, and other program management activities.

- **Have IT resources** - for tracking, reporting and producing management reports that identify both high performers and areas needing improvement.

- **Offer high quality customer education** – that treats customers individually and selects the optimal methods to deliver information that they will likely act upon.

6.3. Existing Programs

The energy efficiency programs that serve New Hampshire's low income community provide free installation of energy efficiency measures, as well as some health and safety testing and repair work. The longest running program is the state's Weatherization Assistance Program (WAP), which was created in 1976 and is funded under a formula grant from the U.S. Department of Energy. New Hampshire's WAP is managed by the New Hampshire Office of Energy and Planning (NH OEP), which administers sub-grants to six Community Action Agencies (CAAs) whose respective territories provide coverage to the entire state. As part of their management of this program, NH OEP maintains technical and administrative manuals, performs administrative/financial monitoring at least annually, and performs on-site inspections on a minimum of 10% of the units weatherized. The NH OEP also develops and carries out training and technical assistance activities when necessary to respond to the changing needs of their sub-grantee network.

The CORE Energy Efficiency Programs were launched by New Hampshire's electric utilities in June, 2002, and include a low income component, referred to as the Home Energy Assistance (HEA) Program. The HEA program provides free, comprehensive weatherization services to qualified customers, and New Hampshire's electric utilities work primarily with the CAAs to deliver the services. CAAs are provided a "first right of refusal" to provide low income weatherization services to utility customers. CAA services are paid for based upon established rates for specific measures, similar to the Home Performance with ENERGY STAR® program.[5]

HEA program weatherization jobs are classified as “A” or “B” jobs, based upon whether or not the job is for an electrically heated home and/or if the household is classified as a high electric user. If yes, to one or both, the household is considered an A job, and is eligible to receive thermal and electric base load measures covered through the HEA program. If no, the household is considered a B job, and is eligible for electric base load measures, water heating savings measures (such as water heater tank and pipe insulation), and water savings measures (such as low flow showerheads and faucet aerators). A jobs are expected to be serviced within a certain time frame – usually within eight weeks – and the utility reserves the right to contract with another service provider if the CAA cannot provide services within this time frame.

The HEA program maintains a reporting database, referred to as OTTER, to which all CAAs must report job specific information, including any notes or messages to the utility program administrator, and invoices.[6] The HEA program also requires that CAAs utilize the TREAT audit software and prescribed pricing agreements for determining which measures will pass cost effectiveness screening requirements.[7]

The gas utilities also fund energy efficiency upgrades in low income homes that focus on gas saving measures. They contract directly with the CAAs, and rely mainly on the state’s infrastructure – including administrative policies and technical field standards, QA mechanisms, and training – to ensure technical best practices and adequate oversight. The gas utilities also reserve the right to contract with other service providers in order to meet their program’s savings and budget goals. The gas utilities solicit customer feedback through post-installation letters mailed to program participants.[8]

Both the HEA program and the gas utilities’ low income programs operate under income guidelines that complement the state’s WAP income guideline – any household that income qualifies for the NH WAP also qualifies for the utilities’ low income programs. Additionally, CORE utilities customers who qualify for the Electric Assistance Program or who live in subsidized housing will also qualify for the HEA program. Low income customers who receive cash assistance to help pay for their utility bills are the primary source of customers for the low income energy efficiency programs. However, customers whose income qualifies and does not receive utility bill assistance, may still apply for free energy efficiency services through the CAAs.

6.4. Program Results and Market Development

The table below documents the HEA program and gas utility program results for 2008-2010. Since more than 95% of the jobs which receive CORE funding also leverage DOE WAP funds, as well as gas utility funding where applicable, the total number of units closely resembles the total number of low income homes that received services in each of the years.

[5] http://www.puc.nh.gov/Electric/NH%20EnergyEfficiencyPrograms/10-188/10-188%202010-08-03%202011-2012%20CORE%20Joint%20Electric%20Program%20Proposal.pdf, page 31.
[6] Melanson, Frank, Personal Communication, May 12, 2011.
[7] http://www.puc.nh.gov/Electric/NH%20EnergyEfficiencyPrograms/10-188/10-188%202010-08-03%202011-2012%20CORE%20Joint%20Electric%20Program%20Proposal.pdf, page 31.
[8] http://www.puc.nh.gov/Electric/NH%20EnergyEfficiencyPrograms/10-188/10-188%202010-08-03%202011-2012%20Jt%20NGrid-UES%20Gas%20Efficiency%20Proposal.pdf, page 16.

Table 6.1. CORE HEA Program Results – Electric

Year	Budget	Budget Spent	Lifetime Goal (kWh)	Savings Goal Attained	Participation Goal (# of households)	Goal Attained
2008	$2,441,012	128%	17,867,493	116%	965	124%
2009	$2,641,742	94%	19,744,078	118%	691	100%
2010	$2,744,928	109%	24,417,549	145%	1,016	122%

Table 6.2. CORE HEA Program Results – Gas

Year	Budget	Lifetime Savings Goal (Therm)	Savings Goal Attained	Participation Goal (# of households)
2006-2007	$444,589	1,089,108	97%	170
2007-2008	$468,023	1,089,108	147%	170
2008-2009	$510,719	1,200,780	133%	190

Prior to utility funding, a total of 300-400 low income households were served through the WAP, and as Table 6.1 above shows, between 700 to over 1,000 homes were served annually over the last three years; therefore, the utility contributions have enabled many more households to receive these important services.[9] Furthermore, the resources have allowed the CAAs to increase both their in-house crew capacity and subcontractor base to provide services. This may be one of the reasons New Hampshire has been so successful in absorbing and successfully deploying the large influx of short term funding with ARRA - building upon a strong service provider base, and weatherizing an anticipated additional 3,500 homes within a three year period (ending in March, 2012). The increase in low income energy efficiency program resources has very likely also resulted in the building and strengthening of the market based contractor network skilled in whole house energy retrofits. Those same contractors may be leading resources for other non-income based residential efficiency programs, such as Home Performance with ENERGY STAR.

6.5. Recommendations

The following recommendations are intended to acknowledge the strong capabilities and resources of the existing program structure, and identify ways to encourage continual improvement in order to most effectively serve New Hampshire's low income population.

- **Continue to strengthen and enhance coordination of management activities between the utilities and the NH OEP:** In many ways, New Hampshire's low income energy efficiency and weatherization programs are running very efficiently, and efforts to increase coordination and streamline operations appear to be ongoing and effective. The CORE programs largely coordinate program administration through Public Service of New Hampshire (PSNH) and operational decisions are usually consistent across CAAs. Additionally, the utilities, NH OEP, and the CAAs communicate with each other when performance issues arise. For example, PSNH's program administrator notes that if a CAA is experiencing significant performance issues, the program administrator will work with the lead CAA (Community Action Program Belknap-Merrimack Counties, Inc.) to coordinate additional production capacity from neighboring CAAs, as well as with NH OEP to raise the performance issue and coordinate efforts

[9] http://www.nh.gov/oep/programs/energy/documents/blasnik_wxn_study.pdf, pg. 11.

to address deficiencies.[10] However, there appears to be some areas of program administration where duplication of efforts occurs. This section outlines our recommendations to streamline program administration and increase coordination activities.

- Low income programs should **coordinate Quality Assurance inspections activities through a single entity**.

  In order to meet DOE WAP funding requirements, the state must perform quality assurance on a specified number of homes (no less than 10% of planned production, as outlined in the New Hampshire State WAP Plan).[11] The CORE programs also perform site inspections on at least 10% of the units served by the HEA program. As confirmed by interviews with both utility and WAP program administrators, there is coordination to ensure that the same units aren't inspected twice, but each entity is in fact inspecting an average of 10% of its total production. The state has recently contracted with the same firm utilized by the CORE programs for quality assurance inspections due to lack of internal staff resources, and as a result, the firm has developed QA reports that serve both the state's and the utilities' needs. Presumably that also means that fewer units in aggregate are receiving inspections, as the vast majority of households served in NH receive both DOE and CORE funding. It is unclear whether this model of subcontractor coordinated QA will continue once ARRA funding runs out. We would recommend that, whether subcontracted or coordinated through internal staff resources, Quality Assurance should be coordinated through a single entity in order to ensure that both programs' resources are most effectively spent.

- Continue exploring opportunities to **coordinate the planning and delivery of training activities**, being responsive and flexible to the needs identified through Quality Assurance.

  The results of Quality Assurance visits are linked integrally to training and technical assistance needs. The DOE WAP program sets aside a percentage of the state's total federal allocation to be used for training and technical assistance, and every year the New Hampshire State WAP Plan must identify training and technical assistance activities to be completed. The CORE program filings indicate that utility sponsored trainings are coordinated with NH OEP, and occasionally cost shared, although it is not clear that cost sharing has happened recently or with regularity. The HEA program and NH OEP should strive to leverage each other's training activities to the maximum extent possible in order for more resources to be available for weatherization activities.

- Develop **prioritization criteria for weatherization jobs** which ensures that New Hampshire's low income households will be **equitably served based on need** and regardless of fuel type.

  As discussed above, the HEA program targets resources to A and B jobs according to whether the home is electrically heated (only 4% of the state's residential households) or high electric users. A jobs contribute significantly more resources to the total job cost, as they include thermal measures, whereas B jobs only contribute

[10] Melanson, Frank, Personal Communication, May 12, 2011.

[11] http://www.nh.gov/oep/recovery/documents/wx_plan-master_file_worksheet.pdf, page 12.

to electric base load measures. On an annual basis, there appears to be a push by CAAs to identify and provide services to A jobs first, in order to leverage as many utility contributions as possible. This is evidenced by the fact that, per the PSNH utility program administrator, the CORE programs are about to run out of budget for A jobs in 2011, and they are not yet half way through the program year.[12] It is recognized that this may be an issue stemming from the increased units served while the state spends out its ARRA funding. However, interviews with state and local agency staff indicate that their waiting lists can extend several years, whereas HEA program A jobs are expected to be served within eight weeks, so clearly there is a higher priority and urgency placed on these jobs.

An integral part of a coordinated plan to serve New Hampshire's low income households should be a method of allocating utility resources according to service territories and local low income household demographics, similar to the way WAP funds are allocated by the state. This methodology takes into account Heating Degree Days, which can be an indicator of the energy usage of a particular climate. Additionally, the New Hampshire State WAP Plan identifies households with high energy burden as priority households to receive services. The CORE utilities have set A and B job production targets for each region, presumably based on data similar to what is utilized by the state's WAP.[13] Perhaps by eliminating the focus on high electric use customers and electrically heated homes (who would likely rise to priority status anyway based on energy burden), local program goal setting could be less based on a push to secure utility program resources, and focused instead on serving households with the greatest need. Program managers at both the state and utility level should be able to identify in a timely fashion if CAAs will not be able to meet production targets and then be able to reallocate resources accordingly. Regardless of what the ultimate solution might be, it does seem clear that collaboration across programs is necessary in order to find ways to serve low income households based on energy saving opportunities, regardless of the source of the energy.

- Consider adoption of **consistent technical and financial reporting standards** across programs.

As noted, the current structure includes state oversight of the six CAAs for the WAP and utility oversight of the six CAAs for the CORE programs. Since around 95% of homes served by low income programs utilize both WAP and utility program resources, this structure means that each CAA effectively has two (or possibly three, if both electric and gas) funding streams with different sets of technical and financial reporting standards to adhere to for almost every household they serve. As mentioned above, the CORE programs have implemented the OTTER database for program reporting and invoicing, and prescribes reimbursement rates for energy efficiency measures based upon price agreements established for the CORE programs (both income based and non-income based)[14]. The federal WAP rules require that weatherization work performed under the program be reimbursed based on actual

[12] Melanson, Frank, Personal Communication, May 12, 2011.

[13] http://www.puc.nh.gov/Electric/NH%20EnergyEfficiencyPrograms/10-188/10-188%202010-08-03%202011-2012%20CORE%20Joint%20Electric%20Program%20Proposal.pdf, page 75-76.

[14] http://www.puc.nh.gov/Electric/NH%20EnergyEfficiencyPrograms/10-188/10-188%202010-08-03%202011-2012%20CORE%20Joint%20Electric%20Program%20Proposal.pdf, page 31.

costs incurred, especially in the case of CAAs using in-house crews, and reporting and invoicing of those costs is entered into a spreadsheet that is sent to the NH OEP and compiled.[15] The state must perform administrative monitoring of the CAAs to ensure that all federal dollars are accounted for appropriately, and it can be difficult to disaggregate different funding streams on any given job at the local level when reimbursement rules differ.

- **Develop shared IT Resources that strengthen program management and minimize CAA data inputs:** Also essential to effective program management is the ability to track and evaluate program performance through IT reporting systems. As mentioned above, the CORE programs have implemented the OTTER database reporting system to which the CAAs are required to submit their job specific information, and the utility uses this to track performance and pay invoices. The state has not implemented a program management database, which hampers their ability to manage the WAP and judge the performance of individual CAAs. The reason they have not implemented a database reporting system seems to be in part due to the fact that it would then require the CAAs to enter detailed job information twice for each job – once into the OTTER reporting system for CORE work, and once into the WAP database. Moreover, databases reviewed by the state as potential program management tools integrate with a different field audit tool than currently supported by the HEA program and NH OEP. Thus, CAAs would have to run two separate audits for each job in addition to entering job information into two separate reporting databases. According to interviews with NH OEP staff, this has made the possibility of implementing a program management database essentially a non-starter.[16] Ideally, a WAP database should collect complete information on a job by job basis – including measure specific information, even if that measure was paid for by another funding stream. This would help the state determine how effective the programs are at targeting high need jobs and saving energy for their low income customers.

    - The utilities and the state should work together to more effectively **transfer job specific information**, including pre- and post-weatherization usage data, that is essential for the program management activities of both the CORE utilities and the NH OEP. This could include implementation of a **shared database/reporting system**.

      CAAs should not have to enter detailed job information into two different database systems, but in order for the state to more effectively judge overall program performance, it needs to collect measure specific information on each job completed. The review process for the Independent Study revealed a difference of opinion as to the reasons why a shared system has not been pursued to date. Therefore, we recommend that the HEA program and the NH OEP revisit this issue. There are DOE approved audit tools that include database interfaces that can track multiple funding sources and produce management reports that greatly enhance the ability to assess performance on a real-time basis. Additionally, the CORE utilities have expressed in their review comments a willingness to allow the NH OEP to utilize OTTER for program management. Either of these options could lead to the desired end result. The HEA program administrator and the NH OEP WAP management should discuss what tool could serve both the utilities' and the state's needs to collect

[15] Gamble, Nancy, Personal Communication, May 9, 2011.
[16] Gamble, Nancy, Personal Communication, May 9, 2011.

and track such information in the future, without putting undue burden on the CAAs' auditing and reporting activities.

6.6. Conclusion and Summary of Recommendations

Program Strengths

Overall, the energy efficiency and weatherization programs that serve New Hampshire's low income residents are highly effective. The low income service provider network is strong and well established. The CAAs that serve customers through the WAP, CORE, and gas utility programs are well suited to working with the specific circumstances of low income households and not only help them save energy and have a safer living environment, but also refer them to other important resources that they may qualify for, such as food aid, bill payment assistance, job training programs, etc. The CAAs have delivered energy efficiency upgrades to low income households through the WAP for decades, and as a 2007 impact evaluation by M. Blasnik & Associates indicates, actual energy savings achieved by their work compares very favorably with other states.[17]

The state provides a strong framework to help drive the program's success through continued development of administrative policies and procedures as well as weatherization field standards. The state is currently in the process of updating both of these (as is common in all successful WAP programs, to ensure the governing documents reflect current and evolving best practices), including developing a shorter field guide to be utilized for on-site technical and process guidance.[18] The state also supports the program's success through training and quality assurance.

The introduction of utility funds in 2002 has done much to increase the number of low income households served, as well as increase the overall financial stability of the low income energy efficiency services. This is important, as the federal WAP allocation has fluctuated significantly in recent years. New Hampshire had a WAP allocation of $869,837 in 1999, which was almost double by 2006 at $1,605,171. It went down in 2007 to $1,351,697 only to jump back up again in 2009 to $2,533,628 (not including the additional, short-term funding available through ARRA). Other sources of funding help to smooth out these peaks and valleys and lend to overall program stability. According to a 2009 funding survey completed by the National Association of Community Service Programs (NASCSP), the utility programs contributed $3,569,721 in 2009, more than doubling the WAP base allocation. This puts New Hampshire among the leaders in the country for support of low income weatherization through utility sponsorship. Only six states, including New Hampshire, have utility support which is equal to or more than the funding received through federal sources.

Another element that helps strengthen the foundation of New Hampshire's low income programs is that the electric and gas utilities work together to ensure that program offerings are consistent across the state. Such consistency helps eliminate customer and program provider confusion. In fact, customers may have little awareness of the multiple sources of funds paying for the work done on their homes as they experience one "face" to the program (the CAA). This is an effective program design feature, as it helps eliminates customer confusion.

Recommendations for the Future

New Hampshire's low income energy efficiency and weatherization programs have established a strong foundation for success through solid technical capabilities, developed an experienced and dedicated

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[17] http://www.nh.gov/oep/programs/energy/documents/blasnik_wxn_study.pdf, pg. 11.
[18] Gamble, Nancy, Personal Communication, May 9, 2011.

network of service providers, and achieved funding diversification through partnerships with the utility programs. ARRA brought to the state another set of challenges and opportunities – to drastically ramp up the network's ability to serve low income households for a period of three years and then deliver the services. Given the large decrease in funding that will likely result once ARRA funds are depleted, maintaining the newly established capacity to service low income households will become a challenge. The recommendations below could help soften the financial blow, by working within the existing network and infrastructure, with a goal of strengthening overall services and program administration, while putting more energy saving resources into the homes of low income residents. What's more, any additional resources that could be identified - including consideration of an increase to the SBC rate, which could increase funding to all of these valuable programs – which could increase, maintain, or at least partially replace the funding levels experienced under ARRA would be well invested, as the need for these services remains very high.

Summary of Recommendations

Summarized below are the recommendations for New Hampshire's low income programs discussed in more detail above.

Continue to strengthen and enhance coordination of management activities between the utilities and the NH OEP *Recommendation 6.1, Section 6.5*
• Coordinate Quality Assurance inspections activities through a single entity.
• Continue exploring opportunities to coordinate the planning and delivery of training activities, being responsive and flexible to the needs identified through Quality Assurance.
• Develop prioritization criteria for weatherization jobs which ensures that New Hampshire's low income households are will be equitably served based on need and regardless of fuel type.
• Consider adoption of consistent technical and financial reporting standards across programs.
Develop shared IT Resources that strengthen program management and minimize CAA data inputs *Recommendation 6.2, Section 6.5*
• More effectively transfer job specific information, including pre- and post-weatherization usage data, that is essential for program management activities at both the CORE utilities and the NH OEP. This could include implementation of a shared database/reporting system.

Chapter 7: Sustainable Energy Programs Review and Assessment

7.1. Introduction

New Hampshire generates 84% of its electricity from energy sources imported from other regions of the U.S. and the world, with nuclear fuels producing providing 43% of the electricity, natural gas producing 23%, and coal producing 18%. In addition, the state relies on oil and other fossil fuels for most space heating.[1] Having no in-state sources for these fuels, New Hampshire has for decades recognized the value of its abundant, in-state renewable energy resources. Currently, biomass and hydropower combined represent nearly 16% of current electricity generation, with solar, wind, and methane providing less than 1%.[2] Tapping into these local and sustainable fuel sources provides a hedge against fuel supply vulnerability and keeps dollars from energy production in the local economy. Renewable energy is less prevalent as a component of the energy consumption of end-use sectors, with contributions of only 1.5% for commercial, 4.5% of residential, and 7.9% of industrial consumption.[3] With ample supplies of wood and existing hydropower resources, along with substantial potential from wind, solar, methane, geothermal, and ocean-based energy sources, New Hampshire's continued development of its sustainable energy potential, hand-in-hand with strong energy efficiency initiatives, makes good economic sense.

The global, national, and regional markets for sustainable energy are dynamic and growing rapidly. New Hampshire's economy and environment will benefit from participating in this market growth – which is driving costs lower – on the both the supply and demand sides of the market. In response to this potential, a common theme of combined energy efficiency and sustainable energy support has emerged through a number of recent leadership initiatives in New Hampshire, including the 25 x '25 Initiative endorsed by Governor John Lynch, which seeks to produce 25% of the energy consumed in the state in 2025 from clean, renewable resources,[4] as well as the goal established in the New Hampshire Climate Action Plan to reduce greenhouse gas emissions to 80% below 1990 levels by 2050.[5]

Local Sustainable Energy Resources…

- Increase fuel diversity in the state, displacing and thereby lowering regional dependence on fossil fuels
- Stabilize and potentially lower future energy costs by reducing exposure to rising and volatile fossil fuel prices
- Keep energy and investment dollars in the state to benefit the New Hampshire economy
- Reduce the amount of greenhouse gases, nitrogen oxides, and particulate matter emissions in New Hampshire, thereby improving air quality and public health and mitigating the risks of climate change
- Increase system-level grid reliability and security, and reduce the need for transmission and distribution (T&D) upgrades
- Take advantage of consumer interest in environmental benefits and lower long-term energy costs

[1] New Hampshire Office of Energy and Planning Energy Facts, 2008; http://www.nh.gov/oep/programs/energy/nhenergyfacts /index.htm
[2] New Hampshire Office of Energy and Planning Energy Facts, 2008; http://www.nh.gov/oep/programs/energy/nhenergyfacts /index.htm
[3] New Hampshire Office of Energy and Planning Energy Facts, 2007; http://www.nh.gov/oep/programs/energy/nhenergyfacts/ index.htm
[4] http://www.governor.nh.gov/media/news/2006/082906energy.htm
[5] The New Hampshire Climate Action Plan, New Hampshire Department of Environmental Services, 2009

While essential, setting achievable though challenging goals is not enough alone to drive growth in these markets - particularly in a sector whose value is not entirely defined by short-term economic returns. There are a number of market failures or barriers that limit full realization of the opportunities inherent in increased deployment of sustainable energy technologies. These include:

- Energy pricing variability, uncertainty, and lack of transparency;
- High up-front costs of investment;
- High transaction costs;
- Competing disincentives;
- Lack of information on economic potential, technology, and industry and development partners;
- Risk aversion on the part of customers and project developers related to future benefits;
- Lack of access to the financial capital necessary to make investments;
- Lack of access to a robust installer market in the early stages of market development; and
- Risk aversion on the part of developers and contractors relative to secure demand for services.

Addressing these barriers, so that markets are developed to achieve long-term economic potential along with their substantial non-monetary benefits, will require public assistance. Sustainable policy and market development strategies are best achieved by public support of achievable goals and strong commitment to investments in this sector. To reap the economic, environmental, and security benefits of clean energy development, an effective and coordinated portfolio of goals, policy and regulatory structures, and market support is needed.

In the following sections, New Hampshire's current sustainable energy landscape is reviewed and assessed, including the policy and funding framework and the status of public and private activity in sustainable energy markets in the state. The discussion is organized as follows. Each section includes recommendations. A table summarizing the recommendations concludes the chapter.

7.2. New Hampshire Sustainable Energy Policy

7.3. Sources of Funding for Sustainable Energy

7.4. Framework: New Hampshire's Electric Renewable Portfolio Standard

7.5. Framework: Sustainable Energy Permitting and Infrastructure

7.6. Framework: Financial Support Mechanisms for Sustainable Energy Development

7.7. Framework: Customer-sited Sustainable Energy Rebate Programs

7.8. Utility Investment in Distributed Sustainable Energy

7.9. Sustainable Energy Program Administration

7.10. New Hampshire Markets: Solar Photovoltaic and Solar Thermal Energy

7.11. New Hampshire Markets: Wind Energy

7.12. New Hampshire Markets: Biomass Electric and Heat Generation

7.13. New Hampshire Markets: Hydroelectric Generation

7.14. New Hampshire Markets: Methane and Landfill Gas

7.15. New Hampshire Markets: Geothermal and Other Sustainable Energy

7.16. Sustainable Energy: Summary of Recommendations

7.2. New Hampshire Sustainable Energy Policy

While there is language in the purpose statement for the New Hampshire RPS law (RSA 362-F) that articulates the value of stimulating investment in renewable energy, there is currently no general policy outlining the state's overall support for this sector more generally. A broad overarching statement of value and policy support is necessary to provide guidance to regulators, state government, utilities, investors, and other market stakeholders across the wide range of activities that is necessary to undertake for successful long term market development.

Recommendation

Enact a general policy for support for sustainable energy: We strongly urge the establishment of an overarching policy that outlines the state's support for activities that encourage investment in sustainable energy. This policy could identify the value to the state of renewable energy investment to:

- Promote resources that serve to displace and thereby lower regional dependence on fossil fuels;
- Support New Hampshire's economy;
- Improve air quality and public health;
- Mitigate against the risks of climate change; and
- Contribute to lower and more stable future energy costs

And could stipulate the following:

> That is in the public interest and therefore is the policy of the state to foster and to promote, by all reasonable means, investment in low emission renewable energy generation and thermal energy technologies and to support the provision of adequate markets and facilities to this end.

7.3. Sources of Funding for Sustainable Energy

Current Funding Sources for Sustainable Energy Investment

Most states and local governments with growing sustainable energy markets have chosen to offer some form of direct financial support for various levels of project size and investment. In addition, many current markets are very competitive and dynamic, meaning that, in the absence of direct financial incentives, investment and development are attracted to states or localities where such offerings are in place. Direct financial support will continue to be a critical component of market development until the benefits from these technologies is valued more highly than the alternatives.

In New Hampshire, the state's Electric Renewable Portfolio Standard (RPS) provides the main mechanism for generating funding support for sustainable energy development – the RPS is discussed in detail in Section 7.4. Utilities invest in projects directly, purchase Renewable Energy Credits, or make compliance payments to meet their RPS requirements. Any payments collected in RPS compliance are deposited into the New Hampshire Renewable Energy Fund (REF) and used to further fund sustainable energy investment. Established as part of the RPS rules,[6] the REF is currently being used to fund several

[6] http://www.puc.nh.gov/Regulatory/Rules/Puc2500.pdf

customer-sited sustainable energy rebate programs and a competitive project solicitation (programs funded to date by the REF are discussed in Section7.7.).

Because it receives funding solely from RPS alternative compliance payments, the REF has been hampered by a lack of certainty in its funding levels, and thus of availability of budget for the programs it administers, from its inception. Funding of the REF from alternative compliance payment collections have been variable and uncertain:

- $4.5 million in 2009;
- $1.3 million in 2010; and
- Estimated at $1.4 - $2.6 million in 2011.

Thus, there is no guaranteed and consistent budget for this fund; the programs it supports will operate on a year-by-year basis or until funding is exhausted, whichever comes first.

New Hampshire participates in the Regional Greenhouse Gas Initiative (RGGI), proceeds from which fund the Greenhouse Gas Emissions Reduction Fund (GHGERF). While this fund is not specifically authorized to support projects that address sustainable energy development (by statute, GHGERF funds must be used for energy efficiency, energy conservation or demand response programs), to date a few awards have been made that support sustainable energy. The Plymouth Area Renewable Energy Initiative received $99,250, which provided support for community-based solar hot water installations, and grants have paid for wood pellet boilers at New England College and the Gorham Fire Department. Ongoing support for sustainable energy from this fund is likely to be similarly limited under current plans.

New Hampshire received funding through ARRA that includes support for sustainable energy along with energy efficiency projects. As of mid-2011, about a dozen projects have included renewable energy components. All of the ARRA-funded programs will expire in 2012.

Recommendations

At the current stage of New Hampshire's markets, further development based on investment in sustainable energy will not occur at the levels necessary to benefit the state without a long-term, permanent source of funding to support market development activities. The RPS-compliance-funded Renewable Energy Fund represents the only current long-term public funding source for sustainable energy in the state. As discussed below, however, the RPS is a complex instrument, and getting the structure exactly right to encourage multiple goals, provide clear signals to the market, and generate funds for investment is challenging.

- **Establish stable, long-term sources of funding for public support of sustainable energy investment:** The establishment of a permanent, long-term funding source for sustainable energy investment is recommended, to serve as leveraged funding through the mechanisms currently in place and for the enhancements discussed in this section. This will be critical to the ability of the state to undertake activities in compliance with the general sustainable energy policy recommended above. With a more-stable source of funding, the REF can plan market-dynamic incentive structures (that decline in response to market growth) that will catalyze New Hampshire resources and help insure that the state's resources and businesses participate in and benefit from meeting the RPS targets. Suggestions for funding opportunities include:
    - Allocating a portion of an increased **System Benefits Charge,** to include assessments from all ratepayers, to the REF

- **Earmarking portions of the GHGERF**, particularly for thermal generation technology support
- **Allocating Forward Capacity Market** proceeds from either the utilities' activities or from aggregated activities of state programs. Given the current oversupply in this market, this is unlikely to provide a substantial funding source but should be considered as appropriate.
- Certain cost-effective sustainable technologies (solar hot water, for example) could become **eligible measures under energy efficiency programs**

7.4. Framework: New Hampshire's Electric Renewable Portfolio Standard

Renewable Portfolio Standard Structure

In New Hampshire, the Electric Renewable Energy Portfolio Standard (RPS) provides the current primary mechanism for sustainable energy goals and market development. Many other states use a Renewable Portfolio Standard to spur economic investment in sustainable energy. Currently, 29 states and the District of Columbia have an RPS in place, and an additional 8 have non-binding renewable energy goals. Seventeen of these jurisdictions have specific requirements for solar investment (set-asides or multipliers).[7] Combined, these RPS requirements now apply to ~ 56% of the total retail electric sales in the US.[8] If achieved, these requirements together are expected to contribute to the attainment of roughly 71-88 GW of new sustainable energy capacity by 2025[9] and provide a substantial drive toward the increased investment that will result in lower costs and a more-fully developed sustainable energy market.

In 2007, the New Hampshire Legislature enacted RSA 362-F, which established an Electric Renewable Portfolio Standard (RPS) as the cornerstone of its sustainable energy support framework. The objectives of this RPS legislation are to:

- Promote resources that serve to displace and thereby lower regional dependence on fossil fuels;
- Support New Hampshire's economy;
- Improve air quality and public health; and
- Mitigate against the risks of climate change[10]

As a fundamental characteristic of this type of mechanism, this RPS has a dual role, to both:

- Codify sustainable energy **goals** by requiring electric service providers to acquire set percentages of their power from sustainable sources; and
- Seek through this requirement to **drive economic investment** in sustainable energy.

New Hampshire RPS goals are prescribed through its multi-class structure:

[7] DSIRE http://www.dsireusa.org/summarymaps/index.cfm?ee=1&RE=1. Solar hot water is an eligible RPS technology in 14 states and qualifies toward the solar provision in 6 of the states with solar set-asides.
[8] The Status of State RPS Efforts-Observations & Trends, Clean Energy States Alliance presentation to NH 2011 RPS Review Meeting, 2/14/2011
[9] The Status of State RPS Efforts-Observations & Trends, Clean Energy States Alliance presentation to NH 2011 RPS Review Meeting, 2/14/2011
[10] Minutes of the 2011 RPS Review Meeting, 4/21/11

- **Class I:** New sources of renewables (wind energy; geothermal energy; hydrogen derived from biomass fuel or methane gas; ocean thermal, wave, current, or tidal energy; methane gas; or biomass; displacement of electricity by end-use customers from solar hot water heating systems; incremental new production from Class III and IV sources; and existing hydropower and biomass facilities that began operation as a new facility through capital investment)
- **Class II:** New solar
- **Class III:** Existing biomass/methane facilities that meet certain emission criteria
- **Class IV:** Existing small hydroelectric facilities (≤ 5 MW) with installed upstream and downstream fish passageways

In 2005, 2.3 million megawatt hours of electricity was generated from renewable energy facilities, including hydroelectric, biomass, and landfill gas power plants, with a combined generating capacity of 576 megawatts. This equaled 10 percent of the total electricity generation and 20 percent of the total retail electricity sales in New Hampshire in 2005.[11] Much of this renewable generation is from large hydroelectric facilities that do not qualify for the RPS.

Each year, providers of electric service must meet a certain minimum percentage of the load they serve with renewable resources from these four classes. These requirements grow over time, to result in an overall target that 23.8% of the state's electricity must come from qualifying renewable energy by 2025, with 16.3% of that requirement being met by new renewable energy resources (in service after January 2006). There are technology minimum targets for new solar electric (0.3% - equivalent to ~30MW) by 2014, existing biomass (6.5% by 2011), and existing small hydroelectric generation (1% by 2009).

It is the stated intent of the RPS enabling law that these goals will be met through economic investment:

> "It is therefore in the public interest to stimulate investment in low emission renewable energy generation technologies in New England and, in particular, New Hampshire, whether at new or existing facilities."[12]

However, electric service providers may meet their requirements in one of three ways:

- Through direct investment in eligible renewable projects;
- Through the purchase of Renewable Energy Credits (RECs, where 1 REC is equivalent to 1 MWh of energy production from a sustainable source) from projects undertaken by others; or
- By payment of an Alternative Compliance Payment (ACP).

The primary purpose of the ACP is to provide a cap on the price necessary to comply with the RPS requirements – if the price of investment in the given technology is too high, the electricity service provider may pay the ACP rather than undertake a project or purchasing RECs. In New Hampshire, any ACPs collected provide funding to the state's Renewable Energy Fund (REF), which is then used to fund additional sustainable energy investment.

Renewable Portfolio Standard Performance

In 2009, New Hampshire electric service providers met the majority of their RPS requirements by acquiring RECs, rather than making ACPs. Because of an excess supply of RECs, most of the electric

11 http://www.gencourt.state.nh.us/legislation/2007/HB0873.html
12 RSA 362:F

service providers also banked low-cost RECs toward future compliance. Many sources for the RECs used are not from investment in NH:[13]

- Class I: 63% of total supply is out-of-state;
- Class II: 95% of total supply is out-of-state;
- Class III: 48% of total supply is out-of-state; and
- Class IV: 96% of total supply is out-of-state.

ACP payments decreased from 2009 to 2010 because of greater market supply and, consequently, the lower cost of Class I and Class III RECs. The price of Class I and Class II RECs even fell below the price of Class III and Class IV prices, creating a situation in which RECs produced by existing renewable generation facilities are more valuable than those associated with new renewable power installations. This means that at this point in time, the regional market for Class I and II is oversupplied and new investment is occurring at only low levels, while supply of eligible Class II and IV facilities is in undersupply.

There are some who predict that this situation will reverse in the near future, as RPS compliance goals in other states as well as New Hampshire ramp up and require a much higher level of investment, driving REC prices to levels where new project investment becomes feasible. The figure below (Figure 7.1) provides a snapshot of regional demand and supply from RPS requirements by 2015. If trends hold, renewable energy deficits are projected for New England, New York, and other regions as the RPS requirements ramp up. Thus, by that time, RPS requirements will lead to increased demand for new supply; if the market conditions are not conducive to new supply, then compliance through ACP will become the default. Predicting exactly when and how fast this will happen is a challenge. Until it does, sustainable energy investment in New Hampshire may remain sluggish, especially since the RPS is the only major investment mechanism currently in place.

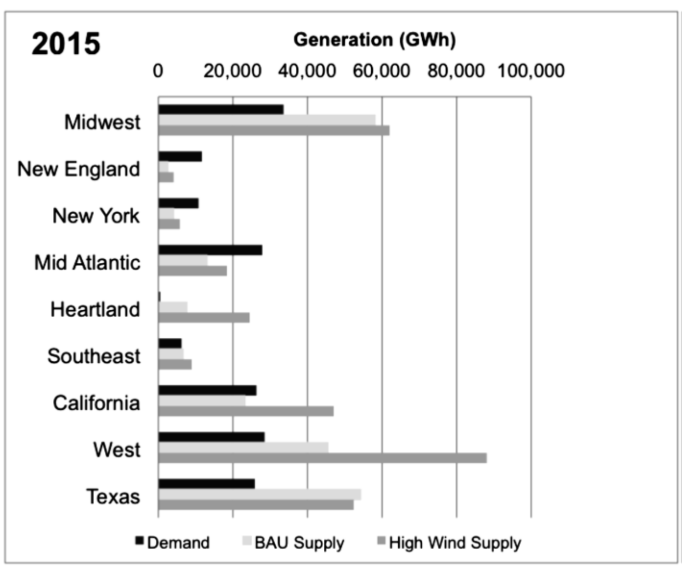


Figure 7.1. Snapshot of Regional Demand and Supply under RPS in 2015[14]

[13] http://www.puc.nh.gov/Sustainable%20Energy/RPS/2011%20RPS%20Review%20Kick-off%20Presentation %202-13-11.pdf
[14] Bird et. al, NREL 2010, Technical Report 6A2-45041

2011 RPS Stakeholder Review Process

In January 2011, the New Hampshire Public Utilities Commission convened a stakeholder process to review the current structure of the RPS. The statute convening this review (RSA 362-F5)[15] identifies the following issues to be reviewed:

I. The adequacy or potential adequacy of sources to meet the class requirements;
II. The class requirements of all sources in light of existing and expected market conditions;
III. The potential for addition of a thermal energy component to the electric renewable portfolio standard;
IV. Increasing the class requirements relative to classes I and II beyond 2025;
V. The possible introduction of any new classes such as an energy efficiency class or the consolidation of existing ones;
VI. The timeframe and manner in which new renewable class I and II sources might transition to and be treated as existing renewable sources and if appropriate, how corresponding portfolio standards of new and existing sources might be adjusted;
VII. The experience with and an evaluation of the benefits and risks of using multi-year purchase agreements for certificates, along with purchased power, relative to meeting the purposes and goals of this chapter at the least cost to consumers and in consideration of the restructuring policy principles of RSA 374-F:3;
VIII. Alternative methods for renewable portfolio standard compliance, such as competitive procurement through a centralized entity on behalf of all consumers in all areas of the state; and
IX. The distribution of the renewable energy fund.

Other legislative activity related to the RPS in recent years includes a legislative committee established in 2010 to study methods of encouraging the installation and use of small-scale renewable energy resources by homeowners and businesses in the state.[16] In addition to considering direct mechanisms to encourage investment in such small-scale systems, the Committee made a number of recommendations for modifications of the RPS law. In response to one of these, a bill was introduced in the House in 2011 to transfer all Class II (new solar) RPS compliance obligations from electricity suppliers to distribution utilities.[17] It is expected that such a change would result in a greater proportion of these RECs used to satisfy RPS requirements would come from distributed sources that are interconnected with the electrical distribution systems in the state.[18]

Recommendations

The list of items identified by the RPS study group above confirms the complexities of fine-tuning any RPS to a state's underlying policy and goals. Presented below are recommendations for New Hampshire based on research and assessment conducted during this independent study, and VEIC team experience in other jurisdictions with well-developed and successful sustainable markets (New Jersey and New York, for example). These recommendations may help inform the work of the RPS study work in the future.

[15] RSA 362-F:5 requires the PUC to review elements of RPS in 2011, 2018, and 2025, and report to the Legislature by November 2011 on those recommendation
[16] HB 1377, Chapter 229:3, Laws of 2010
[17] HB 311-FN: currently in review in the House Science, Technology, and Energy Committee
[18] Final Report of the Committee to Study Methods of Encouraging the Installation and Use of Small Scale Renewable Energy Resources by Homeowners and Businesses (HB 1377, Ch. 229:3, Laws of 2010) http://www.gencourt.state.nh.us/legislation/2007/HB0873.html

- **Require at least some investment to be made locally:** This could include structures such as that proposed in HB 331-FN (focusing RPS requirements on distribution utilities) or other mechanisms for narrowing geographic eligibility to benefit New Hampshire development. Care should be taken to choose options that allow the retention of state-specific benefits of the RPS without running afoul of the Commerce Clause. A recent Clean Energy States Alliance report addresses this issue in detail.[19] For example, the fact that in-state interconnection may allow additional benefits to ratepayers by avoiding distribution and transmission charges or costs that might otherwise be incurred may provide sufficient justification for such actions. It should be noted that other states such as Massachusetts and Maryland have special solar requirements that restrict eligibility to production occurring within their own states.

- **Consider all mechanisms to support a fuel-neutral RPS:** Providing incentive for investment in thermal as well as electric efficiency is important in a state such as New Hampshire with a preponderance of non-electric heating and large potential for higher-efficiency technologies that incorporate renewable fuels. Mechanisms could include a single class RPS with one REC market, with REC multipliers to recognize different technologies and higher efficiency technologies; an additional Class requirement for thermal energy technologies; or an alternative portfolio standard program, which could be paid for through charges more-directly related to thermal technologies, such as on regulated fuel ratepayers and unregulated fossil fuel commodities. There are pros and cons to each of these options that should be part of the conversation of the RPS study group.

- **Improve the process for, and encourage distribution utilities to conduct competitive procurements** for long-term contracts for RECs from facilities that are interconnected and feed power into their distribution system (including net-metered facilities).

- **Allow co-firing of generation with renewable fuels** to qualify for RECs if appropriate projects arise.

- **Continue facilitating the aggregation of smaller projects** (through net-metering) to lessen transaction costs of measurement and participation in REC markets, including streamlined means of aggregating and computing RECs by utilities and other aggregators. This will help assure that projects funded through programs supported by the ACP-funded REF will in turn create RECs to support the RPS.

- **Allow appropriate costs of purchasing RECs to be recovered by utilities** as part of distribution rate charges to all customers. This would recognize the benefits to all customers from avoided transmission charges and incremental distribution system capacity upgrades.

- **Establish new, higher Alternative Compliance Payment levels** for some or all RPS classes, followed by a scheduled ramp-down of ACP levels. The ACP is an important design element for an RPS, serving two major functions:
    - To provide a cap on the investment needed to ensure compliance with the RPS requirements in any given year, and
    - To provide a tool that can help define the value of investment in the given market.

While the ACP can provide a source of funds for investment by the state, which uses collections from

[19] The Commerce Clause and Implications for State Renewable Portfolio Standard Programs, Clean Energy States Alliance, 2011.

ACPs to fund sustainable energy programs, this function is secondary and should not drive the design of effective ACP levels. (One measure of success for an RPS program is that sufficient RECs are available in the market such that electric service providers do not need to use ACP payments for compliance.) Using ACP collections as the primary funding source for program-level investment in the state constrains the ability of the ACP level to help shape market development. As such, New Hampshire should look elsewhere for its main source of program funding (see Section 7.3. for recommendations). A review of elements to consider when setting new ACP levels is provided below.

- **Design a schedule for subsequent lowering of the ACP** as markets develop and prices fall

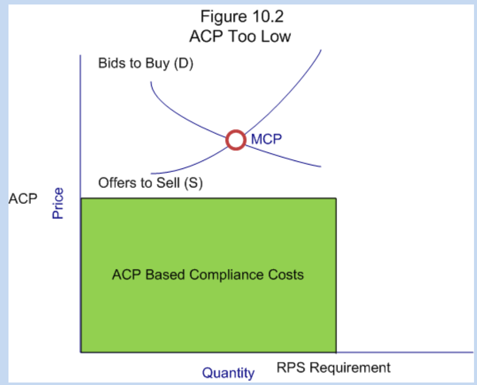
7.5. Framework: Sustainable Energy Regulatory and Permitting Infrastructure

Current Regulatory and Permitting Infrastructure

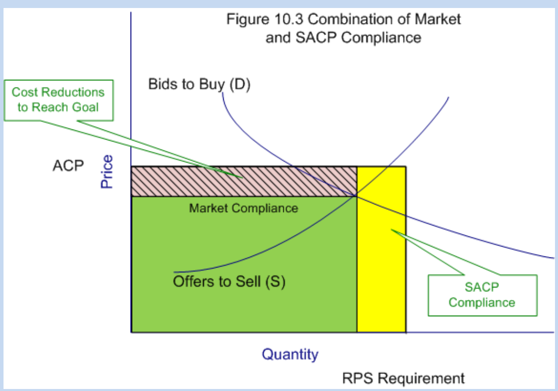
While the RPS currently serves as the overarching policy and regulatory signal for stimulating growth of sustainable energy in New Hampshire, the regulatory and permitting framework (or infrastructure) in the state includes a number of impressive approaches that provide support for investment. The framework includes a number of foundational strategies that are required for healthy market development. Such strategies, if absent or not structured effectively, can seriously undermine expenditures and initiatives at other levels. These foundational elements also provide support over a long time. For example, as markets mature and develop, the need for various incentives and other public financial initiatives may diminish over time – while the importance of sound net metering, interconnection policy and infrastructure, and permitting practices are more enduring. The table below summarizes the current regulatory and permitting infrastructure relevant to sustainable energy currently in place in New Hampshire. Many of these have been reviewed and strengthened in recent years.

How Well-Designed ACP Levels Can Influence Market Development

Current REC market prices represent the value of sustainable energy development to date. In general, New England REC markets have seen an increase in the supply of RECs as a result of investment in New England and New York – resulting in REC prices for all NH RPS classes that are nearly all below the current NH ACP levels. This means that, in the current market, the ACP is not a driving factor in any of these markets. This also means that at this point in time, new investment is occurring at only low levels.

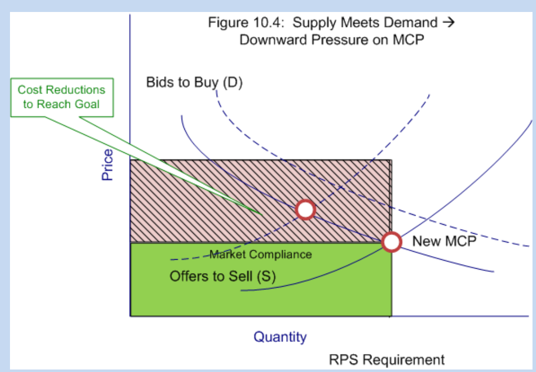


In open markets such as these, at any given price, sustainable energy project developers determine the level of supply they can offer, and buyers (who must meet RPS requirements) have a certain demand for projects at that price. The market competitive price (MCP) is defined at the intersection of the price of supply and demand – Figure 7.2. shows this relationship in a simplified micro-economic representation of a solar market. In the case illustrated here, it is assumed that the overall demand for sustainable energy has outpaced the ability of developers to provide low-cost projects; the MCP is higher than the ACP shown. Such a scenario might be expected if the strong demand driven by the ramp-up in RPS requirements in NH and the region over the next few years requires a much higher level of investment, driving prices up, and the NH ACP remains at its current low level.



In this case, because the ACP is lower than the cost of investing in new projects (that is, of purchasing RECs), paying the ACP is the least-cost option for compliance, and the entire RPS requirement is met by paying the ACP. Thus, setting an ACP too low does not encourage direct market investment. Any new investment in this scenario would have to come from the state spending the ACP proceeds on projects designated to be funded through its programs.

Figure 7.3. shows the situation when the MCP is below the ACP and market supply at the MCP is lower that the level of investment required by the RPS. In this case, buyers invest in projects up to the supply available at the MCP, and then have to make ACP payments for the rest (developers will not sell projects for prices above the MCP). RPS requirements are met through a combination of market activity and ACP payments. Thus, as markets begin to develop, having an ACP level above the MCP stimulates investment.



In the ideal situation, all compliance would be met with investment rather than ACPs. Buyers are indifferent as to whether they meet compliance with investment or ACP payment – they will comply at the lowest price – but sellers would rather have buyers invest than have them pay compliance payments. Thus, once the market is moving, setting the ACP such that it is always just a bit lower than the MCP motivates sellers to lower their prices to drive business (Figure 7.4.). Therefore, a planned schedule of ACP level reductions can drive the market toward lower prices. Of course, this works best with perfect prediction of the sellers price point, but clearly communicated level reductions can stimulate this market behavior.

Recommendations

- **Increase the current ACP level in the short term** to be prepared for the predicted increase in investment costs (and therefore REC values) that will come with the ramp-up of regional RPS requirements. Setting the Class II ACP level at $250/MWh, for example, could provide the needed stimulus with a total revenue impact of only 0.51%

Table 7.1. Current Regulatory and Permitting Infrastructure in New Hampshire

Strategy	Date Current Authority Effective	Key Characteristics

Interconnection Standards & Net-metering Rules	September 2011[20]	• Standard interconnection application – simplified standards for inverters sized up to 100 kVA
		• Customer-generators shall be responsible for all costs associated with interconnection with the distribution system
		• New project size limits for net-metering:
		  ○ Small systems: up to 100 kW
		  ○ Large systems: up to 1 MW
		• Aggregate capacity: 50 MW state-wide (allocated to utilities as a % of annual peak demand for each)
		• Net excess generation rolled over or payment for credit can be requested
		• Allows third parties to own facilities
		• PUC recently updated net-metering rules (Docket 10-216)

Local Ordinances: Renewable Energy Policy	2008	• The installation of [RE] shall not be unreasonably limited by use of municipal zoning powers[21] • Zoning ordinances shall be designed to encourage the installation and use of solar, wind, or other renewable energy systems[22]
Solar Easements	1985[23]	• Allows property owners to create solar easements
Small Wind Permitting Standards and Model Ordinance	September 2009[24]	• Prevents municipalities from adopting regulations that place unreasonable limits or hinder the performance of small wind energy systems, defined as 100 kW or smaller • Model ordinance provides guidance to local governments that wish to develop their own siting rules for wind turbines[25]
Local Option Property Tax Exemption	January 1976[26]	• Permits cities and towns to offer exemptions from residential property taxes for PV, SHW, small wind, and central wood-fired heating systems • As of 9/2010, 84 cities and towns (of 234 total) have adopted • Cities that have adopted this option are not consistently applying exemptions in a way that provides appropriate incentives to the industry
Environmental Disclosure	2010[27]	• Providers of electricity must provide information to customers on the sources of their electricity • PUC finalizing rules (Docket 10-226)
Green Service Option	2009[28]	• Requires regulated electric distribution utilities to offer one or more renewable energy source options • PSNH, Unitil, & Nat'l Grid now offer options • NHEC voluntarily began a Green Service option in 2010

[20] RSA 362-A; N.H. Admin. Rules, PUC 900
[21] RSA 672:1, III-a
[22] RSA 674:17, I (j)
[23] RSA 477:49 et seq.
[24] RSA 674:62 et seq.
[25] RSA 4C:5a; http://www.nh.gov/oep/resourcelibrary/swes/documents/technical_bulletin.pdf
[26] RSA 72:61 et seq.
[27] RSA 378:49
[28] RSA 374-F:3, V(f)

Strategy	Date Current Authority Effective	Key Characteristics
Utility Distributed Energy Resources Rules	September 2008[29]	• Provides an exception to the general rule – that utilities cannot build new generation – for DG of ≤ 5 MW • One Unitil project approved to date[30] • Difficulties encountered in the implementation of this rule • Future for distributed generation is uncertain
Energy Facility Evaluation, Siting, Construction and Operation	2007, 2009	• Established the Site Evaluation Committee process for the planning, siting, and construction of electric generation facilities • Objective: to resolve environmental, economic, and technical issues in an integrated fashion • Establishes time frames for review of renewable energy facilities
SE Industry Recruitment and Support – Green launching Pad	2010	• Partnership between the NH OEP and the University of New Hampshire • Supported by ARRA funds, the GLP has allocated a total of $1.5 million to 11 green manufacturing companies in the state, to bring new green products to the market and create jobs

This set of regulations and guidelines lays the foundation for the implementation of sustainable energy projects and provides the opportunity for the development of a robust sustainable energy market in New Hampshire. Allowing systems up to 1 MW to participate in net metering provides opportunity for substantial load offset at customer sites. The increase in the statewide net-metering limit to 50 MW is admirable and should not represent a constraint on the utilities in the near future, as the current net-metered capacity is just over 2 MW.[31] Solar easements, requirements for sustainable energy opportunity in local ordinances, and permitting standards and model ordinances for small wind installations provide helpful and necessary guidance for sustainable energy support at the local level, as well.

Recommendations

New Hampshire can continue to lay the foundation for further development of its sustainable energy markets by taking the actions discussed below. While some may appear to be small and incremental changes, such enhancements can combine to significantly ease barriers to development through limiting the costs of red tape. In addition, some are fairly innovative; this level of public infrastructural support is likely to be required to move markets to the level necessary to meet New Hampshire's stated goals.

An important implicit component of each of the following is a **high level of transparency and effective communication**. All government agencies should be required to clearly communicate about these issues, including individually identifying the details of all fees and taxes assessed, issuing clarifying letters and FAQs, and taking care that all decision-making is as transparent as possible.

- **Further expand net metering opportunities:** Net metered projects can significantly help to displace centralized utility-scale facilities by allowing customers to generate their own electricity for use on site. By reducing regulatory barriers and targeting incentives for these "self-generation" projects, New Hampshire can make it more viable for these privately funded projects

[29] RSA 374-G
[30] PUC Order No. 25,201
[31] NH REF Annual Report for 2009 (Oct. 1, 2010)

to come on line. The options listed below stretch the current thinking about the contribution of customer-sited generation and should be considered as part of a thorough review and development of a coordinated state energy policy that considers energy efficiency measures, thermal energy programs, and renewable energy production.

- Consider **retiring the current net-metering capacity cap** of 100 kW (1 MW for large systems) in favor of **an unlimited cap based on individual customer on-site use**. This would more nearly address the general intent of those who wish to generate their own energy, and allow large load customers to net meter all or a large part of their entire electric load. This should be done in the context of a coordinated state energy policy that considers energy efficiency measures, thermal energy programs, and renewable energy production.
- Additional enhancements include **expanded net metering by allowing meter aggregation** for multiple systems at different facilities on the same piece of property owned by the same customer. Some states now allow "virtual" meter aggregation, where certain customers can net meter multiple systems at different facilities on different properties owned by the same customer.
- **Implement a time-of-use (TOU) tariff for net-metered electric customers**. A TOU tariff for net metering is already allowed but not yet implemented. While this option could be economically beneficial for owners of sustainable energy systems in many situations (particularly solar PV), it has proven difficult to design TOU tariffs that actively promote renewable generation. In some cases, the demand charges built into a TOU tariff are excessively high.

- **Provide support for community-scale endeavors:** Community-scale planning and development is becoming one of the most-effective channels for investment in energy efficiency and sustainable energy – for example, community solar or biomass-fueled district energy projects. These efforts are often targeted to a specific market niche or geographical location, and can be designed to draw attention and create more market buzz for relatively smaller initiatives and budgets. In addition, community-centered projects can tap into the economies of scale found in larger projects, and provide an opportunity for a broader base of consumers, including renters and those whose properties are not suitable host sites, to participate in sustainable energy investment. Support at the state level for policies and standards that encourage such community investment can include:

    - Expansion of net-metering rules to include **group net-metering for community sustainable energy projects:** Community net metering, or "neighborhood net metering," allows for the joint ownership of a sustainable energy system by different customers.
    - **Regulatory provisions to support district heating**, such as those that allow hot water to be distributed across property lines through district grids
    - Structural support for and facilitation of **customer aggregation programs** – group purchases, or "aggregation" programs, reduce the up-front cost of solar installations by giving groups of individuals or businesses a discounted rate for bulk purchases.
    - **Community-targeted outreach and education** to support community-scale projects.
    - **Enhanced support for municipal bonding for community-scale projects**

The current excitement generated by the state's 150+ local energy committees can be tapped to provide input and the launching pad for such community-scale sustainable energy projects and provide local policy interface, such as planning, land use development, zoning, and economic growth practices.

- **Streamline permitting as appropriate:** In general, customers indicate that the "hassle factor" of sustainable energy development can be more of an obstacle to undertaking a project than the up-front costs. In addition, excessive permitting requirements add real costs to project development. For example, a recent study[32] finds **that inefficient local permitting and inspection processes can add as much as $0.50/ W, or over $2,500 in total, to the cost of a residential photovoltaic installation**, and that streamlining the often cumbersome process would provide a $1 billion stimulus to the national solar industry over the next five years. These extra costs come from excessive fees, unnecessarily slow processes, and wide permitting variations not connected to safety. Ideas for addressing these inefficiencies are given below.
    - To address such issues, the State of Vermont recently enacted an **innovative solar registration process,** to replace permitting for small-scale projects (< 5kW), that allows solar customers to install a system 10 days after completing a registration form and certificate of compliance with interconnection requirements.[33] This 10-day window allows the utility time to raise any issues concerning the interconnection; otherwise a Certificate of Public Good is granted and the project may be installed.
    - In Colorado, state permit fees more than doubled last year, and local fees and processes vary widely by region; in some communities, government permit costs exceeded the labor costs to install a solar system. The recently enacted Fair Permit Act[34] now **prevents state and local government agencies from charging excessive permit fees** and plan review fees to customers who are installing solar electric or solar thermal systems. The legislation extends existing caps on solar permit fees through 2018 and closes loopholes to further reduce costs. The Act does not just apply to permit fees; it also applies to plan review fees and other fees to install a solar electric or solar thermal system.
    - Permitting incentives can also **reduce or waive local building permit fees**, plan-checking fees, design review fees, or other such charges that residents and businesses normally incur when installing a sustainable energy system. While permit fees are set locally, states can establish standards for permit fees for municipalities and counties. Simple systems such as **giving priority to processing permits for sustainable energy projects,** or reimbursement of fees, can also help moderate the high transaction costs of development. This may be particularly effective for motivating more-aggressive projects, such as Green Building or Net-Zero projects.

- **Expand uniform standards and model ordinances** to technologies other than wind – By adopting energy ordinances, local governments have the ability to affect energy siting decisions on all energy projects and facilities proposed within the local jurisdictions. By providing guidance on land use ordinances that address energy development, the State can support cities and counties to establish public policy that will apply not just to locally regulated projects, but also to all energy development within the local area. In addition, uniformity in planning and zoning requirements results in savings in sustainable energy.

[32] The Impact of Local Permitting on the Cost of Solar Power, SunRun, Jan. 2011 www.sunrunhome.com/permitting
[33] Vermont Energy Act of 2011 (H.56)
[34] Colorado Fair Permit Act of 2011 (HB-1199)

- **Lead the state-wide conversation on sustainable energy development siting:** Undertake appropriate studies to identify all public lands that are viable for wind projects, and identify unique public and private lands that should be off limits. Provide leadership in the state-wide conversation on land use planning and urban design in support of sustainable energy siting.

- **Support third-party leasing and Power Purchase Agreement (PPA) structures for sustainable energy investment:** Such ownership structures are critical to encourage investment for customers who cannot take advantage of tax credits or wish to avoid the risks in future savings from sustainable energy projects. They help to defray up-front costs and provide predictable future savings. It is important that there are no regulatory or policy structures in place that constrain this development model.

- **Develop sustainable energy industry contractor licensing and certification standards:** Developing quality and competency standards for sustainable energy professionals and training programs helps build a strong, reliable, and capable workforce and contributes to the appropriate development of these markets. State workforce systems should seek to link local credentials to developing national standards, where they exist, and states can work with regional industry partnerships to develop skill standards.[35]

- **Incorporate sustainable energy into building standards guidelines, support, and codes:** Interest in Green Building and Net Zero construction continues to grow. Ramping up codes and requirements to these levels will require significant technical assistance and subsidies over the next decade. Consider putting intermediate standards in place by requiring "Renewable energy ready" or "Net-Zero ready" building.

- **Provide Leadership by Example at the state level:** State facilities, typically designed for a 40- to 60-year life, are prime candidates for long-term energy planning. Increasing capital costs to reduce yearly operating costs is sound fiscal management. Integration of coordinated energy efficiency and sustainable energy practices into state building projects and state operating procedures will broaden the market for these products and services; stabilize the state operating budget over the long term; and provide highly visible publicity on the value of energy planning and investment. Consider adopting policies to support such investment, including:
  - **Sustainable energy goals for state government buildings and operations,** including direct project investment and REC purchases
  - **Sustainable energy or sustainable energy-ready standards** for new public buildings
  - Policies that encourage or require the **coordination of energy efficiency and sustainable energy into energy decision-making** for government buildings and operations
  - **Policy for state departments to retain some of the cost savings they achieve** from their energy efficiency/ sustainable energy improvements
  - **Green power purchasing** for government buildings

  The State should also encourage similar Lead-by-Example policies and practices at all levels and categories of government in New Hampshire, including counties, municipalities, village precincts, and school districts. The recent Executive Order Number 2011-1 is an important next

[35] Greener Skills: How Credentials Create Value in the Clean Energy Economy, Sarah White, Center on Wisconsin Strategy, 2010. http://www.cows.org/pdf/rp-greenerskills.pdf

step in further advancing energy efficiency and sustainable energy use in State Government buildings and the State's vehicle fleet.

- **Expand green industry recruitment and support, including manufacturing incentives:** New Hampshire's Green Launching Pad, funded with ARRA support, encourages innovation in the sustainable energy sector through technology grants, incubators, and support for clean small business development. To date, this project, a partnership between the state and the University of New Hampshire, is working well to help innovative green companies bring new products to the market and realize the economic benefit of in-state technology development and local jobs. Finding continued funding for this program should be a priority, and steps have been taken to assure its continuance. Recognizing the impact and importance of the program, OEP has made the identification of future funding for the Green Launching Pad a priority in its agreement with UNH.

  Additional methods for supporting such green investment include providing economic development support to new sustainable energy companies who want to locate in New Hampshire and businesses that have sustainability as part of their corporate mission, and providing enhanced rebates for projects that use New Hampshire-manufactured products.

- **Be ready for sustainable energy's contribution to transportation-related infrastructure:** Prepare for the implementation of smart grid technology coordinated with the use of sustainable energy sources to produce electricity that can power the transportation sector with electric plug-in vehicle technology and increases in public transportation. As a first step, the State is currently participating in a multi-state effort to prepare for electric vehicle infrastructure through the Dept. of Environmental Services.

7.6. Framework: Financial Support Mechanisms for Sustainable Energy Development

In New Hampshire today, the RPS remains the only major mechanism for driving investment in sustainable energy projects. In addition to direct investment by the utilities to meet RPS requirements, the RPS compliance-payment-funded REF provides direct incentives for small customer-sited projects and a competitive solicitation grant program with funds generated from RPS compliance payments (information on these programs is provided in Table 7.3.).

Recommendations

- **Expand the current portfolio of investment support mechanisms –** Many states have found that developing a broad portfolio of funding mechanisms that support investment, each designed to target different goals and/or different components of the market, provides an effective strategy to drive investment. The following table provides a review of additional common investment incentive structures used in other jurisdictions, summarizes when each of these is likely to be a "good fit", and suggests factors to consider when choosing between one or more of these strategies. These additional forms of support are recommended for further consideration in New Hampshire.

Table 7.2. Major Financial Support Mechanisms for Stimulating Sustainable Energy Investment

Investment Incentive Mechanism	A Good Fit When…	Factors to Consider
Direct Rebates	Earlier stage markets – beginning to build market awareness and political support	• Relatively simple, can be smaller scale, and can start up relatively quickly • Good for high levels of interest in similar projects: can apply a "cookie cutter" approach to providing support • Can be designed to respond to market conditions and to target specific markets • Can be a good complement for other financial incentives • Can be difficult to set at optimum levels
RPS with Set-asides for Certain Technologies	States have political commitment to establish longer-term goals and requirements	• Early stage markets need to ramp up targets at reasonable pace • More complicated than rebate; high transaction costs for small projects • Incentivizes good system performance; relationship to other eligible resources and RPS markets, and rules in neighboring states • Places more risk on market actors than other strategies • Incentive levels can be capped (at % maximum rate impact) but since compliance costs will be determined by market dynamics, the budget commitment is less certain in comparison to rebates
Tax Incentives	Desire to provide financial incentive without "program infrastructure"	• Does not address upfront costs • Based on % of installed cost; may not promote market competition or system performance • Does not rely solely on rate-payer funds as many other options do; funded rather by taxpayers • Provides support to "healthy" businesses; not available for non-profits, government entities, etc. • Can be very difficult to budget for - commitment is uncertain • May not be viable if large tax burdens do not exist
Feed-In Tariff or Standard Offer	Confidence exists in ability to determine correct cost-based price for tariff Willingness and ability to commit to development associated with a fixed price Interest in rapid and visible project development	• Can be applied in early and more-mature markets • Need to be designed carefully to avoid oversubscription • Auctions or other mechanisms may be needed to encourage competition and price reductions • Unless pricing mechanism is "perfect", will not necessarily result in the most-cost-effective projects • Can use various bases for setting prices

Investment Incentive Mechanism	A Good Fit When…	Factors to Consider
Sustainable Energy Adders	Earlier stage markets – beginning to build market awareness and political support	• Provides payment of a set amount above retail rate for net-metered production over use • Encourages small net-metered systems; helps address return needed for investment
Competitive RFP	Earlier stage markets – beginning to build market awareness and political support	• Can be applied in early and more-mature markets, and can be a good complement for other mechanisms • Allows review to assess and fund the most-cost-effective projects • Allows targeting specific characteristics (low-income projects; specific technologies) • Can be structured to fund over time according to performance
Financing Mechanisms	All markets	• Provides additional mechanism for addressing up-front cost barrier • Discussed in detail in Chapter 10 of this report

- **Incorporate effective design principles –** Regardless of which strategies are selected, financial support mechanisms are most effective when they meet as many of the following criteria as possible:

- **Provide sustained long-term funding –** Incentives that create stop-and-start market conditions are detrimental to business development, consumer awareness, and confidence.

- **Are market responsive and dynamic –** Incentives need to encourage competitive pricing behavior and price declines as the market grows. Static or overly generous financial support can slow or halt continuing progress towards lower prices and full market development.

- **Include transparent and efficient incentive rules, requirements, and procedures –** It is important to maintain appropriate requirements and oversight based on the stage of market development. Early stage markets – or markets that are expanding rapidly with many new entrants – require greater oversight. Administrative requirements can be streamlined as volumes increase and the market matures.

- **Provide solid market information –** Transparent and frequent communications on financial incentives and market growth help stakeholders –investors, contractors, owners, legislative and regulatory sponsors – understand and plan activities that will help sustain development.

7.7. Framework: Customer-sited Sustainable Energy Rebate Programs

The New Hampshire Public Utilities Commission is the state entity currently authorized to administer the Renewable Energy Fund and to use allotted portions[36] of the fund to establish and administer small-scale

[36] Allocated from the REF, as determined by the Commission to the extent funding is available up to a maximum aggregate payment of 40% of the fund over each 2-year period commencing July 1, 2010; RSA 362-F: 10

sustainable energy rebate programs, as well as to issue competitive RFPs for larger systems. The following table provides an overview of the current program support available for customer-sited renewable energy projects through the PUC, as well as the New Hampshire utility programs currently available.

Table 7.3. Current Programs for Customer-sited Sustainable Energy

Provider	Funding	Program Sector / Type	Start Date	Budget to Date	Key Characteristics
NH PUC	REF	Residential PV/ Small Wind	Sept 2009	$2,760,000	• Heavy demand • Incentive level & maximum rebate reduced in 9/2010 • Currently fully subscribed • Funding level for 2011 uncertain • Max size 5kW (PV and wind)
NH PUC	REF	Residential Solar Hot Water/ Space Heat	April 2010	$500,000	• Strong interest • Operates as a single program from customer perspective • REF funds tiered by system size • ARRA flat rebate; level increased in 11/2010
	ARRA	Residential Solar Hot Water		$496,000	
NH PUC	REF	C&I PV/ Solar Thermal	Nov 2010	$1,000,000	• Strong interest • Lower incentive level than residential program • Requires EE audit first
NH PUC	ARRA	Residential Wood Pellet Boiler/ Furnace	April 2010	$450,000	• Slow start • Some changes made to requirements due to equipment limitations
NH PUC	REF	Competitive Grants for Large-Scale SE Projects	RFP issued Feb 2011	$1,000,000	• All RPS technologies eligible, except PV/solar thermal eligible for C&I program above
NHEC	NEHC	Residential Solar Hot Water	2007	$418,500	• Rebates decreased in 2010 from 25% of cost to $750 in response to State program • Accepting reservations for 2011 • Successful collaboration with PAREI
PSNH	CORE	Residential Ground source Heat Pumps	Ongoing	NA	• Part of EE Home Performance and New Construction programs
NHEC	CORE	Residential Ground source Heat Pumps	Ongoing	NA	• Part of EE Home Performance program

While most of the programs listed above are fairly new, reflecting the relatively recent establishment of the REF, they are well designed and have stimulated clear interest. Discussion of the details of program design, as well as program activity levels, is provided within the individual Technology Markets sections later in this section.

Recommendations

The recommendations provided below reflect **overarching strategies for establishing effective market-supportive programs**. They are applicable broadly to most programs in most markets, and address the following fundamental elements of a successful program:

- Supporting **foundational policies;**
- Clear **objectives;**
- An **organizational culture** that supports program goals;
- **Substantial and stable funding** to develop markets;
- A **program structure** designed to target barriers;
- **Clear communication** with and involvement of stakeholders;
- A **portfolio approach** to targeted sectors;
- Engagement of and support for **private sector contractors;** and the
- Ability to be **innovative and flexible.**

Additional recommendations that relate more specifically to individual technology programs are included in the individual Technology Markets sections that follow.

- **Establish a reliable and long-term source of funding for programs:** The uncertainty in the current funding sources – ACP collections and ARRA support – highlights our strongest and undoubtedly most obvious recommendation for all of New Hampshire's sustainable energy programs: that a reliable and long-term source of funding for investment be identified and authorized. Incentives that create stop-and-start market conditions are very detrimental to business development, consumer awareness, and confidence, meaning that customers do not make investments and contractors do not train and hire additional staff. It is also important that funding come from a source that does not limit eligibility to a subset of New Hampshire citizens.

- **Develop long-term plans for program support:** Sustained and predictable funding also has the advantage that best-practice program designs, which lay out incentive structures for the long term, can be developed. Incentives are most effective when they are market responsive and dynamic; that is, are designed to reduce according to a predictable schedule as capacity comes on line and installation costs drop. Incentives need to encourage competitive pricing behavior and price declines as the market grows. Static, overly generous, or unreliable financial incentives can slow or halt continuing progress towards lower prices and full market development.

- **Incorporate thoughtful, long-term, and market-reactive design principles:** To incentivize effective behaviors, incentives should be set at the lowest possible level to motivate action. Sustained and orderly market development, resulting in lowering costs and ultimately a solely market-based industry, will rely on the expectation among market participants that rebate levels will decline over time as the markets develop and installation costs fall. This requires planned rebate design, with **excellent communication to all stakeholders** about the plan and about real-time market performance. Such a plan might include:

- **Scheduled falling incentive levels based on capacity blocks –** a transparent, predictable, objective methodology for managing future rebate reductions on a planned schedule in response to the acquisition of installed capacity.
- **Budget cycles** to limit extended periods of inactivity due to budget constraints.
- **Tiered incentive levels** for larger (C&I) systems to take advantage of economies of scale.
- **Inclusive eligibility and incentive levels** designed to accommodate a broad range of project types, such as leased systems or community-scale projects.

- **Ensure incentives are predictable and responsive to market conditions -** Flat-rate incentives can be effective for getting attention and jump-starting a market, and they are very easy to administer. Whenever possible, however, incentives should be designed to motivate best performance given the market conditions.
  - **Capacity-based incentives** are predictable and easy to administer.
  - **Performance-based (or production-based) incentives** tie compensation to actual production and provide cash payments distributed to project owners over several years based on the amount of energy the system produces; these are more costly to administer and require monitoring after installation.
  - **Estimated performance-based incentives** offer some of the benefits of the previous two, providing cash incentives based on system capacity as well as: for PV, system rating, location, tilt and orientation, and shading; for small wind, estimated wind resource, tower height, and system capacity; etc. Expected performance rebates may be distributed in a lump sum but are calculated based on the expected energy output of the system. Estimation can be complicated for some technologies.
  - **Capacity-based incentive with system site and installation plan review** allows some assurance that systems are being installed well without additional administrative burden.
  - **Time-of-use incentives** offer appropriate monetary incentives to customers who generate electricity at peak demand periods; requires time-of-use pricing and extensive monitoring.

- **Establish a coordinated portfolio of programs to support multiple markets:** Even with secure funding for rebates, market development benefits from a full portfolio of policy and program options, and support for both electric and thermal energy systems. These activities are most effective when they occur in concert with one another and will probably not coalesce without a coordinated statewide initiative to orchestrate the many moving parts. Include the following steps when planning for and establishing a full portfolio of programs, and design incentives appropriately:
  - **Identify overarching goals for the portfolio** of programs – they may include:
    - Promote the development and deployment of renewable technologies (for targeted or all technologies)
    - Serve as many customers as possible
    - Maximize kWh, or reduce peak demand
    - Realize the economic benefit of in-state technology development and local jobs
    - Lower long-term energy costs to consumers
    - Provide access to renewable energy to all economic classes
    - Diversify energy supply; increase grid reliability and security
    - Take advantage of consumer interest in environmental benefits

- **Harmonize incentive levels –** undertake comparative customer financial analysis across programs and markets; allows incentive levels to be set to provide similar returns to customers.
- When considering the customer's return, **consider other types support available for these projects**, including
  - Federal tax credits and grants in lieu of tax credits; bonus depreciation rules
  - Utility-supported programs, including rebate programs as well as sustainable energy technologies that might be eligible as efficiency measures (i.e., SHW)
  - Support from other programs – ARRA, USDA, etc.

Coordination across programs allows funds to fill gaps in support and reach the maximum number of participants without over-rewarding participants. Ensure that the overall financial incentive package is high enough to stimulate adequate demand to meet the program's targets.

- **Consider targeted sectors, markets, or technologies:** Consider designing programs, and perhaps setting aside earmarked funds, to target markets that address your goals.
  - Target **low-income participation** through increased incentive levels; design program design with reduced transaction costs and different timelines for affordable housing projects.
  - Recognize that **non-profits** cannot claim use tax credits and set incentive levels accordingly, and allow third-party ownership structures to be eligible.
  - Target **emerging technologies, slow-to-develop markets, and locally produced equipment** with higher incentives.
  - Include programs to **expand the use of sustainably fueled thermal energy systems** – space heating, hot water, and process conditioning – with incentive levels directly correlated with the efficiency or conservation levels of the end use.

- **Continue to include competitive grants or reverse (procurement) auctions in addition to rebate programs when appropriate**: Rebate programs are effective and administratively efficient when there are large numbers of customers undertaking similar projects. There are advantages to also offering competitive solicitations or reverse auctions for funding, because they:
  - Provide competitive opportunity for **support for larger or less-standard projects.**
  - Can **consider additional objectives** beyond simple project installation – allows selection on the basis of specified goals:
    - Cost-effectiveness (reverse auctions specifically support the lowest cost projects)
    - Maximizing energy or capacity savings
    - Social objectives
    - New technologies
    - Locally produced equipment
    - Educational projects
  - Can **support special categories**, such as project feasibility study development.
  - Provides flexibility; total awards can be based on the identified needs of the projects, the number of applicants, and availability of funding
  - **Allows either very structured solicitations or more open requests** – can allow a more-subjective approval process
  - Provides **opportunity for great publicity**

These types of solicitations also have challenges:

- Best designed when program objectives are very clearly defined
- Requires applicants to submit comprehensive technical, economic, environmental, and financial details of proposed project
- Fewer awardees
- Potential for excessive awards
- High administrative costs: best programs provide some level of ongoing assistance to ensure successful outcome
- No guarantee of award (for project sponsor) or of project results

It is important to be sure that the process and decision criteria are transparent to ensure an open, less politically sensitive proposal selection process. Scoring criteria can be communicated in advance and can include criteria such as: savings impact; cost-effectiveness; impact on marketplace; visibility of project; project team; potential for securing private financing; and environmental benefits.

- **Stress transparent communication:** It is very important that incentive rules, requirements, and procedures are transparent and efficient, and that there is a long-term plan in place for them. Market players react best to solid market information and can base their business decisions and sell their products more securely. Transparent and frequent communications on financial incentives and market growth help stakeholders as well – including investors, contractors, owners, and legislative and regulatory sponsors – as they plan activities that will help sustain development.

- **Provide support for education and outreach:** Consumer information and basic education on technologies, incentives, and how to participate in the market help to encourage and catalyze consumer demand – while building a greater general awareness of the ability of clean energy technologies ability to provide solutions today. Outreach and education for consumers and contractor support will engage the market more quickly and effectively.

- **Provide support for workforce development:** It is also effective to have state-level support for elements, such as workforce development, that are unlikely by themselves to drive a market – but the lack of which will leave serious gaps. Encouraging market growth through financial incentives can lead to problems if the infrastructure to train and oversee a qualified workforce is not in place. Private market actors, including industry, and third-party training and certification organizations can make significant contributions to workforce development, quality assurance, and consumer protection.

- **Consider the need for quality control:** Particularly in early-stage markets, some type of quality control mechanism to assure that high-quality equipment is installed properly should also be considered. Appropriate siting and installation are critical for optimal performance for many sustainable energy technologies. Practices to provide assurance of installation quality might include:
  - Provision of **a list of "reviewed" or "authorized" contractors**
  - Working with local organizations and training facilities to determine and institute an **appropriate "certification" level** to be required for a contractor to participate in the programs
  - **Technical review** of project design and installation
  - Requirement for some level of **on-site inspections** on installed systems

- Requirement for **minimum insurance and warranty levels** on equipment and installation
- **Tying incentive levels to equipment and installation practices that give highest capacity**

- **Continue to engage key stakeholders:** New Hampshire is fortunate to have a slowly growing network of sustainable energy installers and manufacturers, utilities, energy efficiency businesses, educational institutions, and other professions such as construction trades, electricians, plumbers, builders, and architects, forestry trades, etc. interested in providing energy efficiency and/or sustainable energy services and products to consumers. Programs are most effective when such stakeholders have been involved in their development. Continuing to engage and collaborate with key stakeholders is important moving forward.

- **Integrate energy efficiency and sustainable energy as much as possible:** There are great advantages, to both the customer and the program funder, of thinking about both energy efficiency and sustainable energy whenever considering an investment project. Undertaking appropriate energy efficiency work first means that a smaller sustainable energy project may be required to meet the customer's needs. Establishing program designs and program administrative coordination that motivate and accommodate this coordination is important. For example, for the most part, renewable energy projects have longer paybacks than energy efficiency projects. It is important that customers seeking a state incentive for a sustainable energy project be advised that they should consider having an energy audit conducted so that they can compare both investments. Wisconsin Focus on Energy has seen a marked increase in the number of customers who pursue efficiency before they install a photovoltaic or solar hot water system with their $500 Solar Bonus initiative.[37] This initiative is also yielding some interesting in-field partnerships between efficiency and renewable energy installers, partnerships that make it easier for customers to do combined projects.

- **Make it easy for participants:** Transaction costs represent one of the most challenging barriers to sustainable energy implementation. It is well worth the effort to design program delivery and administration to result in one-stop-shopping for the customer. Whenever possible,

Unitil's Experience

In 2010, Unitil invested $200,000 in a 100 kW Solar PV system installed at the Exeter High School and a 65 kW micro turbine installed at the Seacoast School of Technology in Exeter. Both units are owned and operated by a private developer that has a power purchase agreement with SAU16. The PUC allowed for rate recovery of the investment but allowed only an insignificant amount of funding for internal management and planning costs, which deterred future project development effectively shutting down Unitil's program.

The energy efficiency Total Resource Cost (B/C model) test was used as a basis for PUC staff's creation of the DG test. Using the TRC can be problematic because almost no renewable projects will pass as standalone projects, and the new Synapse Avoided Costs will make it more difficult for these projects to pass. In 2010, Unitil proposed a 40 kW solar PV system but the project was deemed not cost effective by the PUC.

[37] Would You Like Efficiency With That? Linking Efficiency and Renewables to Motivate Customer Action, B. Schutten & K. Kuntz, ACEEE 2010.

integrate information on programs, financing, contractors, applications, permitting, and other requirements. When the program requires complex calculations (for example, estimated wind turbine performance) or information that is not readily available, be sure there is customer service support in place.

- **Include financing components whenever possible:** Encouraging turn-key financing solutions allows homeowners and businesses to defray upfront installation costs. Financing programs can fill the gap in availability of private financing to help cover up-front capital costs of project installation. Programs can provide funding for a wide range of project types, as defined by customer demand. Financing programs are also a great way to allow program funding to continue for many years as loans are repaid. Programs focused on consumer convenience as well, such as on-bill financing, can be particularly popular. Finance program structures are discussed more fully in Section 13 of this report.

7.8. Utility Investment in Distributed Sustainable Energy

There is currently a debate in New Hampshire about the most-effective policy landscape to encourage appropriate sustainable energy investment by the state's utilities.[38] While as a general rule, utilities in New Hampshire cannot build new generation, a potentially innovative approach to encouraging electric utility investment in distributed energy (or DG) resources (including renewable energy, energy efficiency, demand response and load reduction, and other "clean energy" generation) is found in RSA 374-G, which seeks to provide an exception to this general rule for projects of ≤ 5 MW. The utilities have encountered some difficulties in implementation of this rule. Only one project has been approved to date – see sidebar. Other proposals have been rejected or withdrawn because of cost-benefit or cost-recovery issues. In addition, the process to date has been lengthy and time consuming not only for utility staff but also for the developer, to the point that the developer has stated that they may not engage in future projects. It appears that the utilities have a desire to invest in sustainable energy, but the future of this initiative is unclear at this time.

Recommendations

- **Investigate the issues currently hindering utility investment in DG:** It appears that the utilities are interested in pursuing further investment in sustainable energy. Investment in this type of distributed generation has real benefits in terms of energy, capacity, and reliability. Given the significant benefit that could result from these resources, the experience the utilities might provide toward the development of sustainable energy resources in the state, and their interest in participating in this market, effective mechanisms for allowing appropriate investment appear worth the effort to develop. Consideration should be given to the impact that such development will have on the benefits of market competition provided by non-utility-owned merchant generating plants, as well as the system grid operation.

- **Address obstacles to speedy and efficient project review** at the state and local levels:
    - Consider an expedited and standardized permit process for smaller generation facilities using renewable resources
    - Outline the process in advance such that the exact review methodology or screening analyses that will be required to earn PUC approval are clear

[38] This excludes NHEC and the municipal electric utilities, which are not subject to the restrictions placed on other utilities in the state.

- Provide for an expedited PUC proceeding schedule so that project review may begin prior to project commencement

- **Address transmission infrastructure limitations, including the Coos County loop in northern New Hampshire.** Some utilities believe this to be one of the most significant barriers to utility-scale renewable generation, particularly large-scale wind projects.

- **Consider the value of alternative approaches to supporting investment by the utilities:** Additional mechanisms for funding now being used in other jurisdictions include:
  - **Defining a value-based, rather than cost-based, tariff:** for example, the Sacramento Municipal Utility District is now providing funding to projects based on the "value" of the generation to the utility, rather than based on estimates of the production cost of the eligible technologies.[39] Rates are set using the following components:
    - Market energy price
    - Ancillary services
    - Generation capacity
    - Transmission
    - Sub transmission capacity
    - Avoided greenhouse gas mitigation
    - Risk avoidance from future natural gas price increases

7.9. Sustainable Energy Program Administration

The New Hampshire Public Utilities Commission currently administers the rebate programs funded by the REF. In addition, they are administering the ARRA-funded Residential Wood Pellet Boiler/ Furnace Rebate program and the ARRA-funded portion of the Residential Solar Hot Water program (in coordination with the REF funded portion of this program). The PUC also administers the Competitive Grant program supported by the REF and the grants awarded by the GHGERF (RGGI funded). Details of the design of the rebate programs currently funded through the REF are often listed in statute.[40] This means that new legislation is often required for even small changes in program components, such as incentive levels, maximum system sizes, and maximum rebate levels, as well as allocation of program funding across customer classes. The New Hampshire Office of Energy and Planning is the recipient of the bulk of federal ARRA funds and administers the bulk of the ARRA-funded projects for the state other than those mentioned above.

Recommendations

- **Authorize program administrators to make independent program decisions:** Providing full authorization for the REF fund administrator to trigger program design decisions as needed – without the need for new legislation or other lengthy approval process – would provide streamlined program delivery, reduce program administrative delays, and provide more-market-responsive design options. The ideal strategy is to put a long-term plan in place that schedules changes in incentive levels and other design structures. If this is based on the underlying principles of effective market development and clearly outlines the basis on which detailed

[39] http://www.energy.ca.gov/2011_energypolicy/documents/2011-05-09_workshop/comments/SMUD_Comments_on_May_9_IEPR_Workshop_TN-60815.pdf
[40] RSA 362-F:10

changes to the programs will be made, then this process can be reviewed and approved by the Legislature or other stakeholders as a long-term plan and the program administrator can make decisions as needed in the context of the plan and deliver programs much more efficiently.

- **Design programs for effective and efficient administration:** Appropriate requirements should be maintained, and oversight based, on the stage of market development. Early stage markets – or markets that are expanding rapidly with many new entrants – require greater oversight. Programs can streamline and reduce administrative requirements as volumes increase and the market matures. Programs and operations should be designed for low program delivery costs. Simplicity, consistency, and predictability are key. Tracking funding and participation are important, and data should be captured for measureable results.

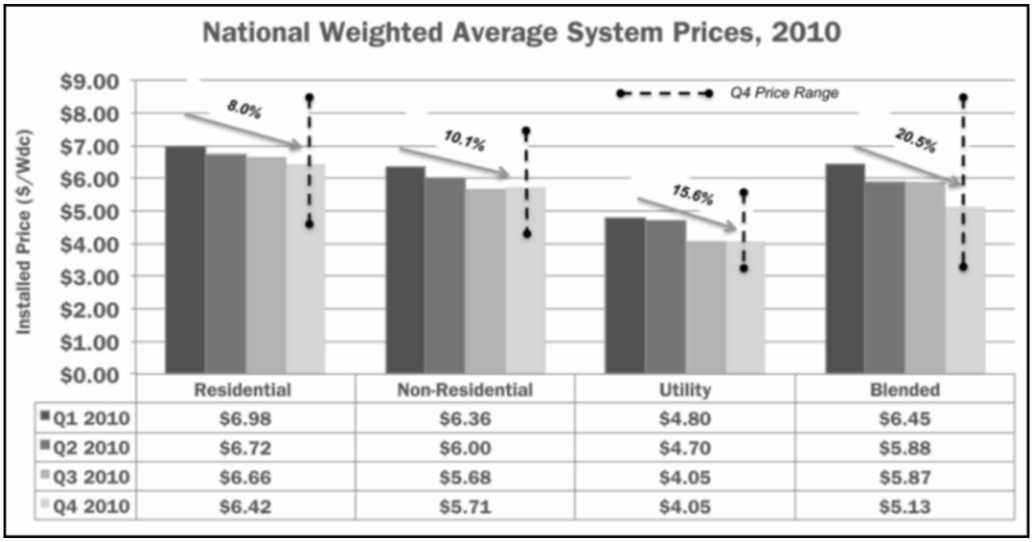
- **Consider integrating the administration of energy efficiency and sustainable energy programs into a single entity for the state:** Such streamlining could take advantage of the economies of scale, coordinated branding and outreach, and one-stop-shopping that would be realized by these combining these programs under a single funding and administrative option. Offering such an integrated program provides the opportunity to educate consumers on the relative paybacks of coordinated efficiency and sustainable energy and provides the opportunity of planning for investment in the whole building approach that leads to more efficient and effective investment – energy efficiency first, then appropriately sized sustainable energy. An independent third-party administrator model that coordinates design and delivery of both types of program support, such as Wisconsin's Focus on Energy, is one way to provide this level of coordination.

7.10. New Hampshire Markets: Solar Photovoltaic and Solar Thermal Energy

Solar markets in the US are growing fast. Last year (2010) was a record year for photovoltaic (PV) systems in the US, with the grid-connected market more than doubling to 878 MW installed. For the 10 years prior to 2010, the average annual rate of market growth was 69%. PV projects remain faster and cheaper to develop than other sustainable energy technologies. Investment by utilities is the fastest growing sector, though major roadblocks including low contract prices and financing bottlenecks threaten to delay this growth. Strong growth potential remains for residential and C&I installations, but they do remain largely dependent on incentive funding availability. Residential third-party ownership is becoming a vital offering. This growth has had a noticeable effect on prices, though a wide range in prices still exists across all categories (Figure 7.5.).[41]

[41] US Solar Market Insight – 2010 Year in Review, SEIA/GTM Research

Figure 7.5. National Weighted Average PV System Prices, 2010[42]



	Residential	Non-Residential	Utility	Blended
Q1 2010	$6.98	$6.36	$4.80	$6.45
Q2 2010	$6.72	$6.00	$4.70	$5.88
Q3 2010	$6.66	$5.68	$4.05	$5.87
Q4 2010	$6.42	$5.71	$4.05	$5.13

Installed capacity for solar water and space heating has increased each year since 2004 – the market has shown resilience even during the economic downturn. The actual growth rate in this market will be affected by the costs of conventional heating/ water heating methods, making it less easy to predict than PV. Aggressive campaigns by the PV market have an effect, potentially drawing customers who are just looking to install solar, away from SHW. Third-party ownership models have also been gaining hold, particularly in the non-residential market.[43]

Current New Hampshire Landscape – Solar Projects and Programs

While solar energy does not yet represent an important part of New Hampshire's existing energy mix (a negligible portion of the state's electric generation in 2008 came from solar power), this market is expected to grow quickly in response to these rapid reductions in prices at the national level and the increase in local knowledge and appetite for solar energy. New Hampshire has an average solar energy density of 4.0-4.5 kWh/m^2/day, enough to drive significant amounts of energy on the state's rooftops and fields, as well as through larger distributed systems. Solar PV generation is highly coincident with typical daily peak demand. Peak demand normally accounts for roughly 5-15% of electricity demand and is typically the most expensive power to provide. As a result, solar generation offers higher value than is captured in a simple levelized comparison with other energy sources.

The Legislature established the Class II REC requirement (for PV) and included solar hot water within the Class I requirement in order to stimulate investment in solar technologies and capture these benefits and improve cost effectiveness. As in the rest of the country, costs have indeed been steadily declining over the past few years, with installed costs for a residential-scale PV system currently averaging below $6.50/W. Solar hot water and space heating has become a popular and relatively affordable option for homeowners and businesses desiring to make the switch from fossil fuels and protect themselves against rising fuel prices. The RPS is commendable in allowing SHW to be eligible to meet the solar usage requirements.

There are several distributed generation solar projects recently developed in the state, including:

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[42] SEIA/GTM US Solar Market Insight 2010
[43] US Solar Market Insight – 2010 Year in Review, SEIA/GTM Research

- Stonyfield Farm, Londonderry – 50 kW solar array, the first major solar array in the state (2005). This project was financed "primarily by purchase of expected life-of-project REC output." Owned by Stonyfield Farm
- North Conway Water Precinct – this 167 kW solar array, finished in July 2010, is the largest in New Hampshire
- Wire Belt, Londonderry – 99 kW system, installed in May 2010
- Exeter High School – 100 kW system recently installed by Seacoast School of Technology; developed by Revolution Energy (a Unitil project)
- PSNH Headquarters, Manchester – 51.3 kW solar array
- East Kingston School's solar array – 60 kW array completed in 2011 and funded through an innovative solar PPA agreement along with a Recovery Act EECBG grant

The State of New Hampshire supported the growth of small-scale PV and other solar technologies for several years through participation in DOE's Million Solar Roofs initiative and with a Solar on Schools project. Funding for these efforts has ended.

Now with funding from the REF, the NH PUC began the Residential PV and Small Wind Rebate program in 2009. Positive response to this popular program resulted in a rapid commitment of budget, and the incentive level was adjusted a year later in response to this demand. Additional programs for Residential Solar Hot Water and C&I PV and Solar Thermal Rebates have been initiated in the past year. Details of the programs' structures and performance are given below – general information on programs funding and administrative structures was given earlier, in Table 7.3.

Table 7.4. Customer-sited Solar Rebate Programs: Program Design and Performance

REF- and ARRA-Funded Solar Rebate Programs – Completed Systems (April 2011)										
			Incentive Design			Program Performance				
Technology	Target Market Sector	Program Start	Incentive Level	Maximum Rebate	Maximum System Size	# Installed	Installed Capacity	Rebates Paid	Total Installed Costs	Per Unit Installed Cost
PV	Residential	Sept 2009	$3.00/W	$6,000	5 kW	404	1309 kW	$2,310,262	$8,472,594	$6.47/W
		Sept 2010	Lowered to $1.25/W	Lower of $4,500 or 50% of cost						
Solar Hot Water	Residential	April 2010	$600 (6-19.9 MMBtu/year) $750 (20-29.9 MMBtu/year) $900 (≥ 30 MMBtu/year) PLUS $2,000		na	103		$259,050		
Solar Space Heat	Residential									
PV	C&I	Nov 2010	$1.00/W ($.50/W for expansions)	Lower of $50,000 or 25% of cost	100 kW	1	80 kW	$50,000	$424,100	$5.30/W
Solar Thermal	C&I		$.07/ rated kBtu/year ($.04/kBtu/ year for expansions)		na	0	-	-	-	-

REF- and ARRA-Funded Solar Rebate Programs – Rebate Reservations (April 2011)								
			Incentive Design			Under Reservation		
Technology	Target Market Sector	Program Start	Incentive Level	Maximum Rebate	Maximum System Size	# Proposed	Estimated Installed Capacity	Rebates Reserved
PV	Residential	Sept 2010	$1.25/W	Lower of $4,500 or 50% of cost	5 kW	94	268 kW	$242,032
Solar Hot Water	Residential	April 2010	$600 (6-19.9 MMBtu/year) $750 (20-29.9 MMBtu/year) $900 (≥ 30 MMBtu/year) PLUS $2,000		na	58		$134,800
Solar Space Heat	Residential							

REF- and ARRA-Funded Solar Rebate Programs – Rebate Reservations (April 2011)								
Technology	Target Market Sector		Incentive Design			Under Reservation		
		Program Start	Incentive Level	Maximum Rebate	Maximum System Size	# Proposed	Estimated Installed Capacity	Rebates Reserved
PV	C&I	Nov 2010	$1.00/W ($.50/W for expansions)	Lower of $50,000 or 25% of cost	100 kW	15		
Solar Thermal	C&I		$.07/ rated kBtu/year ($.04/kBtu/ year for expansions)			11		

Because the ultimate source of its funding is the REF, participants in this program must be served by a utility required to comply with the NH RPS (i.e., not a municipal utility). As mentioned above, the response to the NH PUC residential PV and small wind rebate program has been strong, particularly for grid-connected PV systems, with continued interest even after incentive levels were reduced by more than half and the maximum rebate dropped. Thus, even in tough economic times, this initiative is clearly helping to promote the rapid growth in PV installations. However, the uncertainties caused by the current stall in program funding may affect future response, as solar companies do not feel secure about business expansion and customers are not sure about future investments.

Installed costs under this program are comparable to those in neighboring states, indicating that costs are coming down in NH in line with the rest of the region. Customers are participating in the PV program at high levels even with rebates of only 19% of installed cost, a response certainly assisted by the current federal tax credits available.

Response to the solar hot water rebates has also been strong – over 160 applications have been received in the year since the program began, about the same rate as PV applicants during that period. The current quite rich rebate levels surely contributes to this popularity; total rebate amounts can run as much as 35% of typical installed costs.

These programs are well designed and include many features that help to drive effective development. Both PV and SHW rebates are based on capacity, and the incentive level for the PV program was reduced appropriately in response to high demand. The dual funding sources for the residential SHW program could have resulted in more-complicated application and participation requirements for customers and installers – the program administrators were wise to provide a single point of contact and program administration for participants. Application review for approval includes a review of the siting conditions that might affect performance, providing additional assurance that quality installations are happening.

New Hampshire participates in the Regional Greenhouse Gas Initiative (RGGI), proceeds from which fund the Greenhouse Gas Emissions Reduction Fund (GHGERF). While this fund is not specifically authorized to support projects that address sustainable energy development (by statute, GHGERF funds must be used for energy efficiency, energy conservation or demand response programs), to date a few awards have been made that support sustainable energy. The Plymouth Area Renewable Energy Initiative received $99,250 to provide homeowners with technical information and volunteer support to weatherize 10 homes and install solar hot water. Ongoing support for sustainable energy from this fund is likely to be limited under current authorization.

New Hampshire has received funding through ARRA that has included support for sustainable energy along with energy efficiency projects. As of mid-2011, seven C&I projects funded through the Enterprise Energy Fund have included solar hot water as part of the project, two have included wood pellet systems, and one included a PV system. It is believed that these solar projects also received rebates under the state's solar rebate programs, so data on the systems and their performance is included in the information on those programs given above. Through ARRA funds provided to the Community College of New

Hampshire, three PV systems and one solar thermal project have also been funded. All of the ARRA-funded programs will expire in 2012.

Recommendations

The major challenges to increased development in the solar market in NH continues to be the lack of **stable and reliable funding** for all initiatives, and **permitting complexities for larger DG systems**, particularly those developed by the state's utilities. Recommendations on these issues have been presented in the previous sections.

- An additional interesting idea comes from the new US DOE initiative called Brightfields, which **specifically promotes the redevelopment of brownfields to use solar technology** to generate both clean energy and revenue for the community.[44] Closed landfills may be considered brownfield sites in some areas, particularly in older urban environments where the landfills are close to the city's urban core. The Brightfields approach offers a range of opportunities to link solar energy to brownfields redevelopment and thereby transform community hazards and eyesores into productive, green ventures.

- **Consider the overarching program recommendations given in the section above:** These recommendations are highly relevant to program design in the solar market. In particular, in the fast-changing PV market, an intelligent, long-term plan for reducing rebate levels in response to demand (and falling prices) will be very important to make the best use of limited funds. Falling incentive levels based on installed capacity blocks, tiered incentive levels, and budget cycles will likely be elements of this design. It will be important to monitor not only the program performance but also changes in the market, including prices and new development models, such as third-party ownership and community group-purchasing aggregates, and build appropriate support into the programs.

- **Continue to review the SHW program incentive design:** New Hampshire recently completed a review of the levels of support for solar hot water with a view towards the customer economics. While a generous rebate level can be very effective in garnering attention and giving a boost to a new market, it does limit the number of participants a given budget can accommodate. The SHW program incentive was revisited in 2011 and rebate levels were adjusted accordingly. Future reviews are encouraged at least annually in the future.

- **Consider designing programs to target markets** that specifically address goals: target low-income participation through increased levels of incentives or with reduced transaction costs; provide higher incentives for non-profits, schools, and government buildings that cannot use tax credits; accommodate community-scale projects with special program design.

- **Provide integrated programs** for this popular market: This would be a good place to test out financing options and support for third-party ownership models, as well as leveraging interest in solar to motivate integrating energy efficiency more fully in the projects undertaken.

[44] http://www.epa.gov/swerosps/bf/partners/brightfd.htm

7.11. New Hampshire Markets: Wind Energy

Like other renewable energy sources, wind is inexhaustible, produces no waste or pollution, provides locally sited power and local economic value, and its costs are subject to neither market nor geopolitical volatility. Improvements in wind technology have brought its long-term costs down to a level that is competitive with fossil-fuel energy generation,[45] and wind power continues to be the fastest growing energy resource in the US. Markets in many regions do still struggle with siting issues.

Current New Hampshire Landscape – Wind Projects and Programs

While the share of New Hampshire's power provided by wind in 2010 was very small (26 MW capacity, or 0.3% - equivalent to powering 6,000 NH homes), the state's potential wind resource, at 2,135 MW, is not negligible.[46] According to a resource assessment at 80-meter heights from the National Renewable Energy Lab, New Hampshire's wind resource could provide 60% of the state's current electricity needs. While the highest value resources are found in NH's mountain regions, there are extensive areas of the state where wind development can provide valuable renewable energy, including substantial off-shore potential (Figure 7.6.).[47]

[45] http://www.windpoweringamerica.gov/pdfs/2007_annual_wind_market_report.pdf
[46] AWEA Fact Sheet for NH Q1 2011: http://www.awea.org/learnabout/publications/factsheets/factsheets_state.cfm
[47] AWEA Fact Sheet for NH Q1 2011: http://www.awea.org/learnabout/publications/factsheets/factsheets_state.cfm

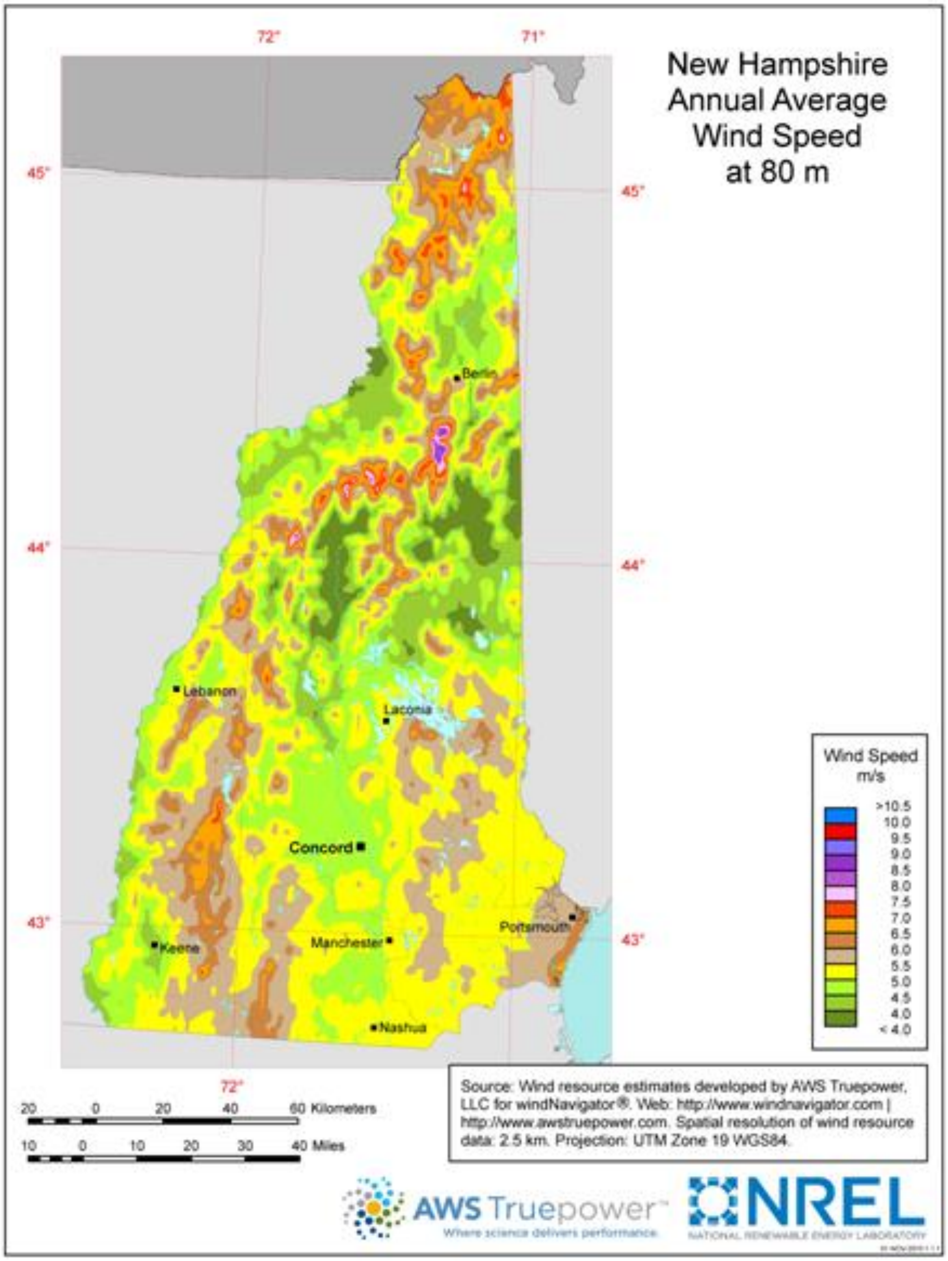
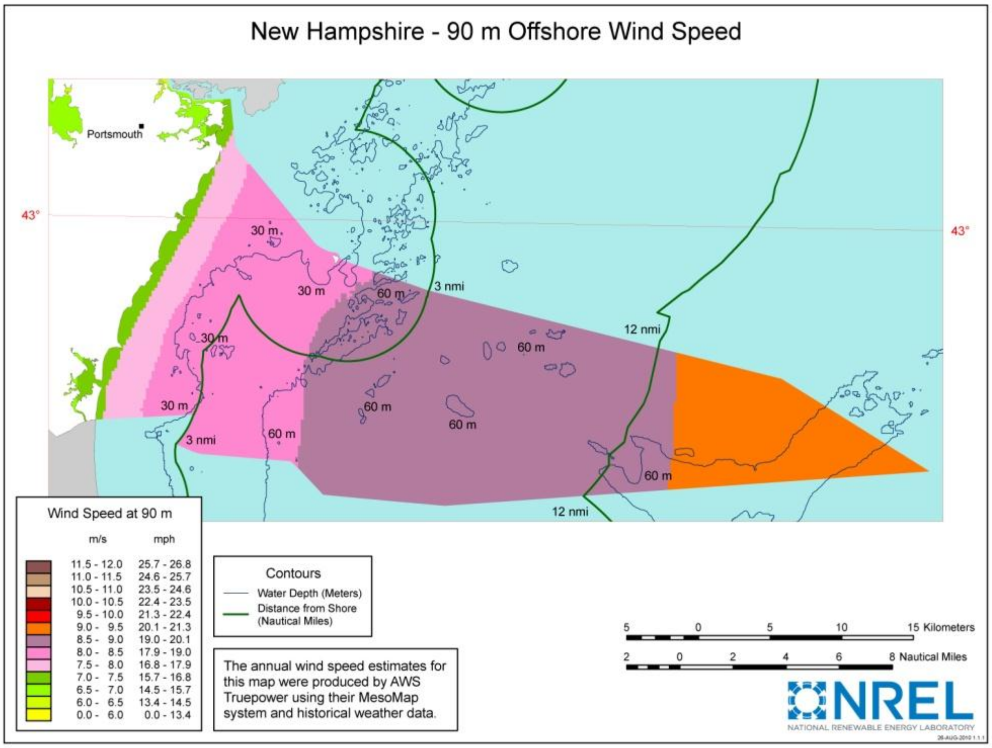


Figure 7.6. New Hampshire Wind Resources



Recognizing this potential, wind developers have additional projects under construction (99 MW), and other wind projects in queue (396 MW) in the state. Some of the wind projects currently operating and proposed for NH are summarized in the following table.

Table 7.5. Large-scale Wind Projects in New Hampshire

Name	Capacity (MW)	Power (MWh/yr)	Location (County)	Status	Key Characteristics
Lempster Mountain	24	70,000	Sullivan County	Operating	• First major wind-power installation • Owned by Iberdrola • Opened in 2008 • 12 turbines
Granite Reliable Power, LLC	99	300,000	In Coos County, from Dixville to Dummer	Proposed/ In Construction	• $275 million, 33 turbine plan • Proposed by Noble Environmental Power Application submitted and permit granted in 2008 • Target online date: end of 2011 - in order to qualify for IRS grant in lieu of tax credit programs • Received $135 million in loan guarantees from DOE
Groton	48		Groton, NH; Grafton County	Proposed/ In Construction	• Owned by Iberdrola • Target online date: end of 2012 • 24-turbine

Name	Capacity (MW)	Power (MWh/yr)	Location (County)	Status	Key Characteristics
Crotched Mountain	0.6		Bennington, NH	Closed	• Built in 1980 • Owned by US Windpower (later Kenetech) • 20 wind turbines

Investment in wind power is also an investment in jobs, including jobs in operations and maintenance, construction, manufacturing, and many support sectors. In addition, wind power projects can produce lease payments for landowners and increase the tax base of communities. Direct and indirect jobs supported in NH in 2010 from wind development totaled 100-500.[48] There are a few manufacturing facilities of wind power components in New Hampshire. Goss International, located in Durham, NH, produces nacelles for wind turbines for Aeronautica. Aeronautica Windpower markets mid-scale wind turbines to schools and municipal buildings, commercial facilities, industrial parks, farms, neighborhoods, or smaller wind parks. At least five other manufacturing facilities in NH currently supply components to the wind industry.

The 24-turbine Groton Wind Project, under development by Iberdrola, is expected to be completed in 2011

- Has already resulted in over $1 million spent on contracts with New Hampshire companies for engineering, geotechnical services, surveying, environmental studies, mapping, and permitting.
- Estimated to have a regional economic benefit of approximately $81.5 million over 20 years.
- Anticipated to create up to 150 construction jobs many filled by New Hampshire workers, for work on electrical lines and poles, concrete, hauling, and civil construction.
- Will provide significant payments to local landowners
- Will provide a substantial amount of the annual municipal budget of the Town of Groton, in addition to annual tax payments to the State of New Hampshire.

New wind farms are being developed by private developers through investment that relies on the current availability of the ARRA-funded 1603 program, which offers renewable energy project developers up-front cash payments in lieu of investment tax credits. The value of these awards are equivalent to 30% of the project's total eligible cost basis in most cases. Two major wind farm projects in New Hampshire are planning to use this program for construction scheduled to be finalized in 2011. This federal program is not currently authorized to extend past 2011, and it is unclear if the absence of this type of financial support will affect new wind farm development after that time. The Coos County project, a 99 MW project under development by Granite Reliable Power, has recently been awarded a $135 million loan guarantee from DOE.

In addition to large-scale wind projects, there is interest in using wind power for the production of energy for use on-site through small net-metered systems. The NH PUC administers a Residential Small

48 AWEA Fact Sheet for NH Q1 2011: http://www.awea.org/learnabout/publications/factsheets/factsheets_state.cfm

Renewable Electrical Generation Systems Program that provides rebates for wind projects < 5 kW in size. Details of the program and a summary of the performance of systems completed under this program are given in the table below – there are no additional small wind projects currently proposed or reserved under this program. General information on the program's funding and administrative structure was given earlier, in Table 7.3.

Table 7.6. Customer-sited Small Wind Rebate Program: Program Design and Performance

REF-Funded Small Wind Rebate Program – Completed Systems (April 2011)										
Target Market Sector	Start	Incentive Design			Program Performance – Installed Systems					
		Incentive Level	Max Rebate	Max System Size	# Installed	Capacity	Total Rebates Paid	Total Installed Costs	Per Unit Installed Cost	
Residential	Sept 2009	$3.00/W	$6,000	5 kW	37	83 kW	$208,252	$644,747	$7.77/W	
	Sept 2010	Lowered to $1.25/W	Lower of $4,500 or 50% of cost							

Because the ultimate source of its funding is the REF, participants in this program must be served by a utility required to comply with the NH RPS (i.e., not a municipal utility). Grid and off-grid systems are eligible. The program, which also supports residential PV installations, has been very popular – in spite of the reduction in incentive levels in September 2010, the program is out of funds and applications are now being accepted only for places in the queue. There is no guarantee that the next round of funds from the REF in July 2011 will be sufficient to fund even those applications currently in the queue.

As mentioned above, the response to the NH PUC residential PV and small wind rebate program has been strong, with continued interest even after incentive levels were reduced by more than half. Wind systems supported by the program are quite small, but not out of line for a strictly residential program. Installed costs are in line, or lower, than other states in the region, and rebate levels are also now lower.

Recommendations

- **Ensure there are effective and efficient foundational regulations and guidelines in place:** Permitting and siting issues undoubtedly remain as the strongest challenges for larger scale wind in NH, in line with other locations in the region. Having effective regulations in place once appropriate sites are identified and developers begin to turn toward NH will be important for the market. The following are particularly relevant to the wind market.
    - As discussed above, having the state **undertake appropriate studies** to identify all public lands that are viable for wind projects, and identify unique public and private lands that should be off limits, will be important to the public conversation that will happen about large wind development.
    - It will also be important to **establish a uniform taxation policy** for sustainable energy projects that does not result in inequitable burdens – Sustainable energy generation projects should carry a tax burden than is equivalent across technologies as well as equivalent to other utility generation.

- **Address transmission infrastructure limitations**, including the Coos County loop in northern New Hampshire. Some utilities believe this to be one of the most significant barriers to utility-scale renewable generation, particularly large-scale wind projects.

- **Consider the overarching program recommendations given in the section above:** These are highly relevant to program design in the small wind market. In particular:
    - **Performance based or expected-performance based incentives** are particularly appropriate for wind installations, because of the variability in wind resources, and issues with project location on site, tower height, and equipment performance.
    - **Consider using a list of eligible equipment** (for example, NYSERDA's program eligibility list[49]); require turbines to be approved by the Small Wind Certification Corporation;[50] or provide additional incentives for taller towers (or penalize those that are shorter than some threshold).

- **Allow larger systems to be eligible for program support:** The small wind programs in other locations have found there is a great deal of interest in systems larger than the current 5kW limit in NH – the Bergey 10K is the most often installed small system in Vermont. Small farms have been a particularly active customer group and could be encouraged in NH with appropriately designed programs. There is also likely to be interest in a **small-wind program designed for mid- to community-scale projects** (up to 100 kW) with farms, C&I, and community groups interested. Supporting this interest would require appropriate incentive design (perhaps production-based incentives), outreach, and contractor development and technical support.

7.12. New Hampshire Markets: Biomass Electric and Heat Generation

Biomass can be used both for power generation in the electricity sector and for space heating in residential and commercial buildings. Biomass-fueled generation plants operate in a reliable and consistent manner, providing crucial base load power generation. Both dedicated biomass and biomass co-firing are used in the electricity generation sector. Wood and agricultural residues (e.g., wood chips) can be burned as a fuel for cogeneration of steam and electricity in the industrial sector.

Biomass thermal energy is the use of biomass for space and domestic water heating, process heat, and the thermal portion of combined heat and power. Extremely clean and highly efficient biomass combustion technology is rapidly becoming available in the domestic US marketplace. Efficient fuel distribution systems are in place to expand the adoption of central heating systems in home and business heating, industrial process heat, district heating of whole communities, and combined heat and power. This proven technology has been widely deployed in Europe in homes, schools, municipal buildings, factories and any other large institutional, commercial, or industrial settings. Biomass fuels have also seen widespread acceptance in residential and commercial heating, district heating, and combined heat and power.

Biomass energy systems have a substantial potential to add value to the state by strengthening local economic development and job creation through the domestic production of fuels, system installation and service, and fuel distribution.

[49] http://www.powernaturally.org/programs/wind/eligible_wind.asp
[50] http://www.smallwindcertification.org/

Current New Hampshire Landscape – Biomass Projects and Programs

The Current Biomass Energy Market

Biomass is used in New Hampshire for power generation, for space heating in residential and commercial buildings, and in district heating systems. In 2008, biomass represented over 6.5% of total New Hampshire electric production and just over 4% of residential and C&I energy consumption.[51] In 2009, 5% of New Hampshire residents used wood as their primary heat; 10% of rural residents heated their home primarily with wood.[52]

Currently, there is a soft market for biomass RECs that qualify for NH's RPS, primarily because of policy decisions concerning biomass in Massachusetts. In addition, the six independent operating biomass facilities (those other than Schiller listed in Table 7.7) currently lack long-term contracts, and the REC sales are an important revenue stream needed to keep them in operation. Due to the interface between the regional nature of the REC market, policy decisions in other states, and the coincidental end of power purchase agreements, the fate of in-state biomass electricity generation is uncertain.

The table below gives representative examples of facilities that generate energy from woody biomass in New Hampshire.

Table 7.7. Examples of Woody Biomass Generation Facilities in New Hampshire

Name	Capacity (MW)	Location	Status	Key Characteristics
Biomass Electricity Generation: Wood-fired Electrical Generation Facility				
Schiller Station #5	50	Portsmouth	Operating	• Started in 2006 – Replaced coal boiler • Burns more than 400,000t of wood annually • 300,000 RECs each year[53] • Owned by PSNH
Bridgewater Power Company (BPC)	15	Bridgewater	Operating	• Began commercial operation in 1987 • "Base-load" facility, average yearly capacity utilization rate of 99% • Electricity generated by wood- fired steam turbine unit – small boiler for heat.[54] • Majority owned by Public Service Enterprise Group of New Jersey
Pine Tree Bethlehem	17.5	Bethlehem	Operating	• Owned by GDF-Suez – Pinetree Power, Inc. operates facility
Pine Tree Tamworth	23.8	Tamworth	Operating	• Owned by GDF-Suez – Pinetree Power, Inc. operates facility
Hemphill	16	Springfield	Operating	• Owned by East West Power – Hemphill Power and Light operates the facility
Whitefield	16	Whitefield	Operating	• Owned by East West Power – Hemphill Power and Light operates the facility
Indeck	16.4	Alexandria	Operating	• Reopened in Jan. 2009 • Burns between 200,000 -225,000 tons of wood annually • Owned by Indeck Energy [55]

[51] New Hampshire Energy Facts 2008: Overview based on EIA 2008 Data, NH OEP
[52] Data from US Census (www.factfinder.census.gov) Compiled by the Alliance for Green Heat
[53] http://www.power-technology.com/projects/wood-schiller/
[54] Draft national pollutant discharge elimination system (npdes) Permit to discharge to waters of the united states Npdes permit no.: nh0022021 http://www.epa.gov/region1/npdes/permits/finalnh0022021fs.pdf

Name	Capacity (MW)	Location	Status	Key Characteristics
Laidlaw Berlin	65	Berlin	Proposed	• Former Fraser Paper Mill – Objective to converting existing facility to biomass-energy power plant • Expected to burn 700,000 tons of wood annually[56] • Development proposed by Laidlaw Berlin, LLC, an affiliate of Laidlaw Energy group, Inc.
Clean Power Development Winchester	20	Winchester	Proposed	• Development proposed by Clean Power Development

Examples of Biomass Heat Generation Projects				
Hanover High School	5.0 MMBtu/hr	Hanover	Operating	• Burns 223 tons of wood chips annually • Facility serves approximately 700 students from Hanover and Norwich, VT
Merrimack Valley High School & Middle School	6.74 MMBtu/hr	Penacook	Operating	• Burns 636 tons of wood annually • Supports both schools (230,000 sf) and 1,500 students[57]
Kearsarge Elementary School		Bradford	Operating	• School
The Balsams Grand Resort Hotel		Dixville Notch	Operating	• Business or Industry
Dartmouth, Sachem Village		Hanover	Operating	• Housing
Frances C. Richmond School		Hanover	Operating	• School
New Hampshire Ball Bearing		Peterborough	Operating	• Business or Industry[58]
District Energy Projects				
Concord Steam		Concord	Operating	• In 1980, Concord Steam Corporation converted two of the boilers from coal to wood-fired, and also installed a new, higher pressure, wood-fired boiler • Serves steam to the Concord business district: state and federal office buildings, Concord Hospital, and New Hampshire Hospital. • Generates power equivalent to heat for 1,000 homes
Concord Steam	17 MW	Concord	Proposed	• Steam and electric generation facility • NHEC has contracted to purchase 40% of the generation

[55] http://www.indeckenergy.com/images/Indeck_Broch.pdf
[56] http://www.nyenrg.com/berlinnhproject.html
[57] http://www.nh.nrcs.usda.gov/news/NCRC&D_WoodBiomassHeating.html
[58] http://www.biomasscenter.org/

Crotched Mountain Rehabilitation Center	12MMBtu dual boiler	Greenfield	Operating	• Biomass district hot water heating system installed in 2007 • Supplies heat, hot water, and some cooling to 275,000 sf • Facility burns 3,000 green tons of wood annually

The downtown and state buildings complex in Concord have been served by a predominantly biomass-fueled district heating system since 1980 (approximately 25% of the fuel used in 2005 was oil). This system generates power equivalent to the heat for 1,000 homes. Such district energy projects fueled by biomass have recently seen a resurgence in interest. A new non-profit organization, the Northeast District Energy Corporation, has been assembled to develop and build new community-wide district energy systems in New York, Pennsylvania, Massachusetts, Vermont, and New Hampshire. The initial goal is to establish at least one new system in each state to gain experience with specific regulatory and financing requirements in each of those jurisdictions. Systems are being developed in communities ranging in size from small villages to large cities, and include existing heat sources and new biomass plants. These projects will validate the design standards and technology for the thermal distribution systems and biomass plants, while gaining experience in connecting a wide variety of buildings.

While such biomass-fueled energy appears to have a good potential in New Hampshire, biomass electricity generation plants have been encountering difficulties in providing cost-competitive electricity. In June 2011, four wood-fired biomass plants - in Bridgewater, Bethlehem, Tamworth, and Alexandria – teamed up in an attempt to secure power purchase agreements with PSNH. Plant operators say they cannot survive on the open market and will be forced to shut down operations if they cannot sell their energy, at least in the short term, to PSNH. When the four biomass plants were built in the mid-to-late '80s, the state required PSNH to enter a 20-year rate order with them. Once the contract expired, most plants were able to secure short-term contracts with other providers, which have since expired.

The Alexandria plant applied, had been approved, and subsequently has been suspended from qualification as a Class I (new) resource. The plants in Bethlehem and Tamworth and the Springfield plant are conditionally approved as Class III resources (subject to emissions limits). Based on the PUC's list of resources, Bridgewater and Whitefield have not applied to become NH-qualified resources (they may be qualified in other New England states). The RPS current standards do allow for the four wood-burning plants to move up to the Class I REC market, but in order to qualify they would have to undergo significant capital upgrades. Based on current market conditions, moving up to Class I would actually lower the revenue these resources would receive because, as stated in the report, Class III RECs are trading at a premium compared to Class I. Therefore, increasing the percentage of Class III RECs would not help the situation. The bigger issue seems to be the definition of what resources qualify as Class III resources based on emissions versus the reality of how these plants operate. (None of these plants are owned by New Hampshire entities. The Pinetree plants in Tamworth and Bethlehem are owned by GDF Suez, a multinational energy conglomerate based in France; the Bridgewater plant is majority owned by Public Service Enterprise Group of New Jersey; and the Alexandria plant is owned by Indeck Energy Services Inc. of Illinois).[59]

To remain viable, the plants hope to see an increase in the percentage of Class III RECs utilities are required to obtain. The value of Class III RECs could also be enhanced by keeping the required percentage constant, but reducing the level of supply (i.e., restrict eligibility to resources that are physically interconnected to NH distribution equipment). The state PUC is currently reviewing the state's Renewable Portfolio Standards, with a report of its findings to go to the Legislature in November. Older plants need to be upgraded, but care should be taken to prevent the RPS process from dis-incentivizing older plants.

[59] http://www.nhbr.com/news/921480-395/four-n.h.-wood-burning-plants-warn-theyll-shut.html

Recognizing the interest and potential in small-scale wood-fueled energy, a residential wood-pellet central boiler rebate program was made possible with ARRA funds and made available by the NH OEP, currently being administered by the PUC. Supported by ARRA funds, the program, as outlined in the following table, provides incentives for the installation of efficient bulk-fed wood pellet central boilers and furnaces that meet certain storage, automation, emissions, and other technical specifications. General information on the program's funding and administrative structure was given earlier, in Table 7.3.

Table 7.8. Customer-sited Biomass Rebate Program: Program Design and Performance

ARRA-Funded Residential Wood-pellet Boiler/ Furnace Program – Completed & Reserved Systems (6/2011)								
Target Market Sector	Start	Incentive Design		Program Performance – Installed Systems				
		Incentive Level	Max Rebate	# Installed	Total Capacity (Btu/hr)	Total Rebates Paid	Total Installed Costs	Avg. Efficiency Rating
Residential	April 2010	30% installed cost	$6,000	7	631,600	$41,652	$153,907	86.6%
				Systems Under Reservation				
				# Reserved	Total Capacity (Btu/hr)	Rebates Reserved	Estimated Installed Costs	Avg. Efficiency Rating
				8	846,000	$44,738	$186,622	86.6%

This program is the first residential wood-pellet central heating system rebate program in the country. The program received a great deal of interest but was very slow to start because of difficulties in finding available systems that met the original efficiency requirement (> 85%). The program has been modified to approve systems of > 80% efficiency and to loosen the automatic cleaning requirement so that more available and less costly systems are eligible. Funding has not yet been identified to continue the program beyond ARRA support.

Economic Impact of Local Woody Biomass Energy

Biomass energy is beneficial to the New Hampshire economy. It has been estimated that the increased supply of biomass and adoption of advanced chip and pellet heating technologies for residential, commercial, and industrial heating and combined heat and power will create thousands of jobs in the northeast and generate billions of dollars in economic activity. In a recent study, the Northeast Biomass Thermal Energy Working Group developed a vision for heating the Northeast with renewable energy biomass, calling for 25% of the Northeast's thermal energy demand to be met by renewable sources (biomass, solar thermal, geothermal) by 2025, with 75% of that amount derived from renewable biomass It has been estimated that 19 million green tons of forest and crop biomass will be available by 2025 to fuel this Vision.[60] Reduced demand for foreign oil by over 20% will mean that fuel expenditures that otherwise flow out of the northeastern economy will circulate in the region instead, at an estimated $2 billion annually. New regional economic activity would receive an additional $4.5 billion dollars due to retention of fuel dollars and as a result of job creation if the region is successful in attaining this vision.

Research undertaken as part of the New Hampshire Climate Action Plan indicates that the total energy content in standing biomass in the state in 2003 was 2.1M Billion British Thermal Units (BBTUs), or roughly six times the total annual energy consumption in the state. Biomass (mostly woody biomass)

[60] Heating the Northeast with Renewable Energy Biomass: A Bold Vision for 2025; Executive Summary; http://www.nebioheat.org/pdf/heatne_vision_ExecSummary.pdf

provided roughly 19,000 BBTUs per year, or about 6% of total demand in 2009.[61] Preserving working forests and avoiding conversion of forest lands to other purposes will be critical to the success of New Hampshire's Climate Action Plan. New Hampshire is currently 83% forested, and the forest products industry has been and will continue to be a key component of the state's economy. In addition, tourism and outdoor recreation economies are heavily dependent on the health of the forests. Sustainably managed forests in New Hampshire provide a broad range of benefits, including: the ability to absorb and store large amounts of carbon; renewable supply of wood for heating, lumber, and a variety of forest products; and recreational opportunities.[62]

Several of the New Hampshire biomass co-generation plants initially used coal before switching to biomass (e.g., the Schiller plant). Aside from the environmental benefits of burning renewable fuel rather than fossil fuel, locally sourced fuels benefit the state's economy directly. Most wood fuelling co-generation plants are sourced locally, which leads to the local creation of jobs. New Hampshire has a developed infrastructure of forest management, wood pellet manufacturing, and co-generation.

The distribution network for woody biomass is extensive. Wood and wood pellets are distributed from a diversity of suppliers, and foresters and loggers manage and provide the wood products. In addition, some wood pellet manufacturers are located in New Hampshire, including:

- **New England Wood Pellet**, a leading producer and distributor of pellet fuels for use in residential, commercial, and industrial heating throughout the Northeast. New England Wood Pellet was founded in Acton, Massachusetts in 1992 before moving to New Hampshire in 1995, and to Jaffrey in 1999.

- **Lakes Region Pellets**, a startup producer and supplier of wood pellets for private households and commercial businesses that started in 2009 in Barnstead. Lakes Region Pellets planned on hiring up to or more than 20 positions, ranging from direct labor skilled work to managerial positions.

Recommendations

- **Increase program marketing and outreach:** Expense of the systems and the lack of consumer awareness or willingness to take a risk on this new technology have resulted in a slow start for this program, making lack of participation the current challenge.

- **Establish a secure source of funding for the wood-fueled boiler/ furnace program:** The major long-term limitation for this program is likely to be lack of a source of long-term and reliable funding for systems once consumer interest and education increase (the current ARRA funding will not be renewed). Because this technology is replacing fossil fuel boilers or furnaces, the RGGI-funded GHGERF might be an appropriate source for future support.

- **Consider extending and expanding this program** to include:
  - Prescriptive rebates for residential and small C&I central wood-pellet boilers and furnaces

61 The New Hampshire Climate Action Plan 2009: Appendix 8;The Wood Biomass Wedge in New Hampshire: Data Sources and Basic Approach
http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/documents/032509_nhccptf_appendix_8.pdf
62 The New Hampshire Climate Action Plan, NH Department of Environmental Services, 2009

- Support for custom installations of larger C&I central wood- pellet and wood-chip-fired boilers and furnaces
- An alternative route to rebates through the CORE Home Performance with ENERGY STAR programs for residential central wood-pellet boilers and furnaces as part of a comprehensive energy efficiency retrofit project

- **Support community-scale investment, including biomass-fueled district heating projects:** Biomass is also a technology that has received attention at the community scale; policy and funding support should be included that encourages appropriate development at this scale.

- **Encourage thermal-led combined heat and power (CHP) technology** where the balance of thermal loads and electric generation offer promising biomass CHP opportunities. Charge the state economic development agency with evaluating opportunities for commercial- and industrial-scale heat loads where biomass might be appropriate and then encourage the owners of these sites to consider cogeneration of electricity as an ancillary benefit. The support should first target industrial parks and large thermal loads that currently use fuel oil. If these customers have consistent year-round heat loads, then perhaps a steam turbine could be added to create electricity. Potential good candidate sites for biomass CHP might be colleges, hospitals and industrial parks.

- **Develop mechanisms to promote high-efficiency biomass heating technology for thermal needs** in the residential and commercial sectors. **Consider setting goals** for the percentage of the state's residential thermal needs to be met by high-efficiency biomass systems by 2030.

7.13. New Hampshire Markets: Hydroelectric Generation

One of the oldest of energy generation technologies, hydropower is the renewable energy source that produces the most electricity in the United States. It accounted for 7% of total US electricity generation and 35% of generation from renewables in 2009.

Current New Hampshire Landscape – Hydroelectric Projects and Programs

As of 2008, hydroelectric generation represented approximately 7% of total NH electric production,[63] with total generation capacity of >500 MW. The majority of New Hampshire's hydroelectric generation originates from small plants associated with small dams built 50 to 100 years ago.

The summary table below gives representative examples of principal hydroelectric stations in New Hampshire, and examples of facilities eligible as RPS Class IV resources (those that began operation before Jan. 1, 2006 and have a capacity of 5 MW or less). In addition, existing hydro facilities that invest capital that results in incremental production in excess of the historical average production can earn Class I REC treatment for all production in excess of the baseline average. Granite State Hydropower Association (GSHA) is a volunteer association made up of owners and other individuals and organizations representing the small hydropower industry in NH. GSHA members include owners of approximately 50 small-scale hydroelectric projects (<10 MW) located throughout the state. Most of the GSHA projects are smaller plants than those listed in the tables below.

[63] EIA 2008

Table 7.9. Examples of Hydroelectric Generation Facilities in New Hampshire

Name	Capacity (MW)	Location	Status	Key Characteristics
The following hydro stations are owned by TransCanada and are representative of the 13 hydroelectric stations and associated dams and reservoirs on the Connecticut and Deerfield Rivers in New Hampshire, Vermont, and Massachusetts; 567 megawatts total [64]				
Moore	192	Littleton, NH and Concord, VT on the state line	Operating	• In service since 1957 • Largest dam in New Hampshire: 193 feet high and 2,920 feet long
Comeford	164	Monroe, NH and Waterford, VT on the state line	Operating	• In service since 1930
McIndoes	13	Barnet, VT and Monroe, NH on the state line	Operating	• In service since 1931
Wilder	42	Hartford, VT on the state line	Operating	• In service since 1950
Vernon	22	Vernon, VT and Hinsdale, NH on the state line	Operating	• In service since 1909
PSNH owns and operates these hydroelectric power plants throughout New Hampshire[65]				
Amoskeag	16	Merrimack River in Manchester, NH	Operating	• In-service since 1924 • 30-foot dam
Ayers Island	8.4	Northernmost hydro station in the Merrimack River Basin	Operating	• In-service since 1924 • 80-foot dam
Eastman Falls	6.4	Pemigewasett River	Operating	• In-service since 1901
Garvin Falls	12.1	Merrimack River in Bow, NH	Operating	• In-service since 1901 • 20-foot dam
Smith	18	Confluence of the Dead River Androscoggin River in Berlin, NH	Operating	• In-service since 1948 • 29-foot dam • Receiving Class I REC treatment after capital investment resulting in incremental production in excess of the historical average
Jackman	3.2	North Branch Contoocook River	Operating	• In-service since 1926 • 32-foot dam
Gorham	2.15	Androscoggin River	Operating	• In-service since 1917 • 14-foot dam
Hooksett	1.6	Merrimack River	Operating	• In-service since 1927 • 14-foot dam
Canaan	1.1	Upper reaches of the Connecticut River, 10 miles south of Lake Francis	Operating	• In-service since 1927

64 Deerfield Plant Fact sheet http://www.transcanada.com/docs/About_Us/ConnectDeerplant.pdf
65 http://www.psnh.com/RenewableEnergy/About-PSNH/Hydroelectric-Stations.aspx

Example of other minor facilities				
Cocheco Falls	0.75	Dover	Operating	• In-service since 1930 • The only NH-based Class IV facility (ongoing)

Existing dams may have the potential to be further used to produce sustainable energy, although this assessment is beyond the reach of this study. There are 3,070 active dams in the state of New Hampshire. Many of these dams are small: 35% are less than 8 feet high. Almost 50% have less than 50 acre feet of storage. Ownership of dams varies: 77% of dams are privately owned; 13% are owned by municipalities; 9% by the state; 1% by the federal government; and less than 1% by NH utilities (12 dams). Of all dams currently existing in the state, only a small proportion are hydropower dams (132).[66]

New Hampshire ranks third in the country in numbers of known dam deficiencies. The infrastructure is old and requires maintenance and repair. However, there is a lack of funding for dam upgrades and maintenance. This has become a serious concern due to the large number of hazardous dams, especially within the private sector.[67]

Hydroelectric generation facilities qualify as Class IV RPS resources if they:

- Began operation on or before January 1, 2006
- Have a gross capacity of 5 MW or less
- Have installed fish passages approved by FERC (Class IV eligibility also requires both upstream and downstream fish passageways)
- Have obtained all necessary water quality certifications under section 401 of the Clean Water Act

Existing facilities that begin operation as a new facility through capital investment can qualify as Class I RPS sources. According to GSHA representatives, while there are opportunities to replace existing inefficient turbines and to make incremental expansions at some existing small plants, current market conditions make it difficult to justify capital investments given the volatility of the electrical energy market and the current low REC prices.

One of the recent grants made through the state's Green Launching Pad program, which provides support for green technology companies in the state, was made to Blue2Green, who is working to revitalize hydroelectric energy in NH by renovating existing dams.

There are some dam/ micro-hydro developers in the state, such as Sunny Brook Hydro in Lancaster, but overall this market is not currently very active. There are no active rebate programs specifically supporting investment in new hydroelectric facilities, though existing hydro facilities are eligible to participate in the NH PUC C&I RFP.

Recommendations

The hydroelectric infrastructure in New Hampshire is old and, in general, in need of upgrade. At this time, energy market prices and REC prices for hydroelectric facilities are not sufficient to support

[66] New Hampshire Department of Environmental Services, http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer_chapter11.pdf

[67] New Hampshire Department of Environmental Services, http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer_chapter11.pdf

continued expansion in this market. Consider the following when planning for future support for hydropower in the state:

- **Commission a study** to assess the potential for energy from the hydroelectric infrastructure in the state. As a result of this study, develop recommendations on the best ways to facilitate the rehabilitation for appropriate projects.

- **Design more-specifically targeted support mechanisms for the hydroelectric market**, if facility upgrades and new market development are desired. Targeted feed-in tariffs, competitive solicitations, and other strategies should be considered, as well as modifications to the RPS program to incent continued operation of existing New Hampshire hydroelectric facilities.

- **Continue simplified and streamlined permitting processes** for small development. Permitting issues can be a major barrier to the development of new small-scale hydroelectric generation. Current permitting processes distinguish between small- and utility-scale facilities. This is encouraged to remain in effect in the future.

7.14. New Hampshire Markets: Methane and Landfill Gas

Biogas is a gas composed mainly of methane and carbon dioxide that forms as a result of biological processes in waste streams. These wastes can be generated from sewage treatment plants, waste landfills, and livestock manure management systems and can also include municipal and industrial wastewater, brown grease, residential and institutional food waste, and leaf and yard waste. Facilities and processes exist that can capture the biogas from these materials and burn it for heat or electricity generation. The electricity generated from biogas is considered "green power" in many states and is often eligible to meet state RPS requirements. The electricity generated may replace electricity produced by burning fossil fuels and result in a net reduction in CO_2 emissions.

Landfill sites have become a productive source of methane-based energy. As of October 2010, 490 landfills have 526 operating gas-to-energy projects in the US.

Other methane-producing projects include farm-based capture. Animal waste-to energy generation, nicknamed “cow power,” uses cow manure for energy production. Not only does this generate sustainable electricity, it also addresses serious animal waste disposal issues.

Current New Hampshire Landscape – Methane and Landfill Gas Projects and Programs

The current 2008 landfill methane generation capacity is over 13 MW, representing 0.75% of total New Hampshire generation.[68] Generation facilities that produce electricity from methane gas, or from hydrogen derived from methane gas, are eligible resources under the NH RPS. There have been a few projects developed to take advantage of the energy potential in the methane gas produced from New Hampshire’s landfills – all of the projects listed in the following table were certified to produce Class I RECs for 2010.

[68] EIA 2008

Table 7.10. Examples of Methane Powered Facilities in New Hampshire

Name	Capacity (MW)	Location	Status	Key Characteristics
Turnkey Recycling	6.6	Rochester	Operating	• Also provides gas to UNH (below)
UNH CHP Plant – EcoLine	7.9	Rochester – Durham	Operating	• Combined Heat and Power • Methane from the Turnkey landfill is primary fuel • Provides electricity and heat for the main campus buildings - up to 85% of the campus energy
UNH Power Plant	4.6	Durham	Operating	• The second generator - uses excess summer gas • On-line since 2009
Colebrook Landfill Gas Facility	0.8	Colebrook	Operating	• 800-kW power plant uses methane from landfill that closed in 1993 • Opened August 2009

In addition, some farm methane projects have been implemented in New Hampshire to produce energy from the methane produced from dairy waste. Stonyfield Farms has installed a large-scale anaerobic waste digester that produces bio-gas from process (dairy - yogurt) waste at their processing plant in Londonderry. Other examples of farm waste projects include:

- Brubaker Family Dairy Farm Methane Project
- Wanner Family Dairy Farm Methane Project
- Hillcrest Saylor Family Dairy Farm Methane Project
- Schrack Family Farm Methane Project
- Dovan Family Farm Methane Project
- Penn England Family Dairy Farm Methane Project

A New Hampshire company, Environmental Power (EPG), owns and operates renewable energy facilities for the production and commercial application of methane-rich biogas from agricultural livestock and organic wastes around the country. They install methane digesters on farms, sell the energy to utilities, and pay the farmers a percentage. EPG has an exclusive license in North America for the development and deployment of an anaerobic digestion technology for the extraction of methane gas from animal wastes for its use to generate energy. This not only allows farmers to rid themselves of the waste which can elevate the phosphorus and nitrogen levels in the soil, it also removes much of the odor from the air. Most importantly, it generates energy in the form of electricity.

Recommendations

- **Provide targeted support for agricultural-waste methane projects:** For example, Vermont has a dairy industry similar to NH and has developed state-supported programs to support farm methane projects. The VT Department of Public Service and the VT Department of Agriculture have received a total of $695,000 from appropriations from the federal budget over the past several years to promote the use of methane recovery technology on Vermont dairy farms. Some new VT projects are proposed to benefit from the VT Standard Offer, which will provide these projects with a constant per kWh payment for power produced over the next 30 years. Investigation of similar potential for NH would be beneficial both to the agricultural industry as well as the sustainable energy market.

- **Provide similar targeted financial support for appropriate landfill sites** and other waste streams suitable for conversion to methane-fueled generation. A US EPA report for the Landfill Methane Outreach Program identifies three additional candidate sites in NH:[69] City of Lebanon Secure MSW Landfill (West Lebanon); Mount Carberry (Berlin); and North Country Environmental Services (Bethlehem).

7.15. New Hampshire Markets: Geothermal and Other Sustainable Energy

According to the US Environmental Protection Agency (EPA), ground source heat pumps are the most energy efficient, environmentally clean, and cost-effective systems for temperature control. Although ground source heat pumps require the use of electricity, the savings with respect to fossil fuel displacement can be substantial in the right settings. Although most homes still use traditional furnaces and air conditioners, ground source heat pumps are becoming more popular. In recent years, the US Department of Energy and the EPA have partnered with industry to promote the use of ground source heat pumps through a number of initiatives.

Current New Hampshire Landscape – Other Sustainable Energy Projects and Programs

Projects that use the energy inherent in ocean thermal, tidal, and wave processes are eligible as Class I resources for the New Hampshire RPS. At this time, no projects have been developed to capture this potential energy. In June 2007, Governor Lynch signed HB 694 (Chapter 222, Laws of 2007) establishing a tidal energy commission to study the feasibility of tidal power generation, specifically in the Piscataqua River under the Little Bay and General Sullivan Bridges. A proposal for Portsmouth was developed but was withdrawn in 2010.

For clarity purposes, ground source heat pumps contrast to *geothermal* systems that use hot geological formations to make steam or hot water directly, sometimes called “hot rocks” technology. An MIT study of the potential for large-scale geothermal energy estimated that Conway is the best place in the Northeast for geothermal power, although an effective project at this location would require a 6-mile-deep well. No projects have been implemented, as this undertaking would be extremely expensive.

The value of ground source heat pumps has been recognized by the NH utilities through the provision of incentives for their installation in both new construction and retrofit projects under their CORE efficiency programs.

- NHEC offers incentives of $800/ton, up to $4,500, for ground source heat pumps with efficiencies of up to 400% in new ENERGY STAR homes. Rebates for conversion to a ground source heat pump in existing homes are based on 35% of installation costs, up to a maximum cost of $10,000.
- PSNH and National Grid provide incentives of $150/ ton for ground source heat pumps installed through their commercial efficiency programs.

[69] www.epa.gov/lmop

Recommendations

There has been a general increase in interest in ground-source heat pumps (GSHP) over the past decade because of their potential as efficient and environmentally benign temperature control technology. GSHP uses the relatively constant 45ºF temperature of the ground as a place to deposit unwanted heat in cooling mode, and a place that is warmer than the outside air to extract heat in the winter time. In cooling mode, GSHPs perform very efficiently when compared with conventional air-conditioning systems. When compared with other electrical heating technologies like resistance heat or air source heat pumps, GSHP is more efficient, but does not gain the levels of efficiency achieved in cooling mode.

There has been strong pressure to move away from electric sources of heating and toward more-efficient sources for cooling. GSHP is compatible with this cooling goal, but conflicts with the heating goal, because it uses the most electricity at times coincident with the winter electric peak. It also uses a large amount of electricity overall, contributing to a pattern of load growth that would currently be met by operating power generating stations that use nuclear or fossil fuel generators.

For these reasons, GSHP is a good option to consider in any building where the annual cost of cooling exceeds the cost of heating. In warm, humid climates where cooling loads are high, GSHP can result in good savings. In New Hampshire, commercial buildings with large cooling or dehumidification requirements may be good candidates. Other good candidates for GSHP are buildings that incorporate all reasonable advanced thermal envelope strategies, and have sufficient on-site renewable electricity generation to supply all building electrical needs, including the GSHP. However, grid connected systems will still contribute to winter peak load.

- **Provide customer education on GSHP technology and appropriate siting:** Because GSHP is not necessarily the most efficient choice for all thermal load types, customer education about the optimal uses of this technology is a very important component of any program to support it.

- **Consider the following when planning for ground source technology implementation** in both the residential and commercial sectors:
  - **Establish installation standards** ensuring that only the most efficient, well designed ground source heat pump systems are used.
  - **Commission a study** to assess the efficiency and carbon footprint of a cross-section of ground source heat pump installations in the state. As a result of this study, develop recommendations on best design and installation practices, and delineate the most common causes of less-than-optimum performance.
  - **Develop a rebate program** to incentivize well-designed systems.

7.16. Sustainable Energy: Summary of Recommendations

The table below summarizes the recommendations for the Sustainable Energy Sector as discussed in the sections above.

Table 7.11. Summary of Recommendations for Sustainable Energy Development in New Hampshire

Enact an Overarching Sustainable Energy Policy *Recommendation 7.1; Section 7.2*

Establish a Stable Source of Funding for Sustainable Energy *Recommendation 7.2; Section 7.3*

Update New Hampshire's Electric Renewable Portfolio Standard to Support Local Market Development *Recommendation 7.3; Section 7.4*
• Consider RPS refinements that require at least some investment to be made locally
• Consider all mechanisms to support a fuel-neutral RPS
• Improve the process for, and encourage distribution utilities to conduct competitive procurements for long-term contracts for RECs from facilities that are interconnected and feed power into their distribution system
• Allow co-firing of generation with renewable fuels to qualify for RECs
• Develop policies to facilitate aggregation of smaller projects to lessen transaction costs of measurement and participation in REC market
• Allow all appropriate costs of purchasing RECs to be recovered by utilities as part of distribution rate charges to all customers
• Establish new, higher Alternative Compliance Payment levels for some or all RPS classes, followed by a scheduled ramp-down of ACP levels

Continue to Enhance Sustainable Energy Permitting and Infrastructure to Support Development *Recommendation 7.4; Section 7.5*
• Ensure a high level of transparency and effective communication for all policies and regulations
• Further expand net metering opportunities
• Provide support for community-scale endeavors
• Streamline permitting as appropriate
• Expand uniform standards and model ordinances to technologies other than wind
• Lead a state-wide conversation on sustainable energy development siting
• Establish a uniform taxation policy for sustainable energy projects that does not result in inequitable burdens
• Support third-party leasing and Power Purchase Agreement structures for sustainable energy projects
• Develop sustainable energy industry contractor licensing and certification standards
• Incorporate sustainable energy into building standard guidelines, support, and codes
• Provide Leadership by Example at the state level – consider adopting policies such as:
• Expand green industry recruitment and support, including manufacturing incentives
• Be ready for sustainable energy's contribution to transportation-related infrastructure

Expand the Current Portfolio of Financial Support Mechanisms for Sustainable Energy Development *Recommendation 7.5; Section 7.6*

Establish Stable Customer-sited Sustainable Energy Rebate Programs Designed to Provide Effective Market Development *Recommendation 7.6; Section 7.7*
• Establish a reliable and long-term source of funding for programs
• Develop long-term plans for program support and incorporate thoughtful, long-term, and market-reactive design principles
• Establish a coordinated portfolio of programs to support multiple markets
• Consider designing programs, and perhaps setting aside earmarked funds, to target markets, sectors, or technologies that address goals
• Continue to include competitive grants rather than rebate programs when appropriate
• Stress transparent communication to all stakeholders
• Provide support for customer education and outreach
• Provide support for workforce development
• Support quality control through contractor lists, certification, insurance requirements, project technical reviews, and/or inspections
• Integrate energy efficiency and sustainable energy as much as possible
• Make it easy for participants – Reduce transaction costs through program delivery and administration that provides one-stop-shopping for the customer
• Include financing components whenever possible

Support Utility Investment in Distributed Sustainable Energy *Recommendation 7.7; Section 7.8*
• Investigate the issues currently hindering utility investment in DG; Develop mechanisms to allow appropriate investment
• Address obstacles to speedy and efficient project review at the state and local levels
• Address transmission infrastructure limitations
• Consider the value of alternative approaches to supporting investment by the utilities

More-fully Enable Effective Sustainable Energy Program Administration *Recommendation 7.8; Section 7.9*
• Authorize program administrators to make independent program decisions based on long-term planning
• Design programs for effective and efficient administration
• Consider integrating the administration of energy efficiency and sustainable energy programs into a single entity for the state

Consider Additional Program and Project Support to Enhance NH's Solar Photovoltaic and Solar Thermal Energy Market *Recommendation 7.9; Section 7.10*
• Consider promoting the redevelopment of brownfields to use solar technology
• Consider the overarching program recommendations given in the sections above, as they are highly relevant to program design in the solar market

Consider Additional Program and Project Support to Enhance NH’s Wind Energy Market *Recommendation 7.10; Section 7.11*
• Have strong foundational policies in place to address issues of siting, permitting
• Address transmission infrastructure limitations
• Consider the overarching program recommendations given in the sections above, as they are highly relevant to program design in the small wind market

Consider Additional Program and Project Support to Enhance NH’s Biomass-Fueled Energy Market *Recommendation 7.11; Section 7.12*
• Provide well-designed programs for emerging efficient wood-fired technologies
• Provide policy and funding support to encourage appropriate development for community-scale projects, including district heating projects
• Encourage thermal-led combined heat and power (CHP) technology where the balance of thermal loads and electric generation offer promising biomass CHP opportunities
• Consider setting goals for the percentage of the state’s residential thermal needs to be met by high-efficiency biomass systems by 2030

Assess the Potential for Hydroelectric Energy in NH and Target Support as Appropriate *Recommendation 7.12; Section 7.13*

Provide Targeted Support for Appropriate Methane and Landfill Gas Energy Development *Recommendation 7.13; Section 7.14*

Establish Standards and Provide Support for Well-Sited Ground-Source Heat Pump Projects *Recommendation 7.14; Section 7.15*

Section 8: Smart Grid Deployment Review and Assessment

8.1. Introduction

The smart grid is a system of digital two-way communication between electric utilities, generators, meters, and other connected devices. The physical infrastructure enables programs and policies that provide more timely information on energy use and grid conditions. This information can then be used to improve grid performance and services. Smart grid infrastructure combined with appropriate programs and policy can:

- Reduce energy consumption,
- Reduce peak demand,
- Increase the system load factor, which reduces the fixed cost per unit energy,
- Better integrate variable renewable energy sources,
- Reduce emissions,
- Improve utility outage management,
- Reduce meter-reading costs, and
- Provide information on all fuels and even water use.

Smart grid is a very large and amorphous topic. Updating decades old infrastructure with high tech connected devices is a major change and opportunity, and presents new challenges. For example, much of existing grid controls are physical and are protected with fences and padlocks. Security takes on a very different meaning for smart grid, with remote control and some capacity of the devices to make decisions for themselves. In addition to preventing physical access of intruders, the smart grid needs to be guarded against electronic attacks of many kinds. Furthermore, it carries customer data, which is not present in the existing grid, and this too must be protected.

There are also many technical details and standards to ensure interoperability of the grid between different utility and regulatory territories. If a major justification of smart grid is to enable greater adoption of renewable energy, which is sometimes located distant from load centers, then the wires and devices in between need to be compatible to transmit power from the sources to the users. Because this is a policy report, discussion of the smart grid technology will be limited.

Presented below is a description of smart grid technology and a discussion of how it may be applied, a review of the status of smart grid deployment in New Hampshire, and recommendations for various policies and programs that will help New Hampshire benefit from smart grid investment.

8.2. Infrastructure Components

The infrastructure that enables smart grid customer and system benefits falls into several categories. Together, these components form a smart grid. However, they must be combined with programs and policies that take advantage of their advanced capabilities to realize the benefits.

The electrical grid has been called the world's largest machine because it is an amazing and massive system in which production exactly equals consumption continuously, and all of the generators and other machines are spinning at the same frequency even if separated by hundreds of miles. The millions of pieces of connected equipment are compatible with each other because they adhere to electric standards regarding frequency and voltage. Smart grid is going to bring two-way communications, two-way energy flow within distribution networks, and many computers and other data driven devices. More complicated standards are required to get this increased number of increasingly complex devices to work together properly. In the United States, many stakeholders have been brought together to work toward these new standards under the Smart Grid Interoperability Panel (SGIP). The panel supports the National Institute of Standards and Technology (NIST) in its assignment in the Energy Independence and Security Act of 2007 to "coordinate development of a framework that includes protocols and model standards for information management to achieve interoperability of smart grid devices and systems."[1] NIST is organizing the interoperability requirements according to the domains shown in Figure 8.1 below.

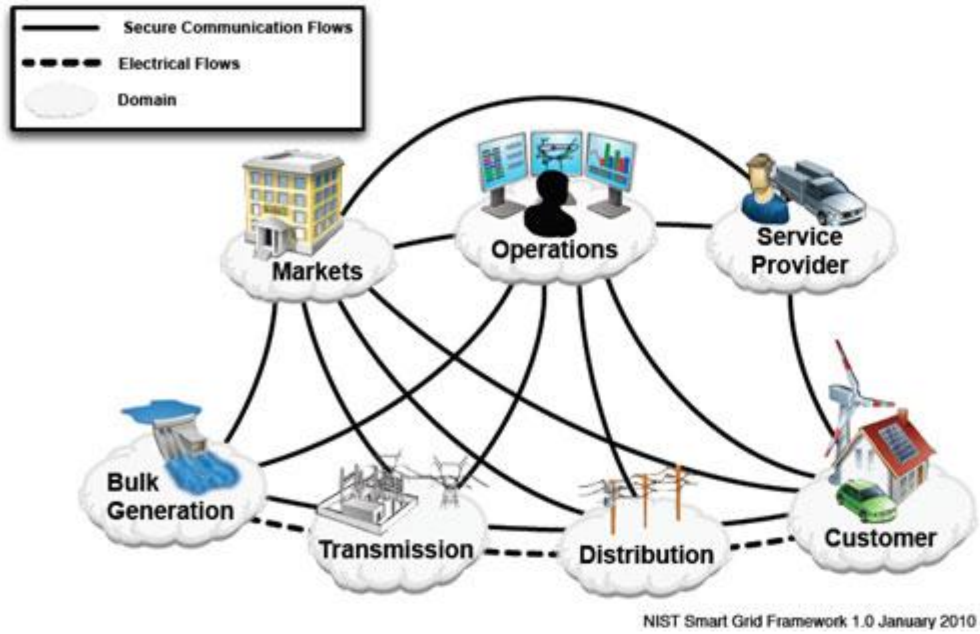


Figure 8.1. NIST Smart Grid Domains

With the security and interoperability requirements in mind, some basic smart grid infrastructure components are presented below to help understand why and how the smart grid can do more.

Advanced Meter Infrastructure, or Smart Meters, and Meter Data Management Systems

The most well-known piece of smart grid technology may be the smart meter, also known as Advanced Meter Infrastructure (AMI), or Advanced Meter System (AMS). AMI replaces the existing analog meters with digital ones that record and transmit energy use and price data by minute or hour instead of by month. Meter Data Management Systems (MSDS) are the utility's system to collect, record, and manage customer usage information, as well as to vary price according to time or grid conditions if desired. The complexity of the system depends on the frequency of data collection and price changes.

Advanced Visualization Technologies

Within the transmission and distribution systems, smart grid technologies give grid operators near real-time awareness of system parameters so that cascading failures and other blackouts might be avoided. An

[1] NIST, "NIST & the Smart Grid," http://www.nist.gov/smartgrid/nistandsmartgrid.cfm

example is synchrophasors which provide voltage and current information in transmission lines more than 30 times per second compared to once every four seconds with typical current technology.

> ***Oklahoma Gas and Electric recently finished year one of a two-year study of smart grid and variable pricing:***
>
> - ***Customers with smart thermostats reduced demand 57% compared to a control group.***
> - ***Energy consumption during the highest price peak periods was reduced 11% to 33%.***
> - ***Energy consumption during the lowest price periods increased 1%.[2]***

Distribution Automation

Modern distribution technology is becoming networked and able to automatically reroute power and optimize system operations. As part of their capital budgets, utilities routinely replace old equipment such as transformers, reclosers, and capacitors. As the newer smarter hardware replaces the old, a smart grid will be built gradually, but careful policy and guidelines are needed to ensure interoperability and security.

Distributed Generation

Distributed Generation (DG) refers to the generation of electricity from various sources spread throughout the grid (as opposed to solely from centralized generating facilities).

The two types of DG most commonly mentioned in connection with the smart grid are renewable generation (primarily wind and solar) and high-efficiency fossil fuel or biomass generation from combined heat and power (CHP) plants. It should be noted, however, that DG is not synonymous with cleaner generation. A highly polluting diesel generator, for example, also represents distributed generation. Renewables and CHP DG are important components of the smart grid because of their ability to supply new capacity with reduced or zero carbon emissions and reduced exposure to volatile fossil fuel prices and supply interruptions.

Managing the intermittency of renewable sources, however, poses a particular challenge for the grid, which must instantaneously match electricity demand and supply. Smart grid communication technologies, such as advanced grid visualization, energy storage, and demand response can help maintain this balance while allowing a greater penetration of intermittent energy sources. Particularly by dispatching energy storage devices, smart grid could maximize the use of renewable energy.

Energy Storage

Technologies that enable large-scale energy storage (ES) have the potential to significantly increase the efficiency of the grid by allowing for higher load factors. Examples of current technologies for storing electricity include pumped hydro and ice thermal storage. In pumped hydro, surplus grid capacity is used to pump water to a higher elevation during off-peak periods, and then the water flows down to spin a turbine and generator during peak periods. Ice thermal storage uses low cost off-peak electric rates to make ice at night, when the chilling system is also more efficient due to lower ambient temperatures. During hot daytime periods when electricity is much more costly, the ice is used for cooling rather than air conditioning struggling to reject heat to the hot afternoon air. The rising peak demand and increasing penetration of air conditioning in New Hampshire mean that thermal storage for cooling could play a

[2] Oklahoma Gas and Electric, Press Release, "Oklahoma Gas and Electric customers realize smart grid energy savings," February 2, 2011, http://www.elp.com/index/display/article-display/1448805853/articles/electric-light-power/smart-grid/2011/02/Oklahoma_Gas_and_Electric_customers_realize_smart_grid_energy_savings_.html

significant role in a more efficient energy system. Energy storage technologies being developed include high-capacity batteries, super capacitors, compressed air, high-capacity flywheels, and others.

An often-mentioned energy storage possibility is via Plug-in Hybrid Electric Vehicles (PHEV) or Electric Vehicles (EV) combined with Vehicle to Grid (V2G) technology. This would allow next-generation PHEVs and EVs to serve as a dispersed energy storage network for the grid. Cars charged at night and during off-peak periods could be plugged in during the day and used to supply critical peak power and voltage regulation to the grid as needed. Since there is little to no existing storage on the grid, fleets of PHEVs and EVs would add significant new ability to integrate high penetrations of variable and intermittent renewable energy. While smart grid is technically not necessary for this to occur, the variable pricing available through the smart grid could incentivize the use of PHEVs and EVs by paying people for the energy services provided to the grid by their car.

8.3. The Smart Grid—a Daily Snapshot[3]

It is useful to sketch out a sample day to show how the pieces of technology might interact.

Midnight – 7 a.m.: The grid runs its most efficient base load generating plants at optimal capacity, storing excess energy via several different distributed storage technologies. Among these storage locations are the batteries of residential ratepayers' PHEVs or EVs. Efficient buildings may bring in cool air, or make ice or chilled water to prepare for daytime cooling demand. Additional energy from overnight wind generation in remote locations is transmitted to populated areas over superconducting High Voltage Direct Current lines and used or stored as needed.

7 a.m. – 9 a.m.: Residents drive to work on all-electric power using the lowest-cost energy stored from the grid overnight.

9 a.m. – 3 p.m.: As electricity use increases, along with its price, on-site demand response systems regulate appliance use by turning off appliances that are not in use and adjusting the levels of those that are, like lighting and air-conditioning. Buildings that have their own energy storage technologies make use of this capacity now with energy that was bought overnight at the lowest rates. The grid makes use of solar generation to supply needed capacity, taking advantage of solar's increasing capacity as the day gets brighter. In buildings that have vehicle charging infrastructure installed, the grid is able to buy needed electricity from workers' cars at a high price.

3:30 p.m.: Construction workers building a new office building accidentally sever a distribution line. The grid's automated sensing technology immediately detects the outage, shutting down the line and routing power via alternate routes, preventing a cascading system failure and reducing the safety risk at the construction site.

4 p.m. – 8 p.m.: After a day of work, workers drive home on the remaining electric power in their PHEVs or EVs or, in the case of having sold most battery capacity to the grid, on power supplied by their cars' internal combustion engine. With most energy storage systems tapped out, electricity prices reach their highest levels, encouraging further demand response measures from smart appliances. The wind begins to pick up, resulting in increased wind capacity that the grid can immediately put to use.

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[3] Fribush, David; Parker, Scudder; Enterline, Shawn; Electric Evolution: Issues Posed and Opportunities Presented by the Emergence of the Smart Grid, VEIC Consulting Division, January 2010.

8 p.m. – midnight: As electricity use and prices fall off, washing machines, dishwashers, and other deferred appliances begin to run. The combination of demand response measures and the integration of renewable capacity have enabled the utility to avoid running low-efficiency peaking plants, with the savings being passed directly to ratepayers through real-time prices and in the cases of homes with solar or wind generation, the purchase of that electricity at high rates.

8.4. Status of Smart Grid in New Hampshire

New Hampshire's electric utilities have taken different approaches to investing in smart grid infrastructure. These approaches include completed AMI investments, planned AMI investments and automation investments in transmission and distribution infrastructure. A brief description of each major utility's actions around smart grid, and especially the more public AMI investments, follows.

Public Service of New Hampshire (PSNH)

PSNH's parent company Northeast Utilities applied for federal stimulus money in 2009 to install some smart grid infrastructure in New Hampshire as well as its other utility territories in Massachusetts and Connecticut. The proposal called for up to 5,000 smart meters for PSNH customers, as well as system automation and outage response capabilities in the distribution system.[4] Northeast Utilities (NU) was not awarded the funding and the project was not constructed. However, NU is upgrading over 700 miles of transmission lines with optical fiber composite ground wire, which serves multiple purposes including high-speed data transmission for smart grid applications.

Unitil

Unitil completed installation of AMI at all customers in New Hampshire in 2008, and performed a pilot in the summer of 2011 to test time-of-use rates and various technologies for both residential and C&I customers. Taking full advantage of the existing TS2 platform meters and using power line communications (PLC) allowed Unitil to upgrade rather than replace existing meters to begin to realize some of smart grid's benefits at lower initial cost and risk. However, this approach lacks the capabilities of new AMI systems and the company would at some point need to replace the meters to continue to take advantage of all that smart grid offers as it develops. Unitil is also in the process of installing a new outage management system and preparing to integrate distributed generation into the system. The company estimated significant operations and maintenance savings and returns on investment, primarily from the reduction of staff required to read meters.[5]

New Hampshire Electric Co-op (NHEC)

NHEC plans to install smart meters for all of its more than 80,000 members in three years starting in 2011. The focus is on member benefits, but NHEC also points out utility benefits such as improved outage response and lower maintenance and operations costs.

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[4] "Building New England's Next-Generation 'Smart Grid,"
http://nuwnotes1.nu.com/apps/corporatecommunications/empinfo.nsf/1655e8f1972fb0848525668000587994/d63cd4ec76ef81a48525760a0069478c?OpenDocument

[5] Testimony of Jim Brenna, NHPUC Smart Grid Analyst, 11/5/2010, http://www.puc.nh.gov/Regulatory/CASEFILE/2010/10-055/TESTIMONY/10-055%202010-11-05%20STAFF%20PREFILED%20TESTIMONY%20BRENNAN.PDF

*“**AMI can help you control your energy costs - but only if you want it to.** The two-way flow of information that is possible with AMI opens the door to a number of potential cost saving applications and educational tools, but only if you want to take advantage of them. Over the next three years, NHEC will be conducting pilot programs that take advantage of the two-way communications provided by AMI. These programs could involve anything from the installation of in-home displays that provide detailed information about electric usage, to the creation of dynamic rates that incentivize the use of electricity during low-demand times. AMI technology can also enable remote load control programs that target the biggest energy users in your home - air conditioners, clothes dryers, water heaters, etc. For example, a signal can be sent through your meter that lowers or shuts down these appliances when energy prices or regional demand exceed a pre-set limit. However, simply installing an AMI meter at your home or business does not give NHEC the ability to remotely adjust your energy usage. This feature can only work with the installation of load control devices that will not be installed unless you want them and expressly allow NHEC to install them. NHEC will be assessing the results of any pilot programs before determining what tools and programs to roll out to the entire membership.”*[6]

Granite State Electric Company

Granite State Electric has not invested in AMI. The company was scheduled to be sold in the second half of 2011, so a change in strategy in that regard is possible. Like most other utilities, Granite State Electric is gradually installing distribution automation equipment as part of regular reliability work. Considering that standards have not been agreed upon and smart grid applications are still being developed, a wait-and-see approach is not hard to understand.

8.5. Policy and Program Options

Just as there is a range of smart grid hardware that involves different investments, risks, and potential benefits, there is a variety of policies that can be used to take advantage of the capabilities of the infrastructure while considering how many changes ratepayers see and how fast, as well as other factors such as privacy and control.

A large disparity of results among smart grid studies, pilots, and simulations points to the fact that the benefits of smart grid implementation are heavily dependent on the specifics of the programs and services enabled by it. A meta-review of 57 studies on household electricity savings resulting from feedback programs found a range in the United States from a 5.5% *increase* in electricity consumption to a 32% decrease. Significant differences were found by world region, era, study duration, and feedback type. As a result, these findings are useful in designing an effective new program. Within the United States, enhanced billing resulted in 1.7% average savings. Enhanced billing is simply contextual or comparative information along with the monthly bill; it has no infrastructure requirements and high participation rates. Daily or weekly feedback resulted in average savings of 11.2%, while real-time whole-house feedback caused 7.9% savings on average. Higher savings per household came from combining financial information with motivational elements such as goal setting, commitments, competition, and social norms. Dramatically higher participation rates came from opt-out programs, as opposed to opt-in programs,[7] but mandatory time-of-use rates have largely been rejected by regulators. Policy, intention,

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[6] New Hampshire Electric Coop, “Advanced Meter Infrastructure,” http://www.nhec.com/AMI.php

[7] Ehrhardt-Marinez, Karen, Donnelly, Kat A., Laitner, John A. “Skip,”American Council for an Energy-Efficient Economy; Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities; June 2010 http://www.aceee.org/research-report/e105

and planning are vital to get the customer and system benefits promised by smart grid proponents. Bernard Neenan, a technical executive at the Electric Power Research Institute (EPRI) writes:

> *"The installation of Smart Metering technology by itself does not produce societal benefits. Rather, Smart Metering serves an enabling role when combined with other initiatives, such as the implementation of demand response programs, the revision of outage restoration practices, and the adoption of devices that communicate consumption and price/event information to consumers."*[8]

Utility operational savings are responsible for the majority of direct benefits, and in cases where utilities have not already deployed automated meter reading (AMR) systems, these savings are responsible for the bulk of positive net present value analyses supporting AMI deployment. Demand response programs, discussed below, also can provide significant savings in energy, cost, and pollution through reduction in peak demand.

Recommendations

- **Design policies to engage people to reduce their power and energy use.** Total power (kW) or energy (kWh) savings can be defined as average savings times the number of participants, so maximizing participation is a key component in achieving significant savings.
    - **Maximize participation with an opt-out approach.** An opt-out approach, where people are enrolled in a peak reduction/energy savings program unless they request not to be, is a good balance between high enrollment and the perception of encroaching on people's rights. Opt-in programs have much lower participation rates, while mandatory programs have been rejected by regulators.
    - **Provide meaningful feedback.** Experience has shown that people are motivated when they see their usage in context, compared to their neighbors, to relevant averages or other scales. This is also a way to establish social pressure to provide additional incentive beyond financial. Similarly, tools for goal setting and tracking progress help people get and stay engaged.

Demand Response

Demand Response (DR) is a change in customer energy consumption in response to communication from a utility requesting a reduction in electricity demand during times of peak consumption.

DR is not a new concept, and it does not require the latest in smart grid infrastructure. FERC estimates that 8% of customers are presently in some type of DR program nationwide.[9] DR is currently accomplished primarily via informal or negotiated agreements between utilities and high-use customers to reduce power consumption during times of critical peak energy demand. The mechanism used for DR thus far has typically been a phone call from the utility to a customer asking for power reduction when needed. More recently, third-party companies have emerged that contract with utilities for a specified amount of DR, and then aggregate multiple commercial customers to reduce demand during periods of critical peak use, often installing their own smart meters in the process.

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[8] B. Neenan, "Characterizing and Quantifying the Societal Benefits Attributable to Smart Metering Investments" EPRI, July 2008

[9] Federal Energy Regulatory Commission, Staff Report, "Assessment of Demand Response and Advanced Metering," December 2008.

The State of New Hampshire participates in demand reductions programs with seven buildings and earns money for capacity and energy reduction, which is then used to fund energy efficiency improvements to state buildings, further reducing energy consumption. In total, New Hampshire has 177 MW of demand response assets enrolled with the grid operator Independent System Operator New England.[10] This is over 7% the state's 2010 peak demand of 2,389 MW, making it a significant contribution to grid stability during peak periods.

According to the NIST, "Demand Response is a priority area because of its important role in maintaining grid stability as the grid is operated closer to capacity and as more renewables are brought online with their less stable generation characteristics. DR is key, at least in the short term, to changing load shape and replacing peaking generation plants."[11] The communications provided by AMI systems presents new opportunities to expand DR to all utility customers. It is technically possible for a smart grid to turn off appliances during times of peak use, but that capability is the contentious and people must be protected by having ultimate control of their homes and any external controls should be opt-in with clear program descriptions and expectations. Another way smart grid can reduce peak demand, is through dynamic pricing, a market based approach that encourages, rather than forces people to shut off electricity consuming devices.

Recommendations

- **Leverage smart grid to reduce peak consumption.** Peak power is generally more expensive and more polluting than baseload power. It also drives investments in new power plants and transmission that are rarely used to capacity. Therefore reducing peak load is a priority.
    - **Continue the State demand response program.** The demand response program for State buildings, along with reinvesting the earnings is a great idea. Additional State facilities should be evaluated for DR potential.
    - **Offer demand response to all ratepayers.** Smart meters and other smart grid infrastructure offer the opportunity to greatly expand demand response, because the decisions and communication can be done without human interaction. All ratepayers would have the information and incentive to reduce power use at peak times.
    - **Offer automated demand response.** As an opt-in program, offer high incentives for people willing to allow their air conditioning, water heaters, and other flexible appliances to be controlled remotely as grid needs dictate.

Dynamic Pricing

The rate customers pay per unit of energy is currently fixed and does not necessarily reflect the true cost of providing electricity at the time it is supplied. As a result, consumers have no incentive to consume energy during off-peak periods when electricity is more economically produced. However, with real-time pricing, price signals provided via AMI devices could motivate consumers to shift their energy

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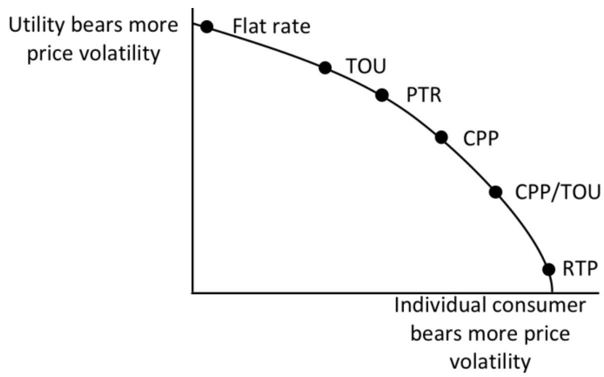
[10] "Demand Resource Asset Statistics as of 08-01-2011," ISO-NE, http://www.iso-ne.com/genrtion_resrcs/dr/stats/enroll_sum/2011/dr_enrollments_08_01_2011.ppt
[11] "Smart Grid Issues Summary," NIST, March 10, 2009, http://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/TnD/Draft_NIST_Smart_Grid_Issues_Summary_10March2009.pdf

consumption from high-price peak periods to lower price off-peak periods. This would smooth out the grid's load curve (reducing the need for utilities to run high-cost, high-emission peaking plants), reduce transmission and distribution line congestion, and improve the grid's capital and energy efficiency. Real-time pricing could potentially also make consumer installation of solar generation more financially viable because electricity sold to the grid during periods of peak demand, when the sun is at its strongest, would receive higher prices than such power does under current net metering plans.

Various pricing frameworks can deliver more accurate price information to consumers. Some of these are:[12]

Time of Use (TOU): The same time-varying prices on all weekdays—not really a dynamic rate, and does not require smart grid.

Peak Time Rebate (PTR): Incentives to reduce energy use during peak periods on high-demand days.



Pure Critical Peak Pricing (CPP): Time varying prices on high-demand days only. Represent only 1% to 2% of year. Price for power can be 5 to 10 times higher than other periods.[13]

Critical Peak Pricing/Time of Use (CPP / TOU): Time-varying prices on both high demand and other weekdays, with the highest prices occurring on high-demand days.

Real-Time Pricing (RTP): Prices change hourly or more frequently in response to market conditions

The closer a utility can price electricity to the actual costs incurred, the more dynamic the rate and the greater potential for peak reduction benefits, though the ratepayers must understand the rate for it to be effective. Programs are usually aimed at either peak reduction or energy savings, and the goals must be kept in mind during program design. Figure 8.2 shows average savings by household for residential units participating in different types of feedback program. A decision also has to be made as to whether dynamic pricing is opt-in, opt-out, or mandatory. Opt-in programs have higher participation rates than opt-out, while ratepayers and regulators have both shown opposition to mandatory dynamic pricing. People without the means to invest in electronics to interact with the smart grid and their appliances need to be protected from significantly increased bills that are possible. If projected savings depend on in home displays or web access, these services should be made available at no or low cost to low-income customers.

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12 Stephen S. George, Josh Bode, and Michael Wiebe "Benefit-Cost Analysis for Advanced Metering and Time-Based Pricing," Prepared for Vermont Department of Public Service by Freeman, Sullivan & Co. and MWConsulting, March 26, 2008.

13 Nancy Brockway, "Advanced Metering infrastructure: What Regulators Need to Know About Its Value to Residential Customers," National Regulatory Research Institute, February 13, 2008.

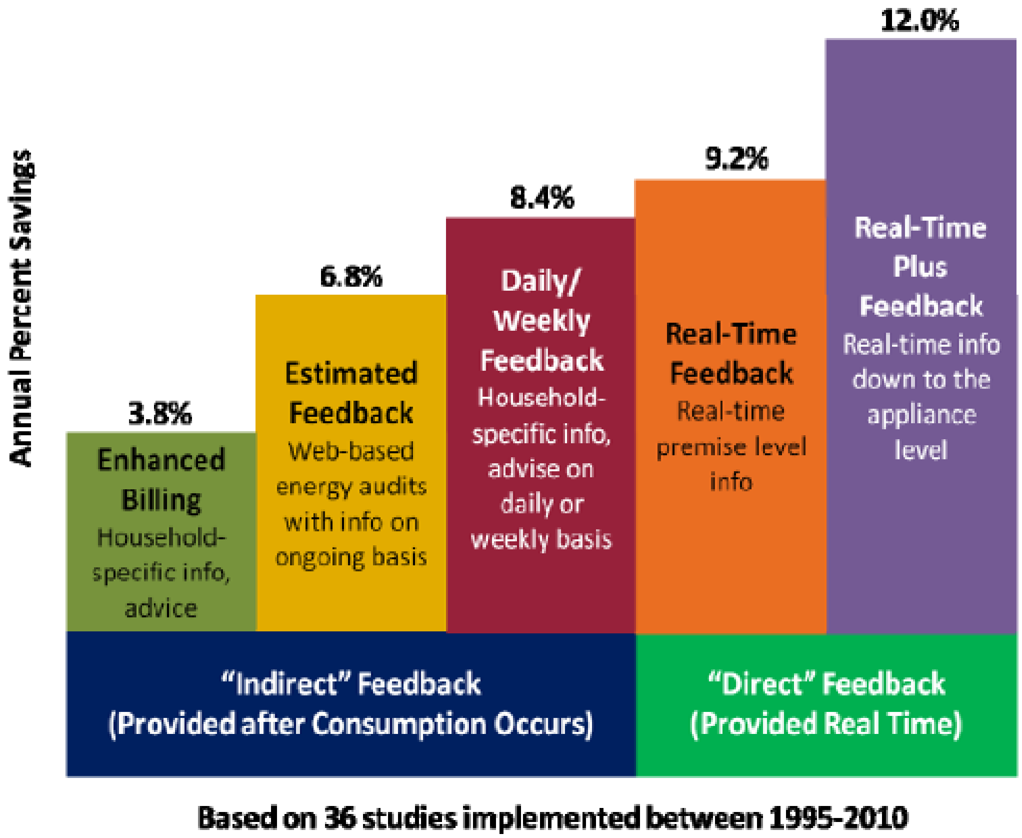

Figure 8.2: Average Household Electricity Savings (kWh) by Feedback Type[14]

Recommendations

- **Leverage smart grid to reduce peak consumption.** Peak power is generally more expensive and more polluting than baseload power. It also drives investments in new power plants and transmission that are rarely used to capacity. Therefore reducing peak load is a priority.
  - **Offer dynamic pricing as market based demand response.** The real-time price of electricity varies dramatically. Ratepayers have been largely isolated from this and may see one price for years at a time. Using an opt-out approach, people with a dynamic rate may be motivated to make simple changes to their schedules to save money. Some people may also respond to information about the changing sources of power during peak periods.
  - **Educate customers.** Dynamic pricing needs to be understood to work. People need information on how the program works, how prices can be expected to vary, and what they can do to save money. Savings strategies should include behavior change and not just what products that can help.

[14] Ehrhardt-Marinez, Karen, Donnelly, Kat A., Laitner, John A. "Skip,"American Council for an Energy-Efficient Economy; Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities; June 2010 http://www.aceee.org/research-report/e105

Cost Recovery

A variety of methods are being used to allocate the cost of smart grid infrastructure across the country. In some cases, it is being treated as a traditional capital expense in that the utility documents the costs and presents them in a future rate case for recovery. Many utilities, however, are being granted approval to assess a monthly surcharge for a period of years that allows quicker cost recovery and may feature "true-ups" to account for the difference between estimated and actual costs. In other cases, utilities may use a tracker to recover costs as they occur. Finally there are approaches that combine a rate case with some form of monthly charge.

Monthly charges for cost recovery are predictable and guaranteed from the utility's perspective, but may not be the best solution for all. The Maryland Public Service Commission denied Baltimore Gas and Electric's (BGE) smart grid and cost recovery surcharge proposal in June 2010, explaining:

> *"The proposal asks BGE's ratepayers to take significant financial and technological risks and adapt to categorical changes in rate design, all in exchange for savings that are largely indirect, highly contingent and a long way off. We are not persuaded that this bargain is cost-effective or serves the public interest, at least not in its current form."*[15]

BGE's second proposal removed the surcharge, increased focus on ratepayer education, removed a mandatory switch of ratepayers to time-of-use rates, and recovers the costs through a future rate case after the costs are better known and the benefits have started to accrue. Utilities are making the choice to invest in the system and therefore should take on the risk. Conversely, for the complete smart grid system to work effectively it cannot have holes in it where old and incompatible grid components have not been upgraded. These competing ideas and many more are weighed by regulators. If a customer charge is used, it should be per usage, not per customer so that people who use the electric system more contribute more to its upgrade. Additionally, these people are likely to have a high potential to reduce their usage and save money because of the smart grid upgrade.

A concise survey of cost recovery plans as of October 2009 is available from the Edison Electric Institute and shows the range of options and details of implementation.[16]

As discussed in the introduction of Section 8.1, the parts of the grid are interdependent and need to be compatible to achieve the potential benefits of smart grid. Because of this dependency, some components may need to be upgrades for the sake of the rest of the grid, but may not themselves, be cost effective. It is important not to consider small parts of a large interconnected system in isolation.

Recommendations

- **Balance utility and ratepayer risks and benefits.** Electronic and equipment companies, governments, and utilities are promoting smart grid; ratepayers should not bare all the risk while utilities are guaranteed quick cost recovery.

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[15] Maryland Public Service Commission, Order 83410, Case 9208, June 21, 2010, http://webapp.psc.state.md.us/Intranet/Casenum/NewIndex3_VOpenFile.cfm?ServerFilePath=C:\CaseNum\9200-9299\9208\59.pdf

[16] Edison Electric Institute, State Regulatory Update: Smart Grid Cost Recovery, http://www.edisonfoundation.net/iee/reports/IEE_State_Update_SG_Cost_Recov.pdf

- **If a customer charge is used, base it on usage**. A flat monthly fee does not reflect the vastly different amounts of electricity ratepayer's use. A fee that is based on consumption (kWh) and/or demand (kW) would more closely reflect ratepayers' relative reliance on the grid, and would more likely correlate to the potential to take advantage of savings offered by smart grid's capabilities.

- **Consider the larger system**. Not every smart grid investment is going to generate savings. Some upgrades are needed to facilitate the larger grid and avoid a weak link or bottleneck.

Access to Energy Consumption Data

Because AMI produces significantly more precise information about energy use than traditional metering, it is important that customers are aware of, and in control of, personally identifiable information. Rather than a vague idea of whether a customer has relatively high or low monthly electricity use, the short-interval (often 15 minute) increments of data from AMI show how much a customer used and when. This information can then be used to determine what types of appliances a person is using at a given time and what their daily routine is like. It is easy to determine if a building is occupied or not. In the future when drivers of PHEVs sell their energy and capacity at work and other locations, customer energy use data could be used to track an individual even when they are away from their home's meter.

This precise data is also what gives smart grid some of its benefits. Utilities can pinpoint the cause of outages, target energy efficiency or demand response programs, and notify customers when their energy use profile changes in a way that could indicate an appliance needs service. AMI data could also be interesting to advertisers and law enforcement agencies.

The Texas smart grid implementation can be a model for the balance between privacy and benefit. Hourly data is transmitted on a day-after basis to a web portal for access by the ratepayer. If the ratepayer authorizes it via the web portal, the same information can be made available to third party organizations. Texas regulations require AMI to be capable of 15-minute data, accessible in real-time by ratepayers and retail electric providers for demand response, dynamic pricing, and other applications.[17]

Privacy and data ownership is not an objective issue and policies should be determined in a public and transparent way so that customers understand how their data may be used and have a chance to influence those regulations. Having suffered from a high degree of public dissatisfaction with the rollout of AMI, California regulators are presently (in 2011) addressing data ownership and privacy issues related to AMI customer data. Because of California's experience with these issues, the final decisions in other states will be better informed. By protecting ratepayer data from the beginning and empowering individuals to use their own data in whichever manner they choose, the conservation and efficiency benefits of better energy consumption information can be realized.

Recommendations

- **Protect sensitive information.** Much of smart grid's benefit comes from more precise and timely information, but that data could be misused.

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[17] Wright, Christine, Public Utility Commission of Texas, "Advanced Metering Infrastructure in Texas," http://www.zigbee.org/zigbee/en/events/documents/Aug2007_Webinar/ZigBee_August_Webinar_Christine_Wright_FINAL.pdf

- **Ensure customers are aware of data about them**. Many people do not think much about their electricity and will not know the smart grid will carry information about them while the old grid did not. People should be clearly informed what data exists, who has access to it, and what it can be used for.

- **Protect ratepayers' control of data about them**. Without their specific authorization, data about customers should only be used for billing and other functions necessary to provide electric service. The host of additional applications made possible by smart grid, of interest to a myriad of innovators and entrepreneurs requires ratepayer approval. Aggregate data that is not traceable to particular meters, may have less restrictive policies.

8.6. Conclusion and Summary of Recommendations for Smart Grid in New Hampshire

Two of New Hampshire's utilities are well on their way toward making investments in smart grid infrastructure, including AMI and some form of dynamic pricing. The rest of the state has the opportunity to learn from the experience of Unitil and NHEC and their difference strategies, and could chose infrastructure, programs, and policies that are compatible with the existing systems. Additional examples can be found in Vermont's statewide rollout and Central Maine Power's deployment.

Smart grid experience in other states has shown that peak reductions for utilities and energy cost savings for ratepayers are possible. In addition, it is known that effective (or ineffective) policies can make a tremendous difference in customers' attitudes and opinions about the technology. If customers are empowered to reduce their electric costs, they are generally satisfied with the technology and realize cost savings on average. Specific recommendations for an effective smart grid policy include:

Design policies to engage people to reduce their power and energy use *Recommendation 8.1; Section 8.5*
• Maximize participation with an opt-out approach.
• Provide meaningful feedback to help people understand their use in context for motivation.
Leverage smart grid to reduce peak consumption *Recommendation 8.2, Section 8.5*
• Continue the State demand response program and expand it if possible.
• Offer demand response to all ratepayers.
• Offer automated demand response.
• Offer dynamic pricing as market based demand response.
• Educate customers about dynamic pricing and how they can take advantage of it.
Balance utility and ratepayer risks and benefits when evaluating cost recovery *Recommendation 8.3, Section 8.5*
• If a monthly fee is used for cost recovery, it should be consumption based.
• Consider the larger system during evaluation, not each project in isolation.
Protect sensitive information *Recommendation 8.4, Section 8.5*
• Ensure customers are aware of data about them.
• Protect ratepayers' control of data about them.

Chapter 9: Utility Performance Incentives Review and Assessment

9.1. Introduction

Under traditional regulatory structures, most utilities have an inherent disincentive to pursue capturing efficiency resources. The primary disincentive typically occurs when the utility experiences lost revenue in the short term (for example, when a utility has a rate case pending), or when there is less need for new supply-side investments that can increase a utility's rate base—and therefore, shareholder earnings. However, incentives for energy efficiency performance can be designed into a utility contract to offset and/or overcome those disincentives, and provide a profit mechanism in which utilities have an incentive (or at least a lack of a disincentive) to pursue the capture of efficiency resources aggressively and successfully.

The utilities' regulatory framework can greatly influence how well energy efficiency performance incentives (PIs) are designed. For example, if a regulatory framework promotes decoupling, the risk and financial losses to a utility from mandated efficiency programs are significantly reduced, and PIs can be more rigorous.[1] Similarly, even without decoupling or the ability to recover lost revenue from lower sales of energy,[2] utility rates can be set according to forecasts that include the expected energy efficiency savings. In such cases, lost revenue might be minimized or eliminated.[3]

Where efficiency programs are not run by utilities, performance incentives can typically be even smaller, since they serve only to encourage superior performance and do not need to overcome any traditional disincentive. There are, however, certain long-term benefits to utilities that offer efficiency programs. They provide new opportunities for utilities to build relationships with customers and provide value to them in new ways. Particularly in a deregulated environment, this approach might be of strategic value to a utility.

The key elements for creating and designing an effective program administrator shareholder incentive mechanism are presented in **Section 9.2**. This analysis compares New Hampshire's current incentive approach with several best practices, and suggests modifications to New Hampshire's current incentive structure, so that it might better align utility goals with the goals of the CORE efficiency programs.

9.2. Key Elements of Utility Performance Incentives

Several key factors or variables must be considered in designing a utility's effective and successful shareholder incentive mechanism for energy efficiency. The following analysis looks at New Hampshire's performance incentive structure and make recommendations for how to improve it.

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[1] Under decoupling, a utility's revenue is based on the allowed rate of return from its rate base, and is independent of electric sales.

[2] Under lost revenue recovery, the reduction of sales resulting from efficiency is estimated and utility revenue is increased by a corresponding amount.

[3] Although forecasting energy efficiency savings and using a reduced forecast to set rates can remove the loss to utilities from lost revenue, relying on this approach fails to completely remove the disincentives between rate cases because if the utility does not capture all of the energy efficiency savings, it can collect additional unanticipated earnings. Similarly, any performance that exceeds planned energy efficiency savings can result in a loss to the utility. However, it dramatically reduces the overall impact on lost revenues from energy efficiency.

Level of Financial Reward

The purpose of well-structured energy efficiency performance incentives is to encourage performance that pushes the boundaries in capturing efficiency resources, year after year. The key is to understand the current regulatory structure, any legislated or ordered efficiency mandates, and the financial impacts (both positive and negative) to the utility from efficiency. PIs should effectively motivate utilities, but not be set any higher than necessary, since their costs are borne by ratepayers. Experience indicates that rewards in the range of 4-8% of total efficiency portfolio budgets have been sufficient to capture utility staff attention and provide a significant motivator. As is described in Section 9.3, the incentives in the states with the most aggressive efficiency programs typically fall within this range. Both Massachusetts and Connecticut, for example, cap their incentives at 8% of the efficiency budget. Vermont, where the efficiency programs are not run by the utilities, has found that a 3% incentive is sufficient to encourage performance. The New Hampshire incentive, at 12% of spending is higher than average for the top-tier states.

Some utilities have argued for much higher incentives (sometimes greater than 100% of spending). However, there is little evidence that levels greater than 10% are necessary for effective motivation. It is worth noting that just the existence of PIs, even when a relatively small amount of dollars are tied to a particular metric, can be highly motivating. Utility staff given internal goals for meeting exemplary levels of performance can become so focused on meeting them that they no longer think about the actual impact to the utility's financial bottom line. Similarly, imposing penalties can also be a motivating factor because utilities might view a penalty as more negative than failing to earn a reward.

Table 9.1. Overview of Key Elements of a Performance Incentive

Level of Financial Reward	Performance Basis	Multivariate Metrics	Scalability	Penalties vs. Rewards	Evaluation, Measurement, & Verification
Rewards of 4-8% are typically sufficient. It is easier to evaluate the size of the reward when it is based on program budget, rather than on net benefits or an increased rate of return.	Based on actual measurable and verifiable performance.	Multiple metrics should be used other than savings to discourage cream-skimming and to promote secondary policy objectives.	Incentives should be scaled to encourage performance, even when goals are met (or when it is clear that goals will not be met).	Some states impose penalties instead of, or in addition to performance awards. Penalties can encourage extra effort to meet goals.	To encourage performance, set goals to be aggressive, yet reachable. Performance metrics should be verified by an independent third party.

In setting incentives, regulators should analyze the potential financial and regulatory risk to the utilities, as well as any relevant legislative or regulatory mandates related to efficiency. For example, in Illinois utilities have no shareholder incentives but instead are mandated by legislation to meet certain goals, and failure can result in financial and other penalties.[4] Many stakeholders in Illinois view the mandate to acquire efficiency resources sufficiently motivating not to support additional ratepayer funding going to the shareholders. Whenever a utility controls the goals and investment levels in efficiency, incentives are an effective way to encourage aggressive energy efficiency efforts.

[4]Senate Bill 1592. http://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=095-0481&GA=095

The term *reward* in this chapter indicates any financial or other incentive that could be positive or negative. PIs can include financial or other penalties as well as rewards.

Performance Basis

It is convenient to think about financial reward as a percent of program budgets. But actual reward mechanisms based on spending amounts or budgets fail to focus on the real purpose—performance— and can even create perverse incentives. For example, if a PI is tied to actual spending (as the current New Hampshire PI mechanism is), it induces the utility to be less efficient about its costs and to spend more funds than necessary to increase rewards.

Effective PIs are tied directly to actual outcomes, and do not provide rewards for simply undertaking specific activities. Effective performance parameters are objective, unambiguous, measurable, and verifiable (through Evaluation, Monitoring, and Verification [EM&V] procedures). Further, they are tied to net savings—gross savings minus free-rider and spillover effects.[5] Calculating free-ridership and spillover values can be problematic, but even an uncertain estimate is better than nothing. Basing a performance incentive on only gross savings provides a strong incentive for utilities to focus on easily obtainable measures, those with a high degree of baseline market acceptance. This is especially the case in states such as New Hampshire, which has no decoupling or lost revenue recovery in place. An independent evaluator can estimate net savings, and can verify that the utility is calculating the savings appropriately. All program administrators will make mistakes in estimating gross savings—often both overestimating and underestimating. However, because the customer for any efficiency effort is the ratepayer, an independent verification process ensures that ratepayers get the most value for the system benefits charge they pay each month.

Finally, focusing on activities rather than on performance can induce utilities to do things simply to achieve a PI, rather than focus on maximizing the ultimate effects of any particular activity. For example, simply rewarding a utility for conducting a study or for offering a seminar to trade allies might not only encourage marginally effective activity, but also divert the utility from focusing on positive outcomes. Early in a utility's experience of offering efficiency programs, a few action-related metrics might be justifiable to get the programs successfully under way.[6] However, it is always best to identify the desired outcomes in the context of that activity, and to articulate the metric in a way that holds the utility accountable to results. This approach also allows program administrators some flexibility in determining the most appropriate activities for successful outcomes.

The New Hampshire incentive is based on spending metrics, which might encourage overspending. However, the specific amount of the incentive is dependent on two performance metrics: cost effectiveness and the percent of savings goals achieved. These metrics are likely measurable and verifiable, but in practice the New Hampshire incentive is based on self-reports from utilities.

Multivariate Metrics

Regulators and policy-makers typically have many objectives and goals for a state's efficiency portfolios. Clearly one primary goal is achieving cost-effective energy savings. However, too many objectives in

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[5] Free-riders are customers who use a utility incentive to implement an efficiency project that they would have implemented even without outside funding. Using gross savings means that there are no adjustments made for free-ridership. Considering only gross savings can produce perverse incentives, particularly in states with no decoupling, since utilities can meet efficiency goals and earn the PI without losing many sales.

[6] These can also be considered for minimum qualifying criteria.

support of any goal can create tension. For example, a single goal of maximizing energy savings can create a perverse incentive to focus only on easily and cheaply acquired resources, such as lighting. This type of "cream-skimming" can undermine other more valuable objectives such as pursuing deep and comprehensive savings in buildings; or transforming markets for better efficiency practices; or ensuring a wider group of customers—low-income and hard-to-reach ratepayers—are served.

A more effective PI structure, then, is based on multivariate metrics, with weighted rewards. Typically the greatest weight is applied to a primary goal or goals, such as net savings or net benefits achieved. However, it is critical to have additional metrics that encourage a comprehensive approach to efficiency portfolio design and balance important and potentially competing policy objectives. Effective PIs typically place a large share of earnings on the few primary interests, with a handful of other metrics offering smaller earnings or penalties that balance the perspective. New Hampshire has two different metrics, but they are very highly correlated to one another, and therefore do not provide the type of balance described here.

In establishing effective PIs, the primary and secondary objectives of efficiency portfolios must be considered in a comprehensive framework. In addition, it is important to identify whether these objectives are: (1) correlated, (2) in opposition to each other, 3) mutually reinforcing, or 4) independent of one another. For example, dollar benefits and electric savings might be highly correlated because typical electric efficiency programs derive the vast majority of benefits from the calculated avoided costs of electricity. Therefore, maximizing both the parameters can be important objectives; however, it might not make sense to have separate metrics and rewards for both.

Alternatively, one could focus on both, but should then consider the overall weight applied to them collectively when considering how important they are for the portfolio. On the other hand, opposing objectives, such as capturing savings cheaply vs. capturing deep and comprehensive savings, can both be important criteria. Therefore, focusing solely on one might result in perverse incentives that undermine the other.

Multiple metrics are worthwhile, but too many metrics with small rewards can unnecessarily increase risk to the utility. A balance should be achieved that ensures some focus on important policy objectives, while maintaining simplicity and primary focus on the overarching objectives. A large portion of total award is typically on the few primary objectives, with at most a handful of smaller ones with secondary objectives.

Scalability

Financial rewards or penalties should be scalable. The better the performance, the higher the reward should be. Caps for scalable incentives can be set to avoid putting too much risk onto the ratepayers. If a utility has only a single target, perverse incentives can result. For example, if a utility meets its annual goal early, it is likely to relax and not continue to aggressively pursue even better performance. Similarly, if a utility realizes three months in advance that it will not be able to reach its target at all, it might decide not to try as hard to come close. Scalable rewards provide ongoing incentives for efficiency programs to strive for the best outcome, regardless of likely final performance. Such rewards are viewed as fundamentally fairer, and they lower the risk to the utility. This lowered risk should be considered in the overall context of setting goals and levels of reward. In New Hampshire, the performance incentive can currently scale up to a maximum of 12% of program spending.

In scaling metrics, one should think about a threshold level as a starting point, a band within which rewards are scalable, and perhaps an upper cap on rewards. Performance that falls below the threshold level would earn no reward, or perhaps expose the utility to a penalty. Threshold levels in recent PI mechanisms have tended to range from 65% to 85% of planned performance goals. Scaling of rewards once a threshold level is reached is typically done in direct proportion to the performance outcome. However, more complex scaling methods can be used to weight exemplary performance beyond the design levels. For example, one might structure a PI mechanism so that outcomes up to the design performance goals result in relatively low rewards, whereas much more generous rewards are available to utilities that exceed the design goals. Since utilities will look at the marginal reward when deciding whether to pursue the extra unit of efficiency, performance incentives that scale up faster provide significant encouragement for performance, regardless of the absolute incentive level.

Many existing metrics that rely solely on rewards, rather than on penalties, typically induce the utility to earn the target level of financial reward if they meet 100% of the design (planned) goals. However, some stakeholders perceive simply meeting the plans as the minimum, and would prefer to target most of the financial rewards for truly exemplary performance. How one sets targets and financial reward levels should be considered in the context of the current regulatory structure, efficiency mandates, aggressiveness of the goals and budgets, risk exposure to the program administrators, and other related issues.

Regulators should also consider caps on maximum rewards. In theory, with scalable metrics one might want to allow unlimited rewards for unlimited performance achievements. This approach supports goals tied to the pursuit of all cost-effective efficiency, and should be considered. However, unlimited rewards can present challenges in some regulatory structures, because of budget caps, or because unlimited ratepayer contributions might be permitted; these cannot be planned and approved in advance. For this reason, many PIs will cap the ultimate rewards, typically around 110%-125% of the targets that were in the original design. The ultimate level of any cap should consider the stringency of the goals, the level of risk for the utility in meeting or exceeding them, the process by which goals are set and evaluated, and the possibility of extraordinary overachievement.

Penalties vs. Awards

As discussed above, PIs can include both direct financial penalties and rewards, and possibly other non-financial incentives.[7] New Hampshire's current PI structure does not include penalties. Avoiding a penalty can be the same as earning the corresponding amount, from a purely financial opportunity cost perspective. The regulatory and political environment will likely inform decisions about whether to offer a range of penalties and rewards, or only one or the other. Many utilities see penalties as unfair; however, it is likely they will have similar effect as incentives, since failing to earn a dollar yields the same result as paying a dollar.[8] Different stakeholders will have different views on this issue. Fundamentally, one must consider: if a utility spends all the budgeted ratepayer funds but fails to capture a reasonable amount of efficiency with it, should the shareholders be held responsible for some of this wasteful spending, or should ratepayers incur the full cost, even though they received little benefit? Typically, recovering the full cost of efficiency program expenditures, including staff time and program administration expenses, is awarded to utilities unless clear evidence of imprudent action is uncovered. Therefore, regulators might decide that a penalty is an appropriate protection for ratepayers if utilities fall below some threshold level of performance. This way, the utility is responsible for a portion of the efficiency program costs if it proves that the benefits to ratepayers fall far short of expectations.

[7] For example, utilities in Illinois that fail to meet goals across a three-year period face the possibility of the State's taking over delivery of energy efficiency programs. Legislation ILCS 5/8-103 (http://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=022000050K8-103)

[8] From a financial opportunity cost perspective, a utility should be indifferent to a dollar lost and a dollar gained. However, in actuality, it is likely utilities might respond more aggressively in avoiding penalties than in earning rewards simply because they associate penalties with failure, whereas rewards are viewed as incentives for exceeding expectations. Of course, from a ratepayer perspective, penalties are preferable because they reduce the cost of energy efficiency and provide some funds back if the utilities fail to capture the planned energy efficiency.

Minimum Criteria

Minimum qualifying criteria recognize that some policy objectives are viewed as critical to the efficiency portfolio and therefore must be met, if a utility is to be eligible for any rewards. For example, a jurisdiction might want to ensure a relative level of geographic equity throughout its territory as a prerequisite for rewards, or possibly a minimum level of effort targeted to low-income customers. Often there are important milestones that stakeholders want a utility to achieve (e.g., setting up a database, having independent evaluations performed, etc.) that might not by themselves warrant financial rewards but are deemed necessary. Minimum qualifying criteria can be viewed as a threshold level before which any awards are earned. If used, minimum qualifying criteria should be designed carefully. Generally, they should reflect performance requirements that are within the utility's control and don't have huge risk of failure. If a utility is unable to meet a minimum criterion and knows this, it can create a large perverse incentive by rendering other metrics moot.

Evaluation, Monitoring, and Verification

Although not specific to PI mechanisms per se, EM&V plays an important role in the development and administration of PIs. As mentioned above, performance metrics should be clear, objective, measurable and verifiable. Well-designed PIs involve negotiated performance goals or goals set up to ensure design level targets are aggressive but achievable, and are supported by reasonable budgets. If goals are significantly easy to achieve and exceed, PIs will lose their effectiveness at encouraging exemplary performance. The level of goals and utility capability should be considered when setting target levels for rewards, as well as the overall scaling mechanism, caps, and financial reward levels.

Similarly, for PIs to be effective and to ensure that ratepayers are protected, it is important to use an independent process for measuring and verifying final achievements and rewards. While typically utilities will self-report achievements, these reports should be based on independent evaluations, be transparent, and at a minimum undergo a detailed review and verification process to ensure accuracy and accountability. In New Hampshire, utilities set the goals with little input or oversight from other stakeholders, and the performance incentives are based on unverified, self-reported results. Predictably, New Hampshire utilities regularly earn close to the maximum incentive available.

Types of Performance Incentive Financial Award Mechanisms

Performance incentives are typically categorized as one of three types: shared savings, performance targets, or rate of return. Recently, Duke Energy has proposed a fourth type of incentive, called "Save-a-Watt," which provides a single mechanism for providing funding to administer the efficiency program, make up for lost revenue resulting from programs, and provide a shareholder incentive. So far, the Save-a-Watt model has been implemented only in Ohio, but Duke has sought to implement the program in Indiana and Kentucky, and reapplied in North Carolina and South Carolina after initial applications were rejected in both states. Fundamentally, these variations pertain to the way financial awards are calculated and awarded. In theory, all of the issues discussed above can be addressed successfully under any of these models. However, there is considerable flexibility within each type of PI as to the amount, size, and manner in which the incentive is offered. Nevertheless, each type has its own special considerations. Table 9.2. provides an overview of each of the four types of performance incentives in use in the United States. Note that New Hampshire uses the performance target approach, with targets based on actual cost-effectiveness compared to the goal, and actual savings compared to the goal. For more details on each approach, and how they relate to the metrics mentioned above, see Appendix D.

Table 9.2. Performance Incentive Comparison

Type	Description	Number of States[9]	Advantages	Disadvantages	Average Incentive as a Percent of Energy Efficiency Budget
Shared Savings	Incentive is earned as a percentage of net benefits from energy efficiency	11[10] Arizona California Colorado Georgia Hawaii Idaho Kentucky Michigan Oklahoma Texas Washington	• Incentive automatically scales continuously with net benefits. • Awards for amount of net benefit produced, rather than amount spent • Keeps earnings independent of other utility issues such as supply-side investments	• Evaluating net benefits is not a science and can be contentious, resulting in greater need for formal evaluations and potentially more disagreements • Can often lead to higher incentives than necessary to achieve desired utility performance • In practice, tends to discourage focusing on other important objectives by setting award levels according only to net benefits. However, in theory other metrics could be designed and included, with the net benefits simply identifying the total pool of funds to be awarded, rather than guaranteeing the amount just for obtaining net benefits.	14% of program spending
Performance Target	Incentive is tied directly to various performance metrics. Total amount of eligible incentive is typically developed prior to implementation and is not a function of the share of net benefits, rate of return, or some other formula.	6 Connecticut Massachusetts New Hampshire Rhode Island Washington Nevada	• More straightforward to set multiple performance metrics based on multiple policy goals. • Easier to provide incentives for goals that are difficult to measure • The amount of the potential incentive is more transparent and easier to calculate • Allows regulators to set limits on incentive amounts, and if other aspects are working (i.e. goal setting, EM&V), can protect ratepayers from excessive and unanticipated earnings. • Keeps earnings independent of other utility issues such as supply-side investments.	• Incentive amounts typically capped, so there is less incentive to continue to perform after reaching the maximum.	6% of program spending

[9] Hayes, Sara et al. *Carrots for Utilities: Providing Financial Returns for Utility Investments in Energy Efficiency.* ACEEE, January 2011.
[10]Washington State has a shared savings and a performance target component to its incentive, and is included in both categories.

Type	Description	Number of States[9]	Advantages	Disadvantages	Average Incentive as a Percent of Energy Efficiency Budget
Rate of Return	Allows the utility to earn their allowed rate of return (in the high 9% range in NH) or higher on energy efficiency program costs, or to earn a bonus rate of return based on energy efficiency performance	1 Wisconsin	• Arguably puts efficiency spending on equal footing to supply-side investments • Can be attractive to utilities because can potentially provide large profits and most visible to shareholders and financial community	• Supply-side investments are often still more attractive, due to larger size. • Incentives calculations can become very complex. • Difficult to apply minimum performance metrics to incentive. • Incentive is not paid out immediately. • Potential for utilities to earn very large windfall profits exists if not designed very carefully because can tie to total utility earnings on a very large ratebase • Does not work for non-utility program administrators.	N/A
Save-a-Watt	Allows the utility to earn a percentage of their authorized rate of return on avoided supply-side costs due to energy efficiency programs.	1[11] Ohio	• A single mechanism provides for program costs, lost revenue recovery, and performance incentives • Arguably puts energy efficiency on a more equal footing with supply, by allowing utility to earn most of the value compared to what would have been spent on supply-side resources	• Can be much more expensive to ratepayers than other types of PIs. Typically provides most of the value of energy efficiency to shareholders rather than to ratepayers, although in theory it could be designed to offer similar award amounts • Difficult to apply minimum performance metrics to program. • Incentive not paid out immediately • Potentially difficult to administer, as avoided costs and other factors can change, resulting in more potential for disagreements.	N/A

[11] Duke has also applied for the Save-a-Watt approach in Indiana and Kentucky, and reapplied in North Carolina and South Carolina after initial rejections.

Distribution of Benefits

One important policy consideration in performance incentive design is how much of energy efficiency's benefits should go to utility shareholders versus the ratepayers. The larger the incentive, the more the net benefits from efficiency flow to utility stockholders (or non-utility program administrators), rather than contributing to lower electric bills. Each type of incentive clearly has flexibility as to how large the incentive will be. However, as commonly implemented, the four types of PIs show different approaches to distributing efficiency's benefits.

A 2008 Lawrence Berkeley National Laboratory (LBNL) study quantitatively examined the effect of each performance incentive model, as commonly implemented, on utility earnings, and the total resource cost and benefits of efficiency programs .[12] Some key findings are:

- Assuming equal performance of energy efficiency programs under all models, ratepayers see the most benefits with no performance incentive, followed by a performance target, cost capitalization, shared net benefits, and finally Save-a-Watt.

- Compared to energy efficiency without an incentive, the performance target model raises the total resource cost by 10%, cost capitalization model by 20%, shared net benefits by 35%, and Save-a-Watt by 160%

- Energy efficiency does not pass the total resource cost test under the Save-a-Watt model, and utility earnings under this model are significantly higher than what they would be with no efficiency.[13]

It is important to note that the LBNL findings are based on current practices, and in some cases the findings are not inherent in the models, so much as in the typical application of these models. For example, the Save-a-Watt model might show much more favorable results to ratepayers if the percent of avoided cost awarded to the utility where much smaller. However, it is not clear this would provide sufficient motivation to the utility, and the models do tend to lend themselves to fundamentally different approaches.

[12] Cappers, Peter, et al. Quantitative Financial Analysis of Alternative Energy Efficiency Shareholder Incentive Mechanisms. Ernest Orlando Lawrence Berkeley National Laboratory. 2008.

[13] Essentially, if one assumes the payments to the utility under Save-a-Watt reflect the "costs" of the program, then unless they are a small percentage of avoided cost benefits, the addition of customer contributions to efficiency tend to result in a total cost of greater than the avoided cost benefits. As a result, while the savings are cheaper than supply, the ratepayers ultimately spend more than supply to procure the savings.

9.3. New Hampshire Performance Approach and National Best Practices

Table 9.3. New Hampshire Performance Incentive

Financial Level?	Performance Basis?	Multivariate Metrics?	Scalability?
0-12% of spending (0% is theoretically possible, although no utility has ever earned it)	Yes, but with limitations Incentive based on gross savings and cost-effectiveness combined. Can reach incentive with one and not the other. Focus on gross impacts ignores net performance.	No. Omits important policy objectives and focuses on only two metrics. In addition, these two metrics are combined into a single award, and are highly correlated. Must achieve 65% of savings goals or minimum 1.0 cost-effectiveness.	Yes Scales linearly with ratio of actual results to goals.

New Hampshire has had a Performance Target style shareholder incentive since 2003. In the 2011-2012 CORE Program Settlement agreement,[14] a working group was charged with further examining the structure of the incentive to find ways in which it could be better aligned with energy efficiency goals. In addition, the incentive calculation was changed and is now based on actual energy efficiency expenses rather than budgeted expenses. This approach avoids double-counting if funds were carried over from one year to the next. The incentive will not be applied to expenses more than 5% over the budget, although utilities can apply for exemptions, case by case. The major aspects of the shareholder incentive, however, remain unchanged. It is calculated as:

$$Incentive = (4\%\ x\ Budget)x\left(\frac{BC_{Act}}{BC_{Pre}} + \frac{kWh_{Act}}{kWh_{Pre}}\right)$$

Where:

Incentive	= Shareholder incentive
Budget	= Actual energy efficiency program expenditures (assuming not more than 5% over planned budget)
BC_{Act}	= Evaluated benefit-to-cost ratio
BC_{Pre}	= Planned benefit-to-cost ratio
kWh_{Act}	= Actual gross kWh savings achieved
kWh_{Pre}	= Planned gross kWh savings

In addition, the following conditions apply:

- The shareholder incentive is calculated separately for the Residential and Commercial and Institutional (C&I) sectors.
- If the benefit-to-cost ratio is less than 1.0, there is no incentive associated with that metric.[15]
- If actual gross kWh savings are less than 65% of the goal, there is no incentive associated with kWh savings.

[14] NH PUC. Docket No. DE 10-188. http://www.puc.nh.gov/Regulatory/CASEFILE/2010/10-188/LETTERS,%20MEMOS/10-188%202010-12-15%20JT%20CORE%20&%20GAS%20SETTLEMENT%20AGREEMENT.PDF

[15] A benefit-cost rate (BCR) of greater than 1.0 ensures that the societal benefits from the efficiency program outweigh the costs. Discount rates, externalities, non-energy benefits, and other specific inputs to the BCR vary from state to state.

- The total incentives for the Residential and C&I sectors are capped at 12% of their respective budgets.

The New Hampshire shareholder incentive mechanism includes many of the aspects discussed in the previous section:

- **Performance basis:** The New Hampshire incentive is based on kWh savings and cost-effectiveness. However, the thresholds to achieve an incentive, at a 1.0 benefit-to-cost rate and 65% of the kWh savings goals are fairly low compared to other states, and the choice of metrics does little to discourage cream-skimming. This is especially true since the savings goals are based on gross savings as opposed to net savings, and thus do not take free-ridership into account. In addition, the utilities tend to set the program goals, and then often exceed them by large percentages.

- **Multivariate metrics:** While technically multivariate in that two different metrics are considered, the two metrics used are very highly correlated. Theoretically, for example, the energy efficiency program budget and goals are set so that if the savings goals are achieved, the cost-effectiveness goals would be achieved as well. On the other hand, the way the incentive calculation is defined makes it possible for the New Hampshire utilities to achieve the full incentive even while coming up short on the savings goals. That is, this occurs if the savings that they do achieve are more cost-effective than expected. Clearly, by limiting this PI mechanism only to gross savings and cost-effectiveness, New Hampshire does not address many other important policy objectives that a more fully multivariate mechanism would. This is a weakness in the state's current PI.

- **Scalability:** The size of the New Hampshire shareholder incentive scales linearly with performance, until actual performance reaches 150% of the goal. There are no tiers that cause the incentive amount to jump, once certain performance thresholds are passed.

- **Evaluation, measurement, & verification**: The two performance metrics are both measurable and verifiable. Although some evaluation occurs for some programs, including the Forward Capacity Market and low-income programs, the shareholder incentive is typically based on the utilities' self-reported savings, rather than on third-party evaluation. This is another weakness in the New Hampshire PI. In addition, relying on gross savings, rather than net savings, undermines a primary purpose of ratepayer-funded efficiency—to make a net difference in energy use. Further, it creates perverse incentives to the utilities to pursue measures that already enjoy relatively large market share.

National Best Practices

Although it is difficult to separate the effects of a performance incentive mechanism from all other policies in the state, many of the states that are leading the way in efficiency programs have some form of performance mechanism in place, and there is a very strong correlation between having a performance incentive and the level of efficiency spending.[16] As Figure 9.1. shows, this correlation remains even when comparing states with a PI to states with decoupling or other policies meant to encourage energy

[16] It is important to note, however, that correlation does not necessarily mean causality. It is certainly possible that states with the most aggressive policy approach to funding and capturing energy efficiency resources are also the most likely to develop a PI mechanism to encourage utility performance. However, there is some evidence that PIs do indeed encourage greater program administrator performance. See, for example, Nadel, et. al., *Does the Rat Smell the Cheese?*, ACEEE 1992.

efficiency, but which provide no performance incentive.[17] The fact that this correlation persists, even in comparison to states with other policies to encourage efficiency but no shareholder incentive, is a strong indication that shareholder incentives encourage increased funding and activities for energy efficiency.

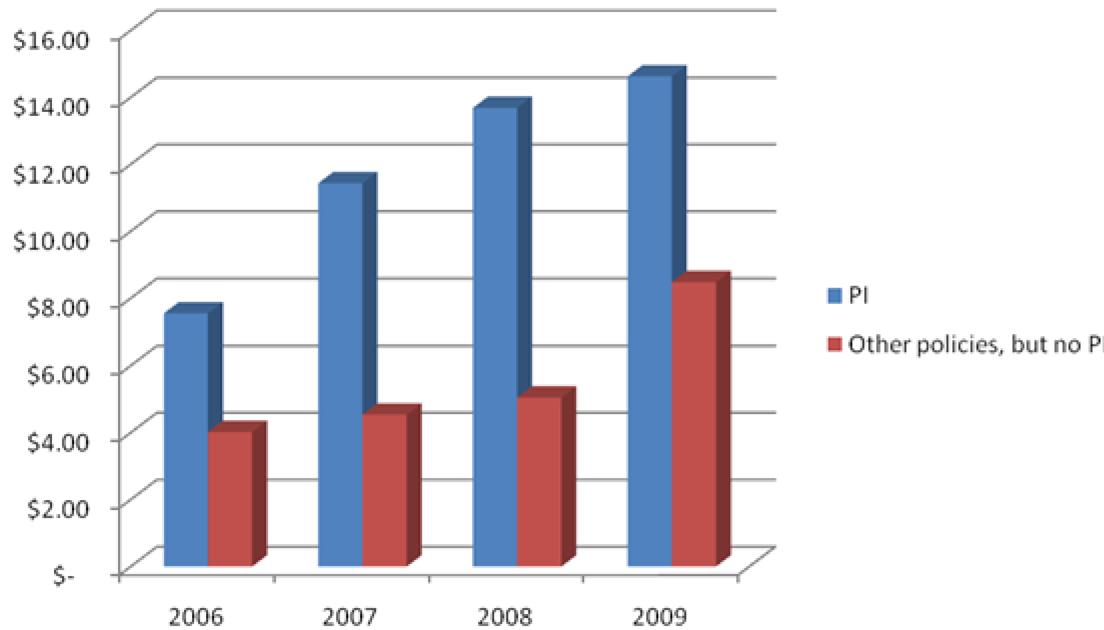

Figure 9.1. Utility Energy Efficiency Spending Per Person

Separating the effect of shareholder incentive from the effect of other energy efficiency-related policies in the states is not addressed here. Rather, this analysis examines the incentive mechanisms in place in states with leading energy efficiency programs and results, based on how aggressive the savings are. Table 9.4 presents the shareholder incentive structure in New Hampshire and these top states. Wisconsin is not given a detailed narrative, since it is rate-of-return incentive applies only to a very limited program. The majority of savings in Wisconsin come from the third-party non-utility administrator, Focus on Energy, which does not earn a performance incentive. However, investor-owned utilities (IOUs) are also allowed to run voluntary programs in addition to their required contributions to Focus on Energy. Expenditures on one such voluntary program, run by Wisconsin Power & Light for C&I customers, is allowed the same rate of return as supply side investments, but is included in the table so that an incentive in the style of a rate of return can be compared to other practices.

[17] Hayes, Sara, et al. Carrots for Utilities: Providing Financial Returns for Utility Investments in Energy Efficiency. ACEEE. January 2011.

Table 9.4. Shareholder Incentive Comparison

	New Hampshire	California	Connecticut	Massachusetts	New York	Wisconsin	Vermont
Type of Performance Incentive	Performance target	Shared benefit	Performance target	Performance target	Performance target	Rate of return	Performance target in form of payments to 3rd party efficiency provider. Note that the utilities do not implement programs in Vermont, so the need to overcome disincentives is removed. As a result, total financial levels are lower than might be the case under a utility model.
Reward Metrics and Levels	Up to 12% of program costs	Up to 12% of net benefits	Up to 8% of program costs	Reward structure varies by program; up to 5.5% of program costs, based on performance in three categories: savings, cost-effectiveness, and program performance (contractors trained, buildings benchmarked, etc)	Up to approximately 20 basis points on the earned ROE, or 12% of program cost.	Wisconsin Power & Light receives the same rate of return on efficiency and supply side investments, regardless of energy savings achieved	Set in formulas for each 3-year contract with efficiency provider. 2006-2008 contract payment is based on 8 metrics such as energy and demand savings, goals from geographic targeting, and participation rates.
Efficiency Goals	Set by utilities, with approval from PUC.	Set by PUC; slightly less than 1% of annual retail sales	All achievable potential	Set by legislature; all cost-effective efficiency, or about 2.4% of sales a year starting in 2012	Set by legislature; about 0.5% of sales in 2008, ramping up by about 2% per year through 2015.	Set by PSC; ramping up to 1% of sales in 2013	Set by PSB; ~2% of sales
Actual Award as % of Program Costs (Latest Available Data)	11.56%	7.5% (subject to change pending evaluation results)	4.7% (planned)	5.16% post tax	Nothing received so far. 2009-2011 goals have been combined.	N/A	3.63% for 2006-2008, out of 3.68% possible. Incentive has gone down as % of spending for 2009-2011.

	New Hampshire	California	Connecticut	Massachusetts	New York	Wisconsin	Vermont
Tiered Incentive Rates?	No; 8% of budget for achieving goals, scales linearly up to 12% as goals are exceeded	9% of net benefits for 85-100% of sales; 12% of net benefits for >100% of sales	1% of costs for 70% of goal; 5% for 100% of goal; 8% for 130% of goal	Different incentive amounts for *threshold*, *design*, and *exemplary* performance for each of three categories and for each program	No; a flat rate of $38.85 per incremental MWh saved, from 80% of target to 100% of target.	WP&L gets the same rate of return regardless of investment size	Yes, each metric has a threshold level (often 75% of goal) with a minimum incentive. Incentive scales linearly up to 100% of goal. There is a bonus incentive for exceeding the goals in multiple categories.
Minimum Criteria	65% of savings goals or 1.0 BCR	Must achieve 85% of savings goals	70% of savings goals	Must achieve 75% of goals	80% of savings goal	N/A	Each metric has a threshold level where they get a % of the full incentive for that category. Often 50% incentive at 75% of target.
Incentive Ceiling	12% of program costs	$150 million per year (<1% of annual customer costs)	8% of program costs	5.5% of program costs post tax, or 8% pretax	100% of savings goal, approximately 12% of program costs	N/A	$2,632,000 from 2009-2011, or roughly 2.7% of estimated program costs
Penalties	None	The greater of the negative net benefits, or $0.05/kWh and $25/kW below 65% of goals. Capped at $150 million/year	No	No.	Penalty of $38.85 per every MWh lower than 75% of goals.	N/A	No explicit mechanism. Might be at risk of not getting contract renewed.
Decoupling/ Lost Revenue Recovery	No	Decoupling	Decoupling	Decoupling	Decoupling	Decoupling piloted	Decoupling, although programs are not delivered by utilities, so is not relevant to the PI mechanism in Vermont.

Figure 9.2 indicates how the performance target incentives listed in **Table 9.4** scale as performance goals are met and exceeded. Simplifying assumptions have been made; for example, in the case of multivariate incentives, all performance is assumed to reach the same percent of the goal for all metrics. Only states with performance target incentives are included, due to the difficulty in comparing net benefits to total program budget.

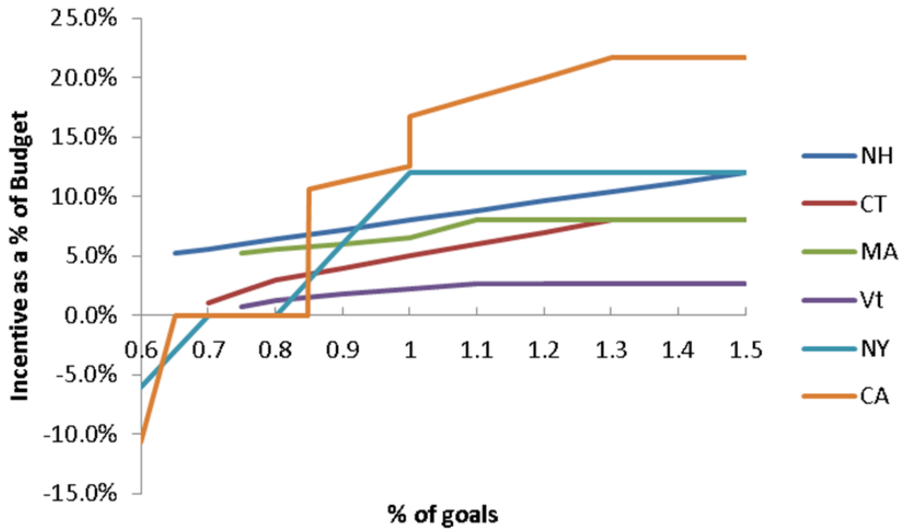

Figure 9.2. Incentive Scaling with Performance by State

As seen above, the size of the New Hampshire incentive is in line with those of other states, although it starts at a fairly high level (5.2% of program budget) for fairly low performance (65% of goals), and quickly exceeds Massachusetts and Connecticut on the high end of savings. Although New Hampshire has the same maximum for incentives as does New York, that latter state's utilities would receive a penalty at a performance level of 65% of savings. By contrast, New Hampshire utilities would earn 5.2% of the program budget. The New York incentive starts off lower and climbs faster than the New Hampshire incentive, which is a positive design feature. But the comparison flattens as soon the goals are achieved, which is a negative for New Hampshire. The California data are very rough estimates, since the percent of program budget depends on the cost-effectiveness. The generosity of those data is balanced by the existence of a penalty and by the aggressiveness of the California goals, described in greater detail below. The Vermont incentive does not have to be as large as that in the other states, since efficiency programs are not run by utilities.

9.4. Analysis of the New Hampshire Shareholder Incentive

Strengths of the New Hampshire shareholder mechanism:
• **Size of incentive:** Although the typical New Hampshire incentive at 10-12% is significantly above the average for Performance Target incentives, it is below the 14% average for states with the shared benefit model. It is directly in the range of overall average performance incentives, of 10-11% of program spending. This is a reasonable size, especially considering that New Hampshire has no mechanism for lost revenue recovery in place. However, evidence in Massachusetts, Rhode Island, and Connecticut imply that it might be more generous than necessary to properly encourage exemplary behavior, and to achieve savings beyond cream-skimming. Consideration should be given to modifying this amount, or perhaps scaling the incentive so that utilities earn only at the higher end, once they are well above planned achievements. Goal setting and strong EM&V should

Strengths of the New Hampshire shareholder mechanism:
also be reexamined in New Hampshire.
• **Simple calculation:** The formula used to calculate the incentive is transparent and easy to use. However, it does depend on accurate analysis of the total resource cost-effectiveness of the programs, which can be uncertain and raise contentious issues.
• **Performance basis:** The incentive is based on actual performance of the program, rather than on spending alone, although actual spending now also figures into the calculation, potentially encouraging greater spending than necessary. Whereas the mechanism is based on performance, it combines two measures of performance into a single formula. As a result, it is possible for the utility to earn a high incentive while still not performing well on one of the two parameters. This dilutes the risk to the utility. Consideration of separate awards on each key parameter would provide more direct focus on each by the utility, and protect ratepayers from paying more than necessary. The fact that New Hampshire utilities have consistently exceeded the goals and earned very close to the maximum incentive implies that the goals are now too easy to achieve. This is really a planning and EM&V issue, rather than a function of the PI mechanism, since goals are set conservatively by the utility, and there is very little verification of the self-reported utility results. These factors can combine to undermine even the best designed PI mechanism.
• **Multivariate metrics:** New Hampshire's shareholder incentive is dependent on both energy savings and cost-effectiveness. However, these two metrics are highly related, and it is unlikely that one would be achieved but not the other. The New Hampshire PI mechanism fails to acknowledge potential perverse incentives (like cream-skimming) through its singular focus on only savings and cost-effectiveness. In addition, other potentially important policy objectives, such as market transformation, are completely ignored.

Weaknesses of the New Hampshire shareholder mechanism:
• **Incentive cap is not applied to each metric separately:** Multivariate incentives are important for encouraging performance in multiple categories. Their usefulness diminishes if good performance in one metric can completely make up for bad performance in another. This could be fixed by capping the maximum financial award associated with each metric, as opposed to only the total award.
• **Might encourage cream-skimming:** The two performance metrics both encourage procuring the most energy savings for the least amount of money. While value and cost-effectiveness are certainly important goals, the current incentive structure does little to encourage the pursuit of deeper, harder-to-reach savings, transforming the market, or building the infrastructure that would allow utilities to do this in the future. This is especially true since the award is based on gross savings, and thus might include free-riders.
• **Goals consistently exceeded:** New Hampshire utilities have wide latitude in setting their own goals and reporting their own savings numbers. This, combined with the fact that New Hampshire utilities consistently earn close to the maximum award available, could undermine the usefulness of the shareholder incentive as a tool for increased consumer benefits and to encourage better energy efficiency programs, as opposed to simply a tool for receiving an automatic bonus for the utilities.

Weaknesses of the New Hampshire shareholder mechanism:
• **Low performance threshold:** The minimum thresholds for performance—65% of savings goals and a 1.0 benefit-cost rate—are very low in comparison with other states. Most people would consider only achieving 65% of what they paid for a failing grade; a 1.0 benefit-to-cost rate means that there would be zero net economic benefits to the program.[18]

Recommended modifications to New Hampshire's incentive structure[19]
• **Cap maximum incentives for each performance metric:** Under the current incentive structure, the overall incentive level is capped, but the incentive for each individual metric is not. This creates a situation in which a utility could potentially receive the full incentive even after failing to save 65% of the kWh goals, if the cost-effectiveness of the program is 3 times better than planned. If the utility just barely saves 65% of the goal, the cost-effectiveness of the program needs to be only 1.35 times better than planned for it to receive the full 12% incentive. By separating this single formula into two separate metrics with appropriate weights, one can ensure that utilities are rewarded only for each metric when they achieve acceptable levels of performance. In addition, other metrics should be added with weights on other important objectives, as discussed below.
• **Use net savings rather than gross savings:** The use of gross savings and the two performance metrics encourages utilities to focus their efforts on promoting technologies such as CFLs, which save a lot of energy and are highly cost-effective. However, they are already widely adopted in the marketplace (i.e., they have high free-ridership rates). Evaluating utilities based on gross impacts creates a strong perverse incentive for utilities to focus on capturing free riders, which are much easier to address and avoid lost revenue. Instead, using savings numbers that are net of free-ridership would encourage utilities to spend more effort promoting promising technologies that are not yet widely in use. This would promote both deeper savings and market transformation, and would create more actual benefits for ratepayers.
• **Tie incentive to budget, rather than actual spending:** A recent change to the New Hampshire incentive structure has made the shareholder incentive dependent on actual spending instead of on planned spending. This creates the potential for a perverse incentive for the utility to spend more money to achieve the same goals, so that the incentive can be increased. The incentive structure should be designed to encourage capturing savings the lowest cost possible, and not provide possible incentives for going over budget. The incentive should be set in advance, based on an amount that appropriately rewards good performance. This amount should not increase if the utilities spend more to achieve the same goals. This also requires a more stringent goal setting process so that stakeholders are comfortable that the goals are robust.

[18] A 1.0 cost-benefit rate means that the costs of efficiency exactly equal the benefits. Thus while ratepayers as a whole are not better off than they would have been without and efficiency program.

[19] The limited sample size of existing performance incentive mechanisms, as well as the multi-faceted and varied policy environments in which they operate, make it impossible to isolate any one of these recommendations and analytically determine how it would affect utility energy efficiency performance. That said, implementing these recommendations would much better align utility incentives with the New Hampshire ratepayers' interests.

Recommended modifications to New Hampshire's incentive structure[19]
• **Raise minimum performance thresholds:** As seen in **Table 9.4**, most states with shareholder incentives in place have a higher minimum threshold than New Hampshire's. The national average minimum threshold is 81% of goals, significantly higher than New Hampshire's 65%. Given that even at this level it is very rare for utilities to fail to achieve an incentive, New Hampshire's 65% threshold seems too low to encourage exemplary performance. Likewise, the cost-effectiveness threshold of 1.0 is very low, given that most energy efficiency programs around the country have BCRs of between 2.0 and 4.0. Further, if an energy efficiency program has a BCR of 1.0 without the shareholder incentive included, then once the incentive is included, the BCR is actually lower than 1.0. This means that ratepayers suffer a net economic loss from the program.
• **Begin incentive at lower amount:** Currently, if a utility achieves 65% of both goals, it still receives an incentive of 5.2% of the program budget. This is a lot for what is essentially a failing grade. Further, since the decision of whether to pursue extra savings is based on the marginal incentive rate, rather than the total incentive level, an incentive structure that starts off low and grows quickly will be more effective than an incentive structure that starts off high and grows slowly, even if they both grow to the same overall level.
• **Create a tiered incentive structure:** Most other states structure their incentives so that the percent of the budget that a utility receives as an incentive increases as energy efficiency program performance passes certain thresholds. Increasing the marginal award for performance above the goals can provide a very strong incentive for truly exemplary performance while protecting ratepayers from unnecessary costs for performance that just meets planned targets.
• **Implement independent third-party evaluations:** To creditably promote good performance, shareholder incentives need to be based on savings numbers that have been independently evaluated and verified, rather than relying on self-reported utility data.
• **Consider changing cost-effectiveness metric or adding weighting factor:** Cost-effectiveness and energy savings are highly correlated performance metrics. In theory, savings goals are set at a level where, if they're achieved on budget, the cost-effectiveness goals would be automatically met. Thus, the two goals are somewhat redundant. Eliminating or lowering the weighting of the cost-effectiveness goal would help avoid situations where utilities could earn significant incentive even while failing to achieve threshold savings levels. Alternatively, cost-effectiveness could be a performance target, as it is in Vermont. That is, instead of an explicit financial award is a minimum goal that must be achieved before any award is available.
• **Consider adding additional metrics:** Currently, both metrics in use in New Hampshire encourage utilities to focus on the low-hanging fruit, especially since free-ridership is not taken into consideration. As explained above, other states use metrics such as: (1) number of contractors trained, (2) retail outlets enrolled in product buy-downs, and (3) amount of community awareness. These additional metrics can help advance supplementary policy goals such as market transformation, achieving deeper energy savings in projects, and increasing participation in underserved sectors.

9.5. Summary of Utility Performance Incentives Recommendations

Most successful performance incentives have been designed through a settlement process with the agreement of a wide range of stakeholders. With this in mind, any changes in New Hampshire's incentive should be made with the cooperation of the NH PUC, the utilities, and other interested parties. With the ongoing input from the group of stakeholders, New Hampshire's shareholder incentive would be best redesigned in a systematic fashion by:

Agree on the various policy objectives of the CORE programs. *Recommendation 9.1; Section 9.1*
• These might include economic benefits, cost-effectiveness, market transformation, and equity across regions or sectors, etc.

Determine whether these goals are independent of each other or if there is significant overlap or tension between the goals. *Recommendation 9.2; Section 9.2*
• If there is overlap, such as between cost-effectiveness, economic benefits, and energy savings, it may not to attach financial awards to each. • If there is tension, such as might arise between cost-effectiveness and market transformation, it makes a lot of sense to attach separate financial awards. • Market transformation might involve, for example, training and education efforts that do not translate into measurable economic benefits and thus lower the cost-effectiveness of the program.

Find measurable and verifiable metrics that can be used to determine the CORE program's success or failure at reaching the goals. *Recommendation 9.3; Section 9.2*
• These goals could range from energy savings as a proxy for economic benefits, or number of contractors trained, as a proxy for market transformation.

Determine the maximum available incentive and the relative importance of the various performance metrics. *Recommendation 9.4; Table 9.4*
• This entails creating weighted factors for each performance metric that sum to 1. • The maximum financial award associated with each performance metric will be the maximum total financial award multiplied by the weighting factor.

Determine whether to add additional metrics that don't carry an explicit financial award, but that can affect the size of the overall award. *Recommendation 9.5; Section 9.3*
• In Vermont, for example, if the program fails to enroll at least 700 small business clients, the overall award is reduced by 18%.

Determine minimum thresholds in each performance metric, as well as a method for scaling the incentive with performance. *Recommendation 9.6; Section 9.4*
• Consider tiered incentive structures or structures that scale faster as certain performance thresholds are met. • This will provide extra encouragement for utilities to beat goals, rather than simply meeting them.

Engage stakeholders to ensure that performance metrics align with the policy and program goals. *Recommendation 9.7; Section 9.4*
• The thresholds and design goals are set to be aggressive but achievable, and the incentive will be earned based on measurable and verifiable results.

Chapter 10: Energy Finance Programs Review and Assessment

10.1. Introduction

Financing is a critical tool for enabling energy efficiency and sustainable energy investments, particularly in an era of concern about sustainability and longevity of market support mechanisms. For purposes of this review, financing is defined as the use of mechanisms such as loans, leases, mortgages, or property-secured finance to spread the cost of efficiency or sustainable energy investments over time. Presented below is a review of key attributes of successful energy finance programs in other jurisdictions, a description of energy finance programs currently offered in New Hampshire, and recommendations for enhancements in the future.

10.2. The Role of Energy Finance Programs in Market Development

Financing programs are compelling tools for encouraging energy efficiency and sustainable energy improvements for many reasons:

- **Financing programs increase the impact of limited government funds**. A rebate or grant program by definition provides funding at no cost. Once it is spent, it is gone. A financing program can leverage government funds to attract additional private capital and can allow funds to be continually recycled as loans are repaid.

- **Financing programs can complement rebate or tax credit programs to eliminate the first-cost barrier**. Most incentive programs do not cover the full upfront cost. A financing program can operate in tandem with a rebate program to help the customer fund the balance after taking a rebate, so the two are not mutually exclusive. A rebate or other incentive can further lower the cost of the project and shorten the payback time for financing.

- **Financing means customers have "skin in the game."** Financing requires customers to pay back the money that they borrow to install efficiency and sustainable energy measures. This may encourage them to operate and maintain equipment better than if the improvements were fully paid for by a grant. While there is no direct study tying this concept to energy efficiency, general behavioral economics stipulates that when customers have some portion of their own money invested, i.e. something to lose, they are more likely to maintain and take a more active role in the investment's performance.

10.3. Overview of Energy Finance Programs in New Hampshire

New Hampshire is to be commended for its dedication to energy efficiency and sustainable energy through the offering of multiple financing programs across all market sectors, as illustrated through the creation of ten revolving loan funds, while also structuring programs that have attracted private capital from financial institutions (FI) and consumers. Table 10.1. provides an overview of the programs currently in place and the aggregate funds disbursed through each since inception, as well as total budgets. Through these programs, New Hampshire has taken crucial steps towards achieving its goals by facilitating access to financing for energy projects. For example, programs such as Better Buildings (BB) which is being offered in three communities, and the Enterprise Energy Fund (EEF) which is offered state-wide, take important steps to overcoming the common financing barriers – access to inexpensive sources of funds, a streamlined process that makes the loans available to the home or commercial building owner with the highest level of convenience, and a strong connection with the home energy audit that encourages a whole building retrofit.

Even with recent advances, New Hampshire continues to face challenges in the creation of an adequately capitalized and sustainable finance model able to serve all market sectors moving forward.

Based on current best-practice models from other states, the most effective finance programs share the following characteristics:

- **A solid link to energy audits;**
- **Sustainable funding** that is adequate to meet goals;
- **Significant program participation**, or uptake; and
- **The ability to attract investment from outside financial institutions and private sources** in a low-cost, leveraged vehicle.
- **Highly coordinated program approach** with either a single centrally-administered program entity, or synergistic program design amongst all key players

These characteristics of effective programs are not always easy to achieve. Financing programs are typically more complex to operate than grants and rebates. Financing programs usually require a long-term commitment of financial and human resources to administer the program and to collect principal and interest, and staff with particular expertise. In most cases, they also require a credit evaluation process that is not necessary for a rebate program.

It is also important to stress that financing cannot be offered in isolation – it addresses one of the potential barriers to investment in energy improvements, lack of capital to meet up-front costs. The most successful energy efficiency and sustainable energy approaches integrate finance directly into the program offerings, and use energy audits, education, and outreach to attract participants to the financing. In this regard, financing is just one tool (albeit crucial) in a well designed and implemented energy program. Without an established or growing marketplace for energy efficiency measures that can sustain an adequate level of demand, the best-designed and implemented finance programs will be ineffective.

Table 10.1. Financing and Finance Related Programs in New Hampshire: Overview

State Programs	Dollar Volume to Date	Total Budget[1]	Source	Year of Program Inception	Year of Program Expiration	Sector
Better Buildings	$32,770	$10M	ARRA	2011	2013	Commercial & Residential
Enterprise Energy Fund	$4.7M	$6.6M	ARRA	2010	None	Commercial
Municipal Energy Reduction Fund	$1.3M	$1.5M	RGGI	2010	None	Municipal
Business Energy Conservation Loan	$3.9M	$4M	RGGI	2009	None	Commercial
Giving Power Back (RMANH)[3]	$1.3M	$3.3M	RGGI	2009	2013	Commercial
Pay for Performance[3]	$0	$5M	RGGI	2011	2012	Commercial
Total	**$11.2M**	**$30.4M**				
Utility Programs	**Dollar Volume to**	**Total Budget**	**Source**	**Year of Program**	**Year of Program**	**Sector**

	Date			Inception	Expiration	
NHEC Residential EE Loan	$68,000	$200,000	RGGI	2010	None	Residential
NHEC SmartSTART	$730,000	$1M	NHEC	2002	None	Commercial
National Grid Residential Loan	$3,000	$3,000	RGGI	2010	None	Residential
National Grid Business Loan	$300,000	Annually Set	SBC	2002	None	Commercial
National Grid Municipal Loan	$0	$300,000	RGGI	2010	None	Municipal
PSNH EE Loan	$380,000	$500,000	RGGI	2010	None	Residential
PSNH SmartSTART	$5.2M	$2M	SBC	2004	None	Municipal
PSNH Energy Rewards[3]	$3.2M	Annually Set	SBC	2004	None	Commercial
Unitil Residential Loan	$140,000	$300,000	RGGI	2010	None	Residential
Unitil Municipal Loan	$0	$430,000	RGGI	2010	None	Municipal
Total	**$10M**	**$4.7M[2]**				
Private Funding	**Dollar Volume to Date ($M)**	**Total Budget ($M)**	**Source**	**Year of Program Inception**	**Year of Program Expiration**	**Sector**
People's United Bank	$1.8M	No cap	Private	2006	None	Commercial
Total	**$1.8M**					

Grand Totals	*Dollars Committed*	*Total Budget*
Finance & Finance Related	***$23M***	***$35.5M[2]***
Finance Only Grand Totals[4]	***$18.5M***	***$26.7M***

1 – Total budgets for Better Buildings and Enterprise Energy Fund include administration costs
2 – Figure uses 2010 Annual funding amounts for People's United: $420k; Nat. Grid Business Loan: $50k; PSNH Energy Rewards: $508k
3 – Programs are funding based (grant/rebate incentive) but linked to finance programs
4 – Excludes Giving Power Back, Pay for Performance, and PSNH Energy Rewards

The current programs in New Hampshire face a variety of challenges and opportunities, common to those being faced in energy programs across much of the nation.

- **Disaggregated program approach**. The current landscape for energy project financing in New Hampshire includes programs administered by four utilities and a number of other financial institutions, non-profits, and trade associations. While this range of program delivery is understandable given the history and variety of funding sources, the result is a fairly fragmented set of offerings that customers must understand and negotiate. This disaggregated and distributed approach limits the ability to provide a coordinated portfolio of programs and does not maximize opportunities for streamlining program implementation and operations.

- **Lack of established or well-functioning market.** Perhaps most impactful to the success of New Hampshire's finance programs is a lack of any solid and sustainable market for energy efficiency improvements. The existence well-functioning market depends on a suite of factors, which when taken as a whole, this independent study covers in great detail. Every finance program manager cited a high level of skepticism in regards to the potential energy savings, and hence financial savings, certain efficiency measures will yield. Program managers also cited a general lack of awareness when it comes to the public's level of understanding of energy efficiency investments. This translates to a low demand for efficiency measures; especially finance related products which inherently require consumers to commit to some type of cash outlay, either in monthly payments, money down, or both. Therefore, New Hampshire's finance programs are not only challenged with securing finance capital and designing an effective structure to offer loans, but also with the task of creating a market demand those loans.

- **Programs are relatively new and have had only a short time frame for fund disbursement.** Of the seventeen finance programs currently offered in New Hampshire, only four existed prior to late 2009. Successful clean energy finance programs take significant time to become established within a state or community, let alone create market transformation to encourage building owners to make significant investments in whole-building retrofits. The primary reason for this, addressed above, is an overall lack of demand for energy efficiency investments. Even in a well-functioning market, an energy finance program may take significant time to realize optimum program uptake due to the variances within each market, and the need for a program to hone its outreach and loan structures to meet specific market needs. In New Hampshire, the relative naissance of this market necessitates even more time as the demand mechanism is stimulated, and programs refine strategy and design. An example of this is the Connecticut Energy Efficiency fund which operated for over a decade before the program finally took hold and realized a sustained surge in participation. Further, the two largest finance programs by dollar amount (Enterprise Energy Fund and Better Buildings) are American Recovery and Reinvestment Act (ARRA) funded and must disburse all funds by 2012 and 2013, respectively. This short timeframe does not allow for optimal program design and implementation, and leads to decisions that may be more oriented towards getting money out the door than developing markets.

- **Future funding uncertainty.** Eleven of the seventeen finance programs are funded through the Regional Greenhouse Gas Initiative (RGGI), the future of which is in question for New Hampshire. This uncertainty can lead to a lack of participation among business customers, who often require significant time to go from application to audit to financing approval. Because the audit process often involves significant upfront expense (which can later be recouped in a financing package), a business customer may be hesitant to incur that expense, and hence to utilize the program, if the availability of finance could be in question once the application and audit process is completed.

- **Capital levels are not adequate or sustainable.** The current commercial programs that are leading the market in participation are oversubscribed and have waiting lists. Further, while the ten revolving loan funds were initially capitalized with $14M, once the primary funds are disbursed (which will happen for the majority of programs by the end of 2011), an estimate of only $2.8M will be available on an annual basis to finance future projects. The single sustainable privately funded program offered in New Hampshire (People's United Energy Efficiency Loan) has limited participation with approximately $420,000 disbursed annually, primarily due to much more favorable terms offered through other programs, as well as a lack of marketing and awareness of the program. This combined annual capital availability for commercial projects of approximately $3.2M is simply not large enough to help New Hampshire meet its aggressive energy savings and climate goals.

- **The majority of current programs are not maximizing opportunities for leveraging financial capital from lending institutions.** Leveraging is often quite effective when public dollars can be allocated to a loan loss reserve. The loan loss reserve is then used to protect lenders from risk, and thereby increases the interest by lenders in participation, while lowering the interest rate offered. With established banking relationships and programs, leverage ratios of 5:1, 10:1, and even 20:1 can be reached (see sidebar in section 10.3.). With the exception of Better Buildings, none of the current commercial or residential programs in New Hampshire use "financial leverage"[1] to attract FI capital. While BB is leveraging capital from FI's at a ratio of 2:1 (which is a great start), this is less than what has been achieved by successful finance programs in other states.

It is worthy to note that for the most part, programs that are offered state-wide have realized the greatest success in attracting significant financial institution lenders.

- **Finance programs and financial institutions struggle to assess risk premiums appropriately.** With the exception of the Better Buildings program, utilities and individual finance programs are responsible for developing the financing and securing loans. In New Hampshire, utility program managers have made it clear that they will not take on financial risk nor directly provide shareholder capital. There is experience with utilities doing this successfully in Connecticut[2], which may inform future finance program design in New Hampshire moving forward.

- **Competing terms hinder program uptake and may be resulting in a "wait and see" delay.** Many program managers in the state noted that competing terms among finance programs are a significant barrier to program participation. Currently, programs targeted to similar market segments have differing interest rates, down-payment requirements, repayment terms, and availability of grant funding. This encourages participants to shop for the best deals, resulting in oversubscription of some programs, and lack of interest in others. Further, since ARRA is a funding source for some of the programs, potential participants may be astute enough wait to see if programs will switch to more attractive terms in order to meet their requirements to disburse money by a specific (federally-driven) deadline.

- **There are conflicting requirements for audit processes in commercial and residential sectors.** Energy finance programs need to be preceded by completion of effective audits. The four utility-run finance programs use a 2-3 page "walkthrough" audit, while the other programs require more comprehensive and privately contracted audits. Several program managers note that a primary concern is a lack of standard protocols for these audits. There is also a lack of standard auditor requirements, such as Building Performance Institute (BPI) certification, as well as no standard list of priority measures to be considered with every audit performed. State's that implement both a minimum auditor certification standard, as well a standardized list of prioritized measures for implementation have increased the likelihood of implementing robust audit process, and in turn ensured an optimal use of investment dollars.

- **Current residential finance programs are too small to provide financing for an optimal number of households.** The residential sector is relatively less well served by the finance programs in New Hampshire, overall. Presently, only 7% of total funds available are dedicated to the residential sector. The total number of residential energy loans made through the active finance programs is 182. This compares to an estimated 438,000 owner-occupied units in the New Hampshire residential housing stock

[1] Financial leverage is not to be confused with the more general term of leverage wherein an initial pool of capital attracts other capital which is lent out dollar for dollar and exhausted when all the money is committed (other than small principle and interest payments back into the pool). Financial leverage is more important where the loan terms are longer (7-10 yrs), such as in residential and large commercial programs.

[2] http://www.ctmirror.org/sites/default/files/documents/Energy%20Northeast%20report.pdf

- **Residential programs are financing low-hanging fruit.** There are currently five active residential financial loan programs, offered by Better Buildings, Public Service of New Hampshire (PSNH), National Grid, Unitil, and the New Hampshire Electric Coop (NHEC). The average loan size for each of the utilities is approximately $3,400, and $4,200 for Better Buildings. These loan amounts are almost half of the national average $7,500 for residential energy loans.[3] This indicates there could be large savings that are not being captured because homeowners may be implementing only one or two measures – rather than a robust list of priorities that would typically be generated from a Home Performance with ENERGY STAR audit (for example).

- **Marketing and outreach could be expanded.** Although there is a multitude of financing programs currently offered in New Hampshire, there appears to be limited information, education, and outreach about them, and there is no single source of contact to learn more. Individual websites discuss individual program offerings, but there is no "one-stop shopping" location where a customer can find information about all of the programs.

In the following sections, current energy financing programs in New Hampshire are described and recommendations are made for enhancements. The final section includes a table that summarizes the detailed program-level recommendations.

10.4. Commercial Sector Finance Programs

At roughly $24M total for finance and finance related programs, and $15.5M total for finance only programs, the commercial sector holds the majority of available capital in the state. This is largely attributable to the recent infusions of ARRA and RGGI monies, and does not include typical annual figures from the People's United and PSNH Energy Rewards program, which together contribute an estimated additional $900,000 annually. Six finance and two finance-related programs serve the commercial sector, managed by nine administrators. In general, the number of commercial loans generated has been small since the first program (NHEC SmartSTART) was created nine years ago. ARRA provided a boost to loans in this sector, with a total allocation of $16.6M, $6.6M of which must be spent by April, 2012, and the remaining $10M by 2013. Table 10.2. provides a commercial program overview.

Table 10.2. Current Commercial Finance and Finance Related Programs in New Hampshire

Program	Year of Program Inception	Funding Source	Interest Rate	Average Loan Term (years)	Finance Mechanism	Completed Projects: aggregate	Total Funding Budget ($M)	Dollar Volume to Date
NH Better Buildings	2011	ARRA	1% - 3.5%	5	Loan	1	$5M[1]	$20,000
Enterprise Energy Fund	2010	ARRA	2%	7-10	RLF	30	$4.76	$6M
Business Energy Conservation Fund	2009	RGGI	Prime to Prime +3%	3	RLF	5	$4	$3.9M
NHEC SmartSTART	2002	Private[2]	Mkt. + 0.5[3]	4	Loan	27[2]	$1	$700,000
People's United EE Loan	2006	Private	Prime-1% 4%	5	Loan	40[3]	No cap	$1.8M

[3] DOE Clean Energy Guide, Third Edition, 2010. MI average $7,000; NYSERDA average $7,700; MA Average$8,080

Program	Year of Program Inception	Funding Source	Interest Rate	Average Loan Term (years)	Finance Mechanism	Completed Projects: aggregate	Total Funding Budget ($M)	Dollar Volume to Date
			floor					
National Grid Business Loan	2002	SBC	0%	2	Loan	123[5]	Set annually	$300,000[5]
Retail Merchants Association NH Giving Power Back[4]	2009	RGGI	-	-	Grant	4	$3.3	n/a
PSNH Energy Rewards RFP[4]	2004	SBC	-	-	Grant	Not available	Set annually	$3.2M
Pay for Performance[4]	2010	RGGI	-	-	Rebate Incentive	5	$5	0
						Total	**$24[6]**	**$16M**
						Finance Only Total[7]	**$15.5**	**$12.7M**

1 – BB has $2.5M provisionally allocated to commercial loans which can be leveraged through financial institutions to generate a maximum of $5M in loans through co-lending and loan loss reserve structures. Some portion of funding will be directed towards rebates and incentives, and actual figure will be less.
2 – NHEC secured credit line
3 – Market rate is the daily spot rate at which NHEC can obtain credit from its credit line
4 – Programs are grant funding based, with direct ties to financing and stimulating private investment
5 – National grid data for years 2008 – June, 2011
6 – Includes 2010 annual budgets for PSNH Energy Rewards RFP and Nat. Grid Business Loan, and average annual funding amount of the People's United program
7 – Excludes Retail Merchants Association Giving Power Back, Pay for Performance, and PSNH Energy Rewards RFP which are all grant/rebate based

New Hampshire Better Buildings - a New Hampshire Beacon Communities Project

Through ARRA funding, DOE created a national Better Buildings (BB) program. New Hampshire successfully applied to participate, and received a $10M federal grant award. The initiative for this program in New Hampshire grew out of a "Beacon Communities" initiative developed by a working group of the Energy Efficiency and Sustainable Energy Board. The concept was to showcase deep energy efficiency investments in selected New Hampshire communities as a means to highlight what can be replicated in other communities, and to learn how to best aid communities in achieving these goals. BB serves three communities – Nashua, Plymouth, and Berlin – and was opened to both the residential and commercial sectors in the second quarter of 2011. Funds will be available on a first come, first serve basis between the commercial and residential sectors. This program is scheduled to end in May of 2013, pursuant to federal requirements. BB seeks to perform deep energy retrofits approximating 30% energy use savings in both commercial and residential buildings. The minimum goal per project is 15% energy use savings, and a comprehensive building evaluation is required to ensure these requirements are met. There are no limitations on the energy conserving measures that can be implemented, and renewable energy installations may be included as well. A variety of energy-saving measures are proposed and evaluated by BB in order to qualify for a loan.

Better Buildings Commercial financing is broken into two categories. Small projects, under $20,000 are eligible for 1% interest through a BB initiated interest rate buy down (IRB) feature. Medium to large projects, $20,000 to $100,000 will be served with a 3.5% fixed interest. To achieve the below-market interest rate, BB funds at 0% are combined with bank funds at market rate in a co-lending structure. Each source provides 50% of the loan amount, blending the overall interest rate to 3.5%. BB will also entertain larger commercial projects on a case by case basis.

To provide finance capital Better Buildings formed partnerships with several local financial institutions (FI): Merrimack County Savings Bank, Laconia Savings Bank, Northway Bank, Guardian Angel Credit Union, Woodlands Credit Union and Woodsville Guaranty Savings Bank. To facilitate project financing with FI capital, Better Buildings has also established a loan loss reserve (LLR) which effectively mitigates loan default risk. Not all projects will utilize the LLR feature, and will depend largely on the individual project terms. The BB program has initially set the LLR at 50% of initial loan principle (i.e., for a $10,000 loan, $5,000 would be put into the LLR). As the program funds new loans and existing loans are paid down, funds will be returned from the lending institution to maintain the 50% coverage ratio. Once a track record of successful loans has been established, BB may attempt to negotiate with the participating financial institutions to reduce the required LLR.

The core financial structure of loans and rebates to both the commercial and residential (discussed below) sectors is a $6.2M program fund that houses a loan loss reserve fund, interest rate buy down funds (IRB), and funds to support the rebate incentives. $2.5M of the program fund is provisionally allocated to commercial projects, including co-lending loans, interest rate buy-downs, contributions to the LLR, and rebate incentives. The commercial incentive structure is as follows:

- 25% of audit cost will be rebated;
- An additional 25% of audit cost will be rebated if the project is implemented with 15% or more projected energy savings; and
- Total rebate/grant is not to exceed $5,000.

The BB program is designed to be flexible and adaptive, allowing the program administrator to appropriate funds to meet demand within each sector, and ensure all program funds are disbursed by the ARRA-imposed deadline. Factoring in the leverage created from 50% co-lending and the LLR, the BB program has the ability to generate up to $5M of commercial loans.

As of August 2011, the first small commercial loan has been closed ($20,000 with a five year repayment term) and several more are currently under development. Annual commercial targets have been established across the three communities and consecutively ramp up over the program's three years of operations. Cumulatively, the goals are to complete 26 projects in year one, 46 projects in year two, and 62 projects in year three, for a total of 137 commercial projects. BB staff emphasize that goal attainment will be measured by square footage, as well as by number of projects (given that commercial projects can vary significantly in size).

The remaining $3.7M available from the grant will be used for marketing, workforce training and administration of the program, which includes running the three community offices, technical energy advisor contracts, measurement and evaluation, and mandated Davis Bacon monitoring. BB is using a variety of community-based local outreach methods, including an informational website, educational workshops, community events (home shows and neighborhood parties), press releases and other media coverage, print advertising/pamphlets, as well as contests and giveaways for energy conserving products. Each community has a local office to offer community outreach and support including in-person consultation, as well as an online application. Over 300 individuals and businesses have visited the community offices to express an interest in project development. Approximately six commercial audits have been completed as of early August, and program marketing continues to be refined and bolstered.

Enterprise Energy Fund

The Enterprise Energy Fund (EEF) was implemented state wide in early 2010 with $6.6M to capitalize a revolving loan fund (RLF), with a portion dedicated to grant funding. Ten percent of this amount, or roughly $600,000, has been set aside for administrative purposes. This program is targeted to commercial (business) and non-profit entities, providing low interest loans with standard repayment terms from 3-10 years, and longer terms available for large comprehensive projects. Administration of the fund is handled by the Community Development Finance Authority (CDFA) and the New Hampshire Community Loan

Fund (Loan Fund).Within this partnership, the Community Loan Fund primarily handles the smaller projects, while the CDFA handles the larger projects.

At inception, the fund had a project cost cap of $500,000, which has been relaxed to allow larger projects that involve comprehensive deep energy retrofits. Initially, the program was setup with a separate loan and grant offerings, with loans carrying 4% interest and grants going towards conducting audits for prospective projects. Under that structure the program funded two projects leading to the determination that further incentives would be necessary to spur demand and ensure complete fund disbursement by April 2012 to meet ARRA requirements. The program was modified in two steps: first lowering the interest rate on the loans to 0% for the first year and 2% for additional years; and then raising interest rates to 2% with 25% grant funding for all projects. The program limits were also relaxed, allowing certain projects over $500,000 to be financed, as well as offering large project applicants a repayment period of over 10 years and a 4% interest rate for that extended term. The result was an immediate surge of interest, yielding applications for over $12M in energy efficiency improvements for only $5.7M in available funds. All funds were committed by June 2011, and the program was closed to new applications at that time.

As of June 2011, 28 projects have been approved to receive financing. Those projects will receive $4,763,000 in loans and $976,000 in grants to complete their energy efficiency improvements. In addition, $201,000 in audit grants was awarded to projects.

Applicants are not required to pay an out of pocket percentage of the project fees. In part due to the very favorable terms, EEF funding is being used to cover 85% of the cost of projects. Some projects are also using utility sponsored rebates or self-financing a portion of the projects. The average project size is approximately $205,000, with the smallest project coming in at $18,000 and the largest at $800,000. Of the 28 projects, twelve are projected to cost $100,000 and under; ten are to fall between $101,000 and $499,000; and six are projected to cost over $500,000. Most projects carry repayment periods of 7-10 years, highlighting the program's emphasis of deeper savings measures that require longer payback periods.

The criteria for project approval through the EEF program is the completion of a level two audit, a project large enough that the loan can be serviced from the energy saved, and that the borrower is sound enough to service loan debt. While some businesses have already had a level two audit performed, those that have not are able to have one performed through a partnership with The Jordan Institute; a New Hampshire based non-profit focused on mitigating climate change, or services available from the Retail Merchants Association or the Business Energy Efficiency Program (BEEP). The Jordan Institute subsequently analyzes all audits and works with the applicant to determine the appropriate measures to implement. The partner organizations stated that significant marketing and outreach was done for this program including conference presentations, press releases and pamphlet handouts, as well as coordination with the New Hampshire Office of Energy and Planning (NH OEP). The online application process begins with single application form, with next steps becoming more complex and comprehensive.

The RLF feature was built into this program to ensure that ARRA funds would continue to work for the state after the initial disbursement deadline passed. As of August 2011, the CDFA stated that no calculations have been performed to estimate the amount of loan payments that will flow in from the RLF, nor the number of projects that can be funded after primary funds have disbursed in 2011. Assuming a loan pool of $4.725M, an average loan term of five years, and 2% interest, it is estimated that the RLF will generate approximately $1M annually in repayments. This also assumes that the CDFA will discontinue grant funding after ARRA disbursement requirements are met. Based on the program's current figures of funding 28 projects with $4.7M, it is estimated that the program will fund six projects annually through RLF payments from 2013 onwards.

Business Energy Conservation Revolving Loan Fund

The Business Energy Conservation Revolving Loan Fund, administered by the New Hampshire Business Finance Authority (BFA), was initiated in 2009 and capitalized with two $2M infusions, for a total of $4M. BFA's program serves the business, non-profit, and agricultural sectors with loans of 1-7 years in repayment length, and interest rates of prime to prime plus three points. The primary goal of the BFA's program is to help businesses become more competitive and lower operational costs, ideally through energy reduction measures. The program's applicants are often property owners in lease-hold agreements that cannot get project funding through traditional means. The Business Energy Conservation RLF is expected to continue until funds are exhausted.

Businesses typically approach the BFA with a particular project in mind, and either bring a previously completed audit, or work with the BFA to have a no-cost audit performed. In all cases, the BFA has worked with the business to implement as many comprehensive measures as possible. While the majority of audits identify 28-30 measures with cost effective paybacks, only enough money is available to implement the first few measures. There is no measurement and verification of energy savings built into the BFA's program.

Presently, this program has approved $3.9M in funding over six projects ranging from $510,000 to $750,000. The businesses implementing these projects have cumulatively brought $2.05M of match financing to the program, ranging from as low as 8% to as high as 125% of the BFA's loan amount. An additional $700k has been reserved to fund a project in the third or fourth quarter of 2011. As of August, 2011, the RLF has $2.459M in outstanding loans, and is receiving over $30k per month in loan repayments. Once the primary loan funds have been completely disbursed, it is estimated that the revolving loan fund will yield $540,000 annually in loan repayments, enabling a further one project to be funded each year based on current average project size of $660,000. The BFA is working with the CDFA to fund applications that did not qualify for the oversubscribed EEF program. Marketing at this time is correspondingly in conjunction with the CDFA programs, as well as through the New Hampshire Business Resource Center.

New Hampshire Electric Co-op SmartSTART

Built on the same core program as the SmartSTART offered to municipal customers through PSNH, NHEC offers loans up to $100k to its commercial customers. The NHEC draws on its own commercial credit line, from which is reserved $1M to capitalize the program. Customers are charged NHEC's spot cost of credit plus a 0.5% fee to cover administration costs (current rates at 5.5%). Loans can be repaid in 1-10 year terms, and are serviced through on-bill financing. Since the program was implemented in 2002, NHEC has funded approximately 228 projects using $730,000. 188 of the projects funded in 2002/2003 were a special CFL promotion. From 2004 to 2010, the program funded 27 projects with permanent measures, at a total cost of $592,127, with an average project cost of $22,000 and average annual projects at 3. The NHEC retains the ability to offer this program to the residential sector, but has no plans to do so in the future. There is no end date scheduled for this program and approximately $900,000 remains in the budget.

In 2010, NHEC SmartSTART funded three projects, with an average size of $35,000. The program has a bad debt fund of $50,000, capitalized with SBC funds. As of June, 2011, two projects have defaulted and NHEC declined to provide numbers on losses.

Eligibility for the program is based on NHEC bill payment history and requires customers to have excellent payment performance. After projects pass the payment history screening, project energy savings estimates are considered. Applicants obtain a 2-3 page walkthrough audit from NHEC to assess possible implementation measures. Loans made through this program are unsecured, but can result in electricity shut-off in cases of non-payment. If the business sells or closes, the loan can either be paid off or transferred to the new owner.

People's United Energy Efficiency Loan

The Energy Efficiency Loan through People's United Bank offers loans to the commercial sector at a rate of Prime minus 1% (4% floor), and a maximum seven-year term. The loan requires a 20% down payment, and approval criteria are typical of a standard business loan. Since inception in 2006, this program has disbursed approximately $1.8M into the community - stimulating an estimated private sector contribution of $450,000 (assuming all loans originated with 20% down payment). This program has no capped budget, and is has no projected end date.

The People's United program averages 6-12 projects a year, at $45,000 per project; achieving an estimated annual loan funding of $405,000 and stimulating $101,000 of private investment annually.
The primary criterion for loan approval is the ability of the customer to service the debt. People's United also considers the amount of projected savings that will be realized from the project. People's United has certain banking guidelines it must adhere to for continued regulatory approval. As a result, People's does not offer guidance or advice on which energy efficiency project measures applicants seek funding for. The majority of People's applicants use a vendor supplied assessment to back the project, or a 2-3 page utility provided assessment. People's United does not perform any project follow-up, or measurement and verification to assess the success of the adopted measures. Business assets are used as collateral for loan underwriting, and the program currently carries a 0% default rate. The energy efficiency loan program is marketed through New Hampshire People's United branches, and in conjunction with the New Hampshire Business Resource Center.

National Grid Business Loan

The National Grid Business loan was initiated in 2002 with the institution of the CORE programs and is funded through the Systems Benefit Charge. This program is largely dedicated to financing lighting upgrades in businesses, carries terms of 0% for up to two years, and has no cap on the amount of the loan. The average loan size of this program is $2,400, and has funded approximately 123 projects from 2008 to June 2011.

Retail Merchants Association "Giving Power Back"

The "Giving Power Back" efficiency program (GPB) serves the commercial sector state-wide, and has the primary purpose of delivering basic energy evaluations (Phase One audit), and a more comprehensive evaluation (Phase Two). The program is administered by Retail Merchants Association of New Hampshire (RMANH), an organization that has a 55-year history. GPB was initiated in 2009 with $1.3M in RGGI funds to conduct audits and provide partial grant funding for customers to implement energy efficiency projects, and received a second RGGI grant for 2011 – 2012 in the amount of $2M with funding allocated for partial project grants, as well as credit enhancement. GPB also has funds set aside to reduce the cost of the phase two audits (providing 60% funding for 2011-2012), as well as partial grant funding for customers to implement energy efficiency projects. The program offers seminars, printed materials, guidance, and tools to access other local and federal energy incentives. The educational material and audits provided through this program are designed to achieve deeper energy savings projects by putting a large focus on building shell, as well as lighting and controls. RMANH has developed a results-driven approach to auditing, granting funds for a phase two audit only to those customers most likely to move into project implementation.

Success Story: Barons Major Brands

A project from the Retail Merchants Association "*Giving Power Back"* program

With audit coordination from the Jordan Institute

Building Overview:

Building Description: Strip mall retail space
Project Goals: Energy savings, air quality, comfort
Annual Energy Costs: $32,108
Electricity Portion: $24,520
Gas Portion: $7,588

Implemented EE Measures:

- Extensive air sealing & insulation
- Electrical system upgrades
- Mechanical system upgrades

Financial Overview

Total Project Cost: $83,287
Utility Rebates: $13,590 ($3,650 in lighting, $9,940 in insulation)
RMANH/GHGERF Rebate: $17,424
Business Contribution: $52,273
Estimated annual energy savings: $7,880 (25%) – Six year payback

The initial RGGI allocation of $1.3M funded 28 phase one audits at businesses in 15 towns across the state. Thirteen of those businesses moved into the phase two audit and were required to pay 25% of the audit cost, which averages $8,000. Of those phase two audits, five businesses moved to project implementation, yielding a 38% conversion rate. The recent $2M infusion of funds is to be allocated evenly over two years, with targets of performing 50 audits in 2011, 20 of which are targeted to be a level two; and 100 audits in 2012. As of August, 2011, the program has performed approximately 18 phase one audits, and is just ramping up marketing of the phase two program. For the 2011-2012 budget allocation, RMANH will require businesses to pay for 40% of the phase two audit. RMANH has partially funded two projects with grants, and has another two projects approved for financing. The average grant amount for these four projects is approximately $10,000. RMANH has allocated $300,000 to a fund that will be used to condition borrowers for more favorable loan terms at financial institutions; either in the forms of a project level loan loss fund, or through interest rate buy-downs. This structure is relatively new to the program and has not yet been fully designed.

In addition to RMANH's direct marketing and outreach, GPB coordinates with audit programs offered by the Jordan Institute and BEEP to assess projects from their program, as well as Better Buildings and the EEF. Significant coordination on RMANH's part is also conducted to steer implementation phase customers to all available finance programs. The GPB program is scheduled to end in 2013.

Public Service New Hampshire Energy Rewards RFP

The PSNH Energy Rewards RFP program is available to commercial and industrial customers within its service territory. The program issues grant funding for energy efficiency and sustainable energy project implementation. This program has an annual budget that is set by PSNH and has disbursed over $3.2M in funds since inception in 2004. The average annual budget for this program over seven years is $495,000, providing funding for 2-5 projects per year. The program is focused on providing funding to businesses with multiple projects that would not necessarily receive funding on an individual basis. Customers aggregate projects into a larger bundle, to which a total benefit analysis is conducted yielding overall energy savings. PSNH then provides grant funding in the amount necessary to make the aggregate project cost effective to the client.

For 2011, PSNH budgeted $475,000 for the program (a 6.3% decrease over the 2010 budget), and will choose 2-3 projects from five applications. Since inception in 2004, PSNH has budgeted $4.4M to this program, and placed $3.2M in funding. Over this same period, PSNH has set savings targets of 231 million KWh and achieved 257 million KWh saved. On average, this program has funded 60% of total project costs, stimulating $2.1M of energy related investment from the businesses.

PSNH holds an applicant bidder session once a year in which customers submit a proposal documenting the energy project. Program criteria include a minimum customer demand of 350kW annually, and estimate a minimum energy savings of 100,000 KWh per year. Minimum project cost is $200,000, and customers are expected to fund 55-65% of project costs. For project approval, PSNH gives weightings to each application, with 40% weighting going towards how much money the customer is asking for in relation to total project size; 40% towards how much energy the project will save; 10% to non-quantifiable benefits; 7% to system design; and 3% to the technology and comprehensiveness of measures selected. All applications are sent out for review by an engineering company that will perform total cost/benefit analysis.

Pay for Performance

Administered by TRC, the New Hampshire pay for performance program was implemented in 2011 with $5M of RGGI funds. This program is targeted towards existing commercial, industrial, and institutional buildings with a peak demand over 100 kW or 1,000 MMBtu of annual energy use. Projects must define a comprehensive package of measures capable of reducing the existing building energy consumption by 15% or more. The program offers a tiered rebate incentive structure as follows:

- **Incentive #1** - Submittal of complete energy reduction plan prepared by an approved program partner - Contingent on moving forward. Incentive based on $0.10/square foot of conditioned space, capped at $40,000, not to exceed 50% of the facility's annual energy expense. Incentive #1 is designed to defray, but not necessarily cover, the cost of the Energy Reduction Plan development.
- **Incentive #2** - Installation of recommended measures - Incentives are $0.19/kWh saved and $20.00/MMBTU saved - based on the projected level of electricity and natural gas savings resulting from the installation of comprehensive energy-efficiency measures. Incentive #2 is paid upon verification of construction completion.
- **Incentive #3** - Completion of Post-Construction Benchmarking Report - A completed report verifying energy reductions based on one year of post-implementation results. Incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum performance threshold of 15% savings has been achieved. Incentive #3 based on $0.05/kWh saved and $5.00/MMBTU saved (actual verified post-construction savings).

The Pay for Performance program differentiates itself from other New Hampshire programs through the use of qualified partners that develop an energy reduction plan with the applicant. The Energy Reduction Plan includes all components of traditional energy audit plus a financing plan and construction schedule. In addition, projects are required to develop an energy model of the building using an ASHRAE-compliant simulation software program. The partner qualification process involves selecting contractors with that meet program qualification standards, program orientation, building modeling instruction, and instruction on conducting audits with TRC's standardized template. It should be noted that the Pay for

Performance program structure has been successfully offered under the New Jersey Clean Energy Fund Programs for the past 2 years, where 80+ qualified partners developed over 130 energy reduction plans.

Presently, the New Hampshire program has 19 qualified partners, and five projects that are in the first stage of developing the energy reduction plan. TRC is working to collaborate with other finance programs such as the enterprise energy fund to arrange financing for applicants once projects go to implementation. Work is also being done to coordinate utility rebates; however, the utilities have stated that they will only consider offering their rebates in conjunction with the Pay for Performance rebates on a case by case basis. Program outreach and marketing is conducted primarily by the qualified partners and supplemented by TRC.

Commercial Sector Recommendations

The finance programs available to the commercial sector vary widely in terms, criteria for approval, and structure. Subsequently they have been met with varying degrees of success. At the time of this writing, the Better Buildings and Pay for Performance programs are just getting off the ground, and understandably therefore have limited data available to evaluate program uptake. These two programs in particular take significant steps forward in optimizing audit practices, using contractor networks to sell energy efficiency, and partnering with financial institutions to leverage public dollars. Despite the anticipated success of these one-time funded programs, there are significant challenges in driving participation.

Presented below are several recommendations for achieving optimal program uptake and results. Recommendations 10.1. and 10.2. are overarching all-sector recommendations. While acting on recommendation 10.1. would have the greatest positive impact for New Hampshire and help overcome multiple barriers, it may also be the most difficult to implement. Therefore, the recommendations that follow provide more of a manageable step by step roadmap to achieve success with New Hampshire's finance programs.

- **Consolidate finance programs into a single-administrator, coordinated state-wide program**. The most-efficient and cost-effective programs are operated with a single administrator and central structure that acts as an umbrella for each separate sector program – residential, large C&I, small business, and municipal customers.[4] At the core of the program is a revolving loan fund that has four critical components:

    - Seed Capital;
    - Loan Loss Reserve Facility;
    - Funds dedicated to interest rate buy downs; and
    - Funds dedicated for administration costs.

  Residential and commercial loan programs cannot be fully commingled due to several factors including: specific lending laws that protect residential customers, different default experience and therefore risk/reward requirements by lenders, and less expensive transaction costs in large C&I project loans. However, an umbrella structure would allow for some economies of scale for a central loan loss reserve that could serve both commercial and residential loans. From a risk standpoint, the recent financial industry crisis has also made consumer loans less attractive to financial institutions; therefore integrating commercial loans balances the risk factors while

[4] Referencing programs run by NY, MA, MI

increasing the loan pool. The larger the total loan pool, the more attractive it will be to lenders to participate, and the lower the interest rate will be.

A program administrator that is not connected to the utilities directly, but a separate agency or special purpose entity, could be an important piece of this structure. Loan programs that successfully attract large participation have significant complexity that goes beyond what utilities core business is and beyond what they should be expected to manage. A single administrator for the finance programs might also reduce overhead costs, while unifying marketing and outreach and delivering consistent loan terms.

Equally important, the loan processing should be streamlined so that it is quick and painless for both the sales agent (either the program itself, or a contractor) and the customer. In the most-effective cases, loan origination and processing is handled by the financial institution. Depending on whether the loan remains at the financial institution, or is transferred back to the energy program, loan servicing is either handled by the financial institution or a third-party dedicated loan servicer.

- **Adopt "Team" Approach to Unify Finance Programs**. In lieu of a centralized single-administrator finance program, it is crucial to coordinate and unify presently offered programs. Presenting consumers with multiple options can lead to confusion, and lack of motivation to take action. Multiple programs, each with their own overhead and marketing strategy, may be ineffective at reaching the consumer and an inefficient use of the limited funding available. An alternative market development approach is to address consumers with a unified and consistent message, as well as a single source of contact and a unified, coordinated application process. By offering fewer and more coordinated programs, overhead may be reduced, thereby allowing more funding to be used for financing measures. Fewer programs can also facilitate better point of sale practices, enabling the contractor or vendor to more easily direct consumers to the proper program.

  New Hampshire also faces significant challenges because the majority of finance capital available has come from ARRA and RGGI funds that have strict timelines for disbursement. This has resulted in a number of issues that are adversely affecting the entire market.

  - Programs understandably are partially focused on getting money out the door, rather than on long-term market development.
  - Strategies for quick fund disbursement may end up over-incentivizing the market – that is, paying more than necessary to stimulate participation. Multiple program managers state that many applicants presently expect "free money."
  - The quick infusion and disbursement of money through numerous programs may result in customers businesses adopting a "wait and see" attitude in hopes of a program with better terms or more grant funding.
  - Certain programs are oversubscribed as a result of very favorable terms, while others have little program uptake.

  Businesses often require significant time to make financing decisions. There is then a sizeable timeframe required completing the audit process, receiving financing approval, and fully implementing a project. This process can preclude many businesses from applying to a program that will be in existence for only two or three years (or less).

At a minimum, it is recommended that programs evaluate the possibility of offering similar terms and approval criteria, to the extent that flexibility exists within the program structures. Significant energy finance market barriers for New Hampshire's business customers are a lack of relationship with the lending program, and skepticism regarding achievable energy savings.

The disaggregated approach to commercial finance that New Hampshire has taken (with multiple programs, multiple administrators, and multiple terms) appears to be exacerbating these barriers.

Adopting a "team" approach with more unified messaging, terms, and outreach could gain trust, buy-in, and ultimately greater uptake of the financing funds available.

- **Standardize Audit Processes and Requirements.** In the absence of a statewide auditor certification standard, clear definitions for audit terms such as "comprehensive" and "level II," as well as uniform audit requirements across programs, there cannot be a level field for assessing effective use of funds, or successful projects across programs. Independently obtained audits that businesses submit with project applications are characterized by program managers as erratic and of inconsistent quality. Further, many audit programs do not collect conversion rate data (audits that move into the next phase of implementation), or coordinate measurement and verification of implemented measures. Without this type of data, it is difficult to assess the effectiveness of the audit program. Funding audits that do not result in implementation is not money well spent.

  The Pay for Performance program is taking significant steps forward by providing templates for audit format, and attempting to standardize audits within the program. Successful state-wide programs in Connecticut and Michigan use a standardized eligible measures list that is coordinated with available financing for each measure. Michigan's program requires all audits to be performed by a qualified auditor that has either BPI certification or HERS with combined testing certificate. One method for increasing the effectiveness of funding used for audits is to move towards standard auditing practices and state-wide certification standards for auditors.

- **Examine finance program design and outreach with regard to sector needs.** Program managers from People's United and the NHEC have stated that many customers reach the final stages of the application and pull out, or are not eligible to begin the application process. The NHEC requires customers to have an excellent bill payment history for project approval. Unfortunately, customers in their service territory who may truly benefit from the program are unable to qualify – and other entities that do qualify end up choosing to self-finance. While the self-financing is not a bad thing in and of itself, a main objective of a finance program is to enable a customer to implement much deeper and more comprehensive energy savings measures than could be done on their own. Even companies with revenues in the billions of dollars such as Johnson & Johnson hire energy service companies to assess, finance, implement and manage a portion of their energy upgrades. A fundamental reason for this is to achieve goals, while still meeting a corporate bottom-line. The fact that many New Hampshire businesses are choosing to self-finance, especially in today's economic climate, raises the question as to how comprehensive the implementation measures are, and calls back into play the fact that many customers are skeptical of the idea that implemented measures will actually yield projected savings. The tendency to self-finance could be pointing to a greater need for outreach, education, and effective presentation of projected energy savings data. This issue is further highlighted in that aside from the Enterprise Energy Fund which is oversubscribed, there appears to be a shortage of financing programs actually resulting in efficiency investment by small and medium sized businesses across New Hampshire. National Grid's 0% interest loan program has extremely limited reach, serving 6% of New Hampshire's retail customers (with limited repayment period options). Better

Buildings is, by design, currently offered in just three communities within the state.

A gap exists between what current programs can offer both within loan terms and geographic reach. The Better Buildings program will provide invaluable information that will further inform commercial (as well as residential) sector needs and barriers. A comprehensive look at commercial sector financing needs across the state is recommended, including evaluating the possibility of tailoring program terms to meet various market segments' needs.

Current outreach and education methods are helpful, but not sufficient. The lack of coordination and consistency in messaging is confusing and it is unclear where to go for the most complete and up to date information on financing programs. Although anecdotal, the study team found it challenging to find knowledgeable individuals at multiple utility programs through the customer service desk, and requests for information often concluded with being directed towards a website. Calls to local branches of a lending bank did not lead to bank employees with familiarity with the current lending program.

- **Address Available Finance Capital Levels and Sustainability of Capital Post-ARRA and RGGI Funding.** The payments flowing in from the two RLF programs are projected to be approximately $1.5M annually. Combined with annual budgets and typical financing amounts of other programs, New Hampshire's commercial sector is projected to have approximately $2.6M of finance capital available on an annual basis. New Hampshire has proven there is a significant demand in the commercial sector if the finance capital is available and programs are accessible.

  In general, the commercial sector offers the largest opportunities for energy reduction savings. It is recommended that a priority be placed on increasing the commercial loan offerings available to meet and drive demand. There is no one "best practice" loan program to create sustainable capital levels. Three paths are recommended – the first for immediate implementation and the latter two for consideration further along the spectrum of options for New Hampshire. It is important to emphasize that a small business loan program will be most successful when it emanates from first a comprehensive audit being performed. The contractor either directly or indirectly involved with that audit can become a sales agent for the loan program. This has proven significantly more successful than relying on a small business to approach a variety of different programs on their own and attempt to "shop the best deal" from a changing array of programs.

  - *Utility-provided loan programs*: Examples of these are in the states of VT, CT, MA, to name just a few. In Connecticut, the utilities provide the source of funds directly from shareholder capital, and the loan repayments are put onto the utility bill. The terms are either two to three years, depending on the utility, and the interest rate to the customer is 0%. (Loan amounts can be up to $100k, but are generally in the $5-20k range.) Rebates are heavy (40-70% of the cost of the measure), and payback of the loan is set to be within the term of the loan. For the Connecticut program, given how attractive the payback is, closure after an audit to a project being financed is very high – 80% in 2010. These programs used to be considered primarily lighting programs, but they are increasingly moving to include more comprehensive measures, with 25% of the 2010 projects financed (1,400 total) considered to be fully comprehensive.

    Effective in August of 2010, New Hampshire passed RSA 374:61 which created an on-bill financing option for owners and tenants of business properties (as well as residential, public and nonprofit properties). Though utilities cannot provide financing through its rate base, it can apportion SBC funds or team with FI's to provide the capital for a commercially focused on-bill financing program. It should be noted that legislation currently limits the amount of financing through RSA 374:61 at $5M, however, combined with the ease and transferability of on-bill financing, $5M could significantly stimulate market growth in the small business and tenant occupied segments.

- *State-wide commercial LLR structure*: emerging is the concept that small businesses can participate in a similar (but not exactly the same, due to Fair Lending Laws) revolving loan portfolio which uses a loan loss reserve to attract outside lenders at lower interest rates. Currently the Colorado Green Credit Reserve is the first to have instituted such a program. Three large counties in Washington State are also well into development of this program with a maximum individual loan of $50k. After the initial launch of the highly successful Michigan Saves program in 2010, MI is now offering this program to the commercial.

  As the loan loss reserve concept was originally conceived as a "portfolio risk technique" to spread the credit exposure to a lending institution to a *portfolio* (rather than any one loan), it has been conventional wisdom that this would be best applied to consumer loans at maximum $20k each. The lending institution still holds the credit risk of 5-30% of any individual loan, dependent on the program, but the majority of the risk is spread broadly and charged against the loan loss reserve. Consumer loan default rates have been very low, i.e. <2%, making a small loan loss reserve sufficient. Originally it was thought this small loss reserve would be insufficient for larger commercial loans. However, small business energy loans have proven to also display very low defaults <1% in many states. Partly for this reason, DOE has encouraged recipients of ARRA funds to consider using this same structure for small commercial loans with the higher maximum of $50k per loan. This is an interesting – albeit not yet well-proven concept – that New Hampshire financial institutions may well find attractive.

  In the residential sector, a pathway for New Hampshire to move towards is a state-wide loan loss reserve structure based on forging relationships with financial institutions and demonstrating the value proposition of energy efficiency retrofit financing (described in section 10.3). If that is successful, it is recommended that New Hampshire also attempt to extend this concept to the small business community. This structure could to serve as a vehicle for the BB program once funding ends in 2013.

- *Commercial property assessed clean energy (PACE)*: PACE is an innovation in which a local government provides funding for building energy improvements (both efficiency and renewables) and collects payment through an assessment on the property tax bill. If the property is sold, the repayment obligation transfers to the new owner until it is paid off. The long term of repayment, up to 20 years, allows projects to be funded on a cash-flow positive basis. This is typically not possible with short-term consumer financing unless there are substantial subsidies.

  New Hampshire enacted PACE legislation in late June 2010. There are two distinctive features of New Hampshire's PACE legislation:

  - Assessments may be applied to the property tax or to other municipal service bills, such as water or garbage. This flexibility allows for better access to rental markets, where split incentives, in which the party incurring the cost may not also receive the benefit, are a major barrier to energy efficiency investments

Examples include a landlord who owns a building but does not pay the utility costs of the tenants.

- When the assessment is made, a lien is created, but not recorded. A municipality may place a lien on the property for unpaid assessments only (including penalties and interest), with no acceleration.

In the commercial sector, PACE programs are being developed and deployed in some states, although several obstacles still remain. The Federal Housing Finance Agency (FHFA) has no jurisdiction in this sector, as Fannie Mae and Freddie Mac do not purchase commercial mortgages. However, the Office of the Controller of the Currency (OCC), which regulates national banks, has also stated its opposition to senior liens. In addition, because commercial mortgages routinely contain clauses that require consent of senior lien holders before a junior lien may be placed, many of the same issues arise as in the residential market regarding an existing mortgage holder's willingness to allow a property owner to take on additional debt.

Many commercial properties are owned by limited liability companies (LLC's), which are constructed as stand-alone bankruptcy-remote investment vehicles. For this reason, they are almost always unrated and this limits their ability to take on debt. PACE financing provides an option for off-balance sheet financing that can address deep retrofit projects in a way that almost no alternative method can.

- **Consider Innovative Program Structures to Address Underserved Market Segments.** The value of a traditional energy service company (ESCO) for delivering energy efficiency measures to companies with large buildings and heavy electric loads is by now well established. Upon contracting, and ESCO will develop, install, and finance projects that improve the energy efficiency or reduce maintenance costs of a building. Typically, building owners will enter into a performance contract whereby the projected energy savings are guaranteed by the ESCO, ensuring that financing commitments can be met. In these scenarios, the ESCO is assuming all project risk, and therefore seeks projects that will result in high energy savings, minimized risk, and maximized return on investment. This business structure's order of priorities leaves much of the potential market un- or underserved. That is, traditional ESCOs cannot cost-effectively address projects that: (1) are on a scale too small to justify the necessary upfront analysis and contracting costs; or (2) projects that present a high risk in meeting a threshold rate of return. While ESCO's and performance contracting certainly has its place in the New Hampshire market (a full recommendation is given in section 10.4.), the size and scale of New Hampshire's commercial sector make the traditional ESCO a non-viable choice.

  The concept of a public purpose energy services company (PPESCO) is currently being developed separately by the Michigan Clean Energy Coalition and the Vermont Energy Investment Corporation. At its core, a PPESCO is structured to fill the gap between the typical ESCO project size ($500k+) and rate of return (30%+) by addressing smaller projects and requiring only minimal rates of return (5-12%). In doing so, the PPESCO can address entire markets that are not touched by traditional ESCOs, such as public housing, small businesses, and eventually the residential sector. As such concepts become further refined and tested in the market, New Hampshire could implement its own programs to provide much-needed support to these customer types.

10.5. Residential Sector Finance Programs

New Hampshire currently offers five financing programs to the residential sector that are relatively small in size both compared to other New Hampshire sectors' programs, and to residential programs within other states. The four electric utilities each offer a Home Performance with ENERGY STAR (HPwES) residential EE loan program that is tied into the utility CORE programming. These utility programs offer a combined total of $700,000 in capital. The fifth program is offered through Better Buildings in the communities of Nashua, Plymouth, and Berlin, and has a total of $6.3M of shared capital available between the residential and commercial sectors. Table 10.3. provides an overview of these programs and their relevant terms.

Table 10.3. Current Residential Finance Programs

Program	Source	Interest Rate	Max Loan Term[1] (years)	Finance Mechanism	Total Funding Budget	Completed Projects: aggregate	Dollar Volume to Date
NH Better Buildings	ARRA	1%[2]	1 – 10	Loan	$7M[3]	3	$12,770
NHEC Residential EE Loan	RGGI	0%	1 – 7	RLF	$200,000	23	$68,000
PSNH Residential EE Loan	RGGI	0%	4 – 6	RLF	$500,000	112	$380,000
Unitil Residential EE Loan	RGGI/ ARRA	0%	2 – 7	RLF	$295,000	41	$140,000
National Grid Residential EE Loan	RGGI	0%	2	RLF	$3,000	3	$2,400
				Totals	**$8M**	**182**	**$526,800**

1 – Program guidelines dictate maximum repayment terms by loan amount
2 – Introductory rate
3 – Program has provisionally allocated $3.5M to the residential sector which can be leveraged through financial institutions to generate $7M in loans through the LLR structure.

New Hampshire Better Buildings - a New Hampshire Beacon Communities Project

The Better Buildings program was introduced in section 10.2 above. While the previously described program design and structure remains the same (including the partnering FI network, a residential LLR, and IRB feature), residential loans and incentives differ from commercial. Residential loans are available up to $20,000, with repayment terms of up to 5 years for loans of $7,500 and under, and up to 10 years for loans over $7,500. These loans are offered at 1% through the IRB mechanism, which is discussed further below. A tiered residential rebate structure is in place, and is as follows:

- $250 for the audit;
- $250 for implementing projects with 15-19% energy savings;
- $500 for implementing projects with 20-29% energy savings; and
- $750 for implementing projects with 30% or more energy savings.

BB anticipates the average residential project cost to be between $5,000 and $7,500, and funds are currently available on a first come, first serve basis to the various markets and sectors the BB seeks to reach.

The primary criterion for approval is a *minimum* projected 15% energy savings per household, with an average BB program goal of much a much larger savings (30%). BB requires a comprehensive building evaluation that proposes a comprehensive range of energy savings measures. Customers may need to provide upfront capital to pay for audit costs, minus rebates. These costs may be then rolled into a project loan, essentially making the BB a no upfront cost program.

The IRB has been structured to provide consumers with a 1% loan, regardless of the term (repayment period). The BB program is paying approximately $2,000 per loan to pay for this buy-down from a market rate of 8% down to 1%. Similar to the commercial sector, the residential program has a dedicated LLR with a 50% reserve ratio. BB has provisionally allocated $3.5M of the programmatic fund to the residential sector, which can be leveraged through the LLR structure to provide a maximum $7M in loans. It should be noted that some portion of the $3.5M will be used to fund rebates and the interest rate buy downs, therefore the maximum leveraged amount of capital will be less than $7M.

While projects must meet BB's energy savings criteria for approval, the financial institutions also have individual minimum credit score requirements. Financial institutions may also consider the projected energy savings associated with each project, but are not required to do so. Because this program is so new, with many programmatic unknowns, there are no projections as to how much financial institution capital the LLR and IRB will enable to program to leverage. As of August, 2011, 80 residential audits have been completed, and 3 projects have been closed with an average loan amount of $4,250 and a 5 year average repayment term. BB has established annual project goals across the three communities to complete 185 projects in year one, 274 projects in year two, and 349 projects in year three, for a total of 808 residential projects. Similar to commercial, year one goals will be rolled into following years because year one was spent setting up the program. This translates to goals of 400 projects a year for the next two years.

New Hampshire Electric Home Performance with ENERGY STAR® Energy Efficiency Loan Program

The Home Performance with ENERGY STAR (HPwES) energy efficiency (EE) loan program offered through the New Hampshire Electric Coop (NHEC) was implemented as a revolving loan fund in May, 2010 with $200,000, and offered to residential customers of the NHEC. This program offers on-bill financed loans up to $7,500 at 0% for terms of 1-7 years. NHEC's HPwES EE loan program is expected to continue until funds are exhausted.

As of May, 2011, this program has disbursed $68,000 in funding for 23 projects, with an average per project funding of $3,000. It is estimated that once the entire $200,000 in funding has been disbursed, the RLF will yield $67,000 annually through loan repayments, allowing for approximately 22 projects to be funded per year.

For loans less than $2,000, approval is contingent upon NHEC payment history. Loans over $2,000 require a credit check, for which there is no stated minimum required score. While this program has not recorded any defaults, any loses will be paid out of the principle loan fund. In the case of customer default, NHEC states that customer electricity will not be disconnected. This program is marketed and offered in conjunction with the core HPwES program.

Public Service of New Hampshire Home Performance with ENERGY STAR Energy Efficiency Loan Program

The HPwES EE loan program offered through Public Service of New Hampshire (PSNH) was implemented as a revolving loan fund in May of 2010 and capitalized with $500,000. This program is offered to residential customers of PSNH through on-bill financing of loans up to $7,500 at 0% interest for up to six years. PSNH's HPwES EE loan program is expected to continue until funds are exhausted.

In the one year since inception (as of May, 2011), this program has disbursed $380,000 in funds to 112 projects, resulting in an average project size of $3,400. Loans to cover heating system projects averaged

$6,000, while envelope sealing and insulation loans averaged approximately $3,000. According to PSNH, approximately 25% of all HPwES projects are requesting financing, and they expect this percentage to increase. It is estimated in this study that the remaining funds will enable financing of an additional 35 projects (at an average $3,400 size). Once the original funds have been disbursed, it is estimated that the revolving loan fund will yield $100,000 annually through loan repayments, enabling funding for approximately 30 projects per year.

The criteria for loan approval through this program are a 680 or higher FICO score, as well as 12 months of consistent bill payment. The program approved an average of 88% of applications during 2010 and 2011. While there have been no defaults in this program, any customer default can result in electricity service disconnection, which is not allowed in several other states and may explain the reason for the utility accepting a higher percentage of loan applicants than is typical (88% versus 76% in other states. Any losses will be paid directly from the RLF. This program is marketed and offered through the HPwES CORE program.

Unitil Home Performance with ENERGY STAR Energy Efficiency Loan Program

Unitil's residential energy efficiency loan program is structured as a revolving loan fund that was capitalized with $295,000 and offered to the public in early 2010. This program is offered to Unitil's residential customers through on-bill financing at 0% with loans up to $7,500 and maximum repayment term of seven years.

As of June 2011, this program has disbursed $140,000 in funds to 41 projects, translating to an average loan size of $3,400. Unitil received $79,000 in ARRA funds which were used to finance 13 heating system projects at an average cost of $6,000. Those loan repayments from those projects will flow into the same RLF. The remaining $60,000 financed 28 weatherization projects with an average cost of $2,166. Once the primary funds are disbursed, it is estimated that Unitil will receive approximately $74,000 annually in loan repayments, enabling approximately a further 35 projects to be financed annually.

For project approval, Unitil looks at electric bill repayment history. No credit checked is conducted on applications. Loans are unsecured, and Unitil will not shut off power in cases of non-payment.

Residential Sector Recommendations

Despite the increased participation of the utility based EE loan programs and potential success of BB, these five programs leave the majority of the residential sector underserved or un-served. A primary issue with New Hampshire's residential energy financing is a lack of programs with adequate and sustainable funding. Previously highlighted in the commercial sector, the residential sector also suffers from the same lack of market demand for energy efficiency products and financing. The utility's core programs have taken significant steps in building this market and created an environment where it is necessary to bolster current programs with increased and coordinated outreach, education, and access to sustainable finance capital at favorable lending terms. Again, our recommendations begin with reiterating recommendation 10.1 and 10.2 above: implementing a single state-wide coordinated finance program or, at a minimum, adopting a team approach to coordinate existing programs. An additional eight recommendations follow which can be integrated into a centralized program structure, or addressed on their own as a manageable roadmap.

- **Re-examine program structure and risk assessment.** A perception seems to exist in New Hampshire that offering energy finance products to the residential sector carries significant risk. Multiple program managers at New Hampshire utilities have stated that loans are not offered to the residential sector specifically because of the high risk involved. However, energy loans have been shown to have significantly lower default rates than the 3.5% of typical unsecured consumer loans. The following are profiles from some of the other programs successfully making consumer energy loans:

- Massachusetts HEAT Loan
  - Over $62M in unsecured loans to 8000+ households
  - Average loan size of $8,000
  - Minimum credit score for most FI's 620
  - 0.79% default rate
- Pennsylvania Keystone HELP
  - 7996 unsecured loans totaling $52.4M
  - 1.45% default rate
- Manitoba Hydro
  - >25,000 unsecured loans totaling >$100 M
  - <1% default rate

The above data demonstrate that the perception that energy loans carry an unacceptable level of risk is incorrect. Further, there are methods to structure a program to effectively mitigate risk. For example, NYSERDA's Green Jobs, Green New York (GJGNY) was launched in 2010 with a structure that tiers underwriting standards to most effectively reach a significant percentage of the residential population:

- Unsecured residential loans with terms of 5, 10 or 15 years
- Two tiers of underwriting standards
  - Tier One: credit score of 640 or higher
  - Tier Two: uses utility and mortgage payment history
  - All loans current as of May 2011

The program was also structured to offer extended loan terms to 15 years, enabling homeowners to make lower monthly payments, effectively overcoming a significant market barrier. With these characteristics, the GNGNY program completed 6,123 retrofits in 2010 at an average cost of $7,700 and an average annual savings of $660 for the homeowner.

It is worth again mentioning RSA 374:61 which was first referenced above in the commercial sector recommendations, and provides an on-bill financing option for owner and tenant occupied residences. Though New Hampshire utilities have expressed an aversion to providing financing to the residential sector because of perceived risk, a new program structure utilizing the on-bill option, combined with the recommended risk reassessment could provide an effective solution for financing energy efficiency improvements in multifamily housing as well as residential financing beyond the core programs. As mentioned above, finance capital must come from either SBC funds, or partnerships with FIs, and aggregate total loans may not exceed $5M.

- **Implement demand stimulation mechanism and allow more time for programs to become effective.** One of the largest hurdles programs such as Better Buildings faces may be the short timeframe in place for fund disbursement. While residential customers may not be as slow to move as commercial, the sector still requires significant outreach and education to understand energy efficiency, the financing options, and the savings that are associated with comprehensive projects. Trust and credibility are crucially important characteristics of a finance program, and are difficult to effectively nurture in a one to two year timeframe. As mentioned above, New Hampshire's market for energy efficiency retrofits is still in its infancy relative to other states. Only time and effective outreach will result in demand levels sufficient enough to ensure financial program success.

While the utility programs do not have a set end date, they have only been offered for slightly over a year and a half. Program uptake is starting to increase as education, marketing, and outreach ramps up and cycles through the communities. As is the case with all sectors, it is believed that more marketing and outreach could be more effective than it currently is. Specifically, there is still a great deal of skepticism that energy savings will actually materialize. To address this issue, work is required to fully understand the issues facing the client, and to then develop messaging that resonates with the New Hampshire population. In addition to honing this messaging, it is recommended that New Hampshire take the following step to jump-start market demand for energy efficiency retrofits:

- **Adopt a contractor-driven sales approach.** One of the major barriers to homeowners taking out loans has been the lack of a streamlined process and a successful sales agent to educate and stimulate market demand. In recent years, many states have significantly improved their participation rates by enlisting either a pre-approved set of contractors, or using "energy advocates" to be a continual resource to the customer throughout the loan application process. Turnaround times of 24-48 hours for loan application approvals are now common. But encouraging a customer to invest in a project that would not otherwise be implemented through the enticement of low-cost financing requires a full initial sale through loan issuance. In states such as Connecticut and Michigan, the loan programs have empowered a group of certified vendors to take on the sales role that would otherwise be done by a loan officer at a bank. Extensive training programs on sales techniques, as well as the requirements of Truth-in-Lending Laws, have enabled the contractors in the program to take significantly greater initiative than what was previously a common practice of simply leaving behind a loan application or brochure.

  For example, in Connecticut the utilities contract with select (currently 20) vendors to perform the home energy audits. In Michigan, the Michigan Saves program has successfully built a contractor sales network that not only effectively stimulates market demand, a 1.99% contractor fee on loans generated enables the operations of the program to be sustained without the use of public funds. Both programs are heavily regulated with significant quality assurance and control to ensure no unscrupulous sales tactics are used and the quality of the work is exemplary. In its first year of operation, Michigan Saves retrofitted over 1,000 homes, highlighting the program's effectiveness. Michigan Saves publically publishes their implementation guide, as well as approved measures and quality control practices specifically to facilitate the replication of this program.[5] Other states have implemented various versions on this same theme of empowering a carefully-selected group of contractors to increase sales of follow-on measures, some of which are financed.

  Major obstacles identified in this report are a lack of market demand, and inability of current marketing and outreach efforts to convey the savings that would be generated from energy efficiency retrofits. The clear benefit of implementing a contractor-driven sales program in New Hampshire is the use of local contractors who know their local market and clientele, and inherently understand how to message products to appeal to individual clients. It is envisioned that this type of program, or variation of, can have significant effect in New Hampshire by both building the market for energy efficiency retrofits through effective marketing, as well as greatly increasing the appeal of financing through a streamlined and assisted process. Before this could happen, however, New Hampshire would have to numerous steps including implementing minimum auditor qualifications (such as BPI

[5] http://www.michigansaves.org/Portals/0/Contractors/MISAVES_ImplementationGuide.pdf

certification); standardizing audit guidelines; as well as standardizing lists of eligible implementation measures.

- **Continue Program Coordination Efforts**. The BB and utility programs indicate that they seek to coordinate moving forward. It is essential that this coordination be successful to avoid competition between programs and to reach optimal program uptake. Increased consistency across utility programs would be helpful as well.

  PSNH's EE loan approval criteria are stricter than those of NHEC and Unitil, both of which are operating with a zero default rate. This suggests some realignment potential may exist across the utilities. Ideally, projects generated through the state-run programs (BB, EEF, Pay for Performance) would have access to utility sponsored rebates, and conversely utility originated projects would offer access to the enhanced financing available through the state-run programs. Financing terms and underwriting across utility programs should be identical since they are all offered through same core programs.

- **Increase Funding to Sufficient and Sustainable Levels***.* Concurrent with an ambitious timeframe to further develop markets in New Hampshire, the lack of available capital is a significant issue. BB offers an important opportunity for providing significant residential loan funds, yet the amount is undetermined and only available for two years. Currently the three utility revolving loan funds are projected to have $241,000 available on an annual basis, as they are not financially-leveraged programs able to attract continual new sources of outside capital. This is sufficient to retrofit between 30 and 60 homes, depending on the size of the loan.

  Comparing relative numbers of housing units per state, the GJGNY program financed the retrofitting of .08% of the housing stock in 2010, while the New Hampshire programs are providing sufficient capital to finance retrofitting of .006% of New Hampshire's housing stock. Though these numbers seem extremely small, they represent an order of magnitude difference of 13 times (i.e. if New Hampshire retrofitted 1,000 homes, GJGNY would have retrofitted 13,000). To achieve the higher level of penetration cited in the GJGNY program, New Hampshire must coordinate programs, and increase effectiveness and scope of outreach and education programs, while broadening the access to financial capital across the state. Presented below are several avenues New Hampshire should pursue to increase available finance capital to the residential sector, while supporting market development.

  - **Broaden scope of the Better Buildings program and reduce LLR ratio requirement***.* BB offers an example for the rest of New Hampshire's finance programs to emulate in that it has established a loan loss reserve by which to attract a multiple of the original funding. At the current 2:1 ratio, if BB allocates all $3.5M available to a LLR (as noted above, the figure will be reduced after funds are allocated to rebates and interest rate buy downs), $7M in loans can be generated. Ideally, in a state-wide program the LLR requirement would be set at a leverage ratio that is more common for new programs – starting at 5:1, and moving to 10:1. Revolving Loan Pools with Loan Loss Reserves are a relatively new concept within the past two years, and several states are in the process of creating them and building more attractive terms with financial institutions as the lenders become more comfortable with the low default rates. As an example, programs in the states of CA, CO, WI, WA, PA and MI have all established LLR structured programs with a 5% reserve requirement, leveraging at a 20:1 ratio. Additionally, several large municipalities which received large EEGBC (Block Grant) funds created leveraged programs which they intend to roll out to state-wide programs.

The total programmatic pool available to support the Better Buildings LLR is $6M, though the actual figure will be less once rebates and incentives have been paid, and commercial loans made that are not supported by the LLR structure. This LLR is dedicated to only 3 counties within New Hampshire, significantly larger than similar loan loss reserve programs that support multi-county and state-wide efforts. With a well-structured LLR ratio at 5%, as demonstrated by other states, the New Hampshire BB program could support $80 - $100M in loans with a LLR at $4-5M. It is important to stress that even with this amount of capital available, it would be ineffective without corresponding stimulation of market demand.

To secure FI capital in the range described above, it may be necessary to engage multiple institutions including credit unions, community development finance organizations, and traditional banks that operate locally and on a national scale. Critical to their participation is creating sufficient volume to generate loans, necessitating the LLR to be offered in conjunction with a program offered state-wide.

- **Use qualified energy conservation bonds to engage private capital and build financial institution relationships.** New Hampshire is faced with the challenge of meeting aggressive goals while simultaneously developing program structures in an energy efficiency and sustainable energy financing market that is fairly nascent. In comparison, states such as Massachusetts, New York, and Michigan had structures already in place to channel time-frame sensitive ARRA and RGGI funds to maximize the benefits of this funding. Namely, these states already had a centralized and coordinated program structure, as well as a much more mature market for energy efficiency retrofits than presently exists in New Hampshire. Time had also been previously devoted to leveraging private funds, and negotiating favorable leverage ratios. To reach a 20:1 leverage ratio, the Michigan Saves program spent over a year engaging credit unions across the state, providing in-depth examples of energy finance loan risk profiles and structuring the partnerships.

  The Better Buildings program is offered to only three municipalities and therefore does not have the ability to generate significant demand as a

Loan Loss Reserve Comparisons

New Hampshire
- $5M+ LLR (3 counties)
- 50% reserve requirement
- $10+M in loans supported

Washington
- $1M LLR (4 counties)
- 10% reserve requirement (5% in certain counties)
- $11M in loans supported

Michigan
- $3.2M LLR (state-wide)
- 5% reserve requirement
- $60M+ in loans supported

Pennsylvania
- $1.2M LLR (state-wide)
- 5% reserve requirement
- $24M in loans supported

Wisconsin
- $2.5M LLR (2 counties)
- 5% reserve requirement
- $50M in loans supported

Colorado
- $2M LLR (2 counties)
- 5% reserve requirement
- $40M in loans supported

California
- $1M LLR (1 county)
- 5% reserve requirement
- $20M in loans supported

result of its limited community focus. This presents a large challenge when considering the fact that program funding must be disbursed within a short timeframe to meet ARRA guidelines. In order to expand the scope of the program, as well as maximizing funds available, it will be critical to develop deep relationships with several financial institutions. In order to achieve these goals, it is recommended that New Hampshire utilize its allocation of Qualified Energy Conservation Bonds (QECBs) to provide the financial backbone necessary to stimulate demand and build a state-wide partnering financial network. Using QECBs in the structure described below also has the benefit of leveraging the bond issuance and putting it to optimal use.

QECB Background

A Qualified Energy Conservation Bond (QECB) is a debt instrument that enables qualified state, tribal and local government issuers to borrow money to fund qualified energy conservation projects. First established by the Energy Improvement and Extension Act of 2008, QECB issuance totaled $3.2 billion through the American Recovery and Reinvestment Act of 2009. A QECB is among the lowest-cost public financing tools because the U.S. Department of Treasury subsidizes the issuer's borrowing costs. Issuers may choose between structuring QECBs as tax credit bonds (bond investors receive federal tax credits in lieu of—or in addition to—interest payments) or as direct subsidy bonds (bond issuers receive cash rebates from the Treasury to subsidize their interest payments). Both tax credit and direct payment bonds subsidize borrowing costs, but most QECBs are being issued as direct subsidy bonds due to lack of investor appetite for tax credit bonds. QECB regulations stipulate that a maximum of 30 percent of QECB allocations may be used for private business activity or private loan purposes. However, by designating an energy efficiency loan program as a green community program, issuers establish its public purpose, which eliminates the 30 percent restriction, and allows them to channel up to 100 percent of bond proceeds to financing programs for upgrading the energy performance of privately owned homes and businesses. This structure was recently established by the St. Louis County Saves program in Missouri to fund a residential energy efficiency retrofit program, and was topic of a policy brief issued by the Lawrence Berkeley National Laboratories.[3]

New Hampshire Recommendations

New Hampshire was allocated $13.6 million in QECBs: $3.6M of which went to the state and the other $10M distributed to the five largest counties by population. As of June 2011, Manchester County had issued their allocation, while other four counties (Hillsborough, Merrimack, Rockingham and Strafford) had not. All counties have the option of re-allocating their QECB portion back to the state. The mostly prominent reasons for counties to leave their allocation unused are 1) the fixed cost associated with the bonding procedure; and 2) a lack of focused projects to use the bonds for. With the relative small allocations to New Hampshire's communities, the bonding costs alone may make the process non-viable. By working with the counties to allocate any remaining QECBs back to the state, the aggregated QECB issuance would prove much more cost effective, and the state would also have the advantage of optimizing the channel for project implementation through a coordinated and leveraged state-wide approach. Upon successful implementation of this program, it could be integrated into finance offerings for the commercial sector as well.

[3] http://eetd.lbl.gov/ea/emp/reports/ee-policybrief_062011.pdf

To build and encourage participation in a partnering financial institution network, it is recommended that the QECB's be used to establish a green community program that is structured with a shared-risk model. Essentially, loans will be originated through the partnering financial network, and QECB's will then be issued to purchase a designated portion of loans from the banks. The basic program design is outlined below:

- Loans will be originated and financed through the partnering FI network
- When a pre-designated amount of loans are originated, QECBs will be issued to purchase a certain portion of loans (e.g., 50%) from the FIs.
- QECB terms partially cover the cost of issuance and program administration costs, as well as a reasonable expectation of loan defaults.

By combining the issuance with loans originated through the partnering FI network, the following benefits will be realized:

- QECBs will help launch FI loan issuance through the shared-risk model.
- The banks are able to remove a portion or all of the loans (depending on program design) from their balance sheet and are thereby protected from future credit risks. At the same time, relationships are being developed with new clients, as well as a greater familiarity with energy efficiency finance products.
- The QECB capital will be leveraged through the shared-risk model. Because QECB's can be issued with interest rate terms to cover possible defaults, financial institution will not require any further mechanism such as LLR to cover loans. Thus, $10M in QECB's can be used to support $20M of loans through the FI partnership with a 50% shared risk model.
- Using the FI partners to handle loan origination provides an effective solution for QECBs' inability to cover fees associated with loan origination. This structure gives QECBs the ability to finance zero upfront-cost loans.
- By using QECBs' issuance to purchase loan bundles from FIs, rather than funding individual projects, overall transaction costs will be lowered.
- By purchasing a portion of loans from the FI with QECB funds, consumers will receive a lower overall interest rate through blending of the FI market interest rate, and the QECB interest rate.

It should be noted that additional costs may be incurred through the QECB issuance, and New Hampshire would have to devote resources to identify all costs and other specific needs of a New Hampshire QECB issuance.

To initiate this process, the program may have to be designed with a dollar to dollar lending ratio – i.e. QECB's will be used to purchase 100% of loans from the partnering banks, rather than a preferred 50% ratio. A 100% ratio would fully isolate banks from lending risk, while still enabling them to gain comfort with the loan products, as well as establishing any loan default data. Once a familiarity and comfort is reached, a more favorable structure can be implemented. With the cooperation of New Hampshire State Treasurers, BB could integrate the QECB funded green community program into the program design, aiding the process of expanding its geographic reach. This process will also greatly assist in lowering the 50% LLR reserve requirement presently in place through Better Buildings. While the actual funds in BB's loan loss reserve will expire as a result of the 2013 ARRA deadline, the QECB funds have no expiration. QECB funds are not a replacement for a LLR (once the bond is issued, it cannot be used again), the funding could provide a transition funding mechanism enabling

Better Buildings to continue operations past the ARRA deadline and possibly locate additional funding for a new LLR.

- **Re-examine PACE for the residential sector:** Just days after New Hampshire enacted its PACE legislation (July 2010), the FHFA issued a statement concerning the senior lien status associated with most PACE programs.[4] The letter instructed Fannie Mae and Freddie Mac to use more restrictive mortgage underwriting standards for all borrowers in jurisdictions with PACE programs, and stated that property owners that participate in senior-lien residential PACE programs will violate standard mortgage provisions and could trigger a mortgage default. As a result of the FHFA statement, almost every PACE program in the country has suspended residential applications until further notice, and the many programs in early stages of development, including New Hampshire, put all plans for rollout on hold until the situation was resolved. Commercial programs have continued and indeed new programs have begun since the FHFA letter, most recently in Michigan in December 2010.

  In spite of this situation, the future status of residential PACE is by no means clear. Possible resolutions to the current impasse include:

  - National legislation to clarify PACE lien position – the FHFA letter raises Tenth Amendment states' rights issues
  - Court order confirming or denying FHFA's claims – there are eight separate lawsuits pending against FHFA
  - Junior-lien PACE program. FHFA has indicated support for both the Efficiency Maine PACE program and also Vermont's pending PACE structure (effective January 1, 2012)

  In July 2011, a bill to address FHFA's concerns was introduced in the House with bipartisan support. The ''PACE Assessment Protection Act of 2011'' would set minimum requirements for PACE programs, including:

  - Homeowner must have at least 15% positive equity
  - Projects capped at 10% of home value
  - Homeowner must have solid property tax payment history
  - PACE lien does not accelerate in event of default

  At this writing, it appears unlikely that the measure will have sufficient support to advance to the Senate. Nevertheless, the proposed parameters do serve to provide a starting point for a continuing conversation about the relative benefits and perceived risks of residential PACE programs.

  New Hampshire's unusual lien treatment, in which a lien is not recorded unless the assessment is in arrears, does not exclude it from the effects of FHFA's pronouncements. Because the lien, if put in place, would take precedence over mortgages, FHFA will not allow Fannie Mae and Freddie Mac to purchase residential mortgages in New Hampshire if a PACE assessment has been made.

  Maine implemented a residential PACE program that uses a subordinated structure to avoid conflicts with senior lien holders. However, Maine's program is almost completely funded by

[4] RSA 53-F.

ARRA money, so has limited applicability as a model for other programs which do not have the benefit of large amounts of grant money.

In May 2011, Vermont enacted changes to its PACE enabling legislation, which covers only residential properties, making the lien securing the PACE assessment explicitly junior to any existing mortgages and always junior to a first mortgage. In the absence of ARRA or grant money, the junior lien model only works economically (i.e., commercially reasonable lending rates) if there is credit enhancement, because potential investors will see the junior-lien status as a far riskier investment.

In the Vermont PACE program, participating property owners provide a one-time non-refundable contribution of 2% of the assessed amount to a mandatory Reserve Account. This would be the first source of funds to meet any shortfalls due to defaults. The program also requires the creation of a loan loss reserve, funded by RGGI funds and/or Forward Capacity Market (FCM) funds which are provided at a level equal to 5% of PACE assessments outstanding. If losses from defaults exceed the amount in the Reserve Fund, the LLR would bear 90% of the loss and the lender/bond investor would bear the remaining 10%. The lender/bond investor would receive coverage for up to 7.5% losses at a cost to them of only 0.5%. This allows the lender to be able to lend these funds at commercially reasonable rates.

In November 2010, New Hampshire's Durham Town Council designated Durham as an "Energy Efficiency and Clean Energy District." Although this is a necessary first step to proceed with a PACE program, it is unclear whether Durham can proceed under the current legislative and regulatory constraints.

In May 2011, New Hampshire modified its PACE legislation.[5] The major revisions include:

- A lien supporting a PACE assessment is junior to any existing mortgages on the participating property
- Municipal bonds used to provide financing must be revenue bonds. General obligation bonds are no longer permissible.
- Prior legislation required a LLR to provide investor protection in the event of default of a participating property. The most recent legislation provides that neither bond funds nor general municipal revenues may be used to fund the LLR. As a practical matter, this means that a PACE program in New Hampshire must receive grant money to create an LLR before a PACE program can be initiated.

The PACE concept continues to offer unique benefits, even with the senior-lien status unresolved. In the commercial sector, the structure offers an attractive off-balance sheet method of funding energy improvements. In the residential sector, credit enhancements can allow PACE programs to proceed, albeit at a higher cost to implement, and provide a funding option to many property owners who are unable or unwilling to use traditional banking products.

[5] Chapter 68 of New Hampshire Laws of 2011 (HB 144).

Program Case Study: Michigan Saves

A state-wide single administrator EE/RE finance program

TIMELINE

- Established in 2009 as non-profit organization with $6.5M grant from the Michigan PSC
- Piloted program in early 2010
- Offered home energy loan products in September, 2010 to 30 communities (80% pop.)
- Went state-wide in February 2011

HIGHILGHTS

- *Effectively leverages financial institution capital – 9 partner credit unions*
- *Contractor-driven sales with strict Q/A,Q/C guidelines and enforcement*
- *Coordinates closely with other state programs and utilities*
- *Measurement and verification to track results and ensure success*

STRUCTURE

- Loan Loss Reserve: $3.2M with 5% requirement – 20:1 leverage enabling over $60M in loans
- 9 credit unions plugged into central loan application system – approval decision within minutes
- Authorized contractor network “sells” efficiency measures and financing
- Contractors charged 1.99% of loan volume – A contractor suggested and supported fee
- Contractor fee funds QA & QC, administration, and maintaining LLR reserve requirements
- Startup costs: $1.6M over 29 months including legal and accounting

LOAN TERMS

- Unsecured residential loans up to $20,000
- Maximum 10 year repayment
- Flat 7% interest rate on all loans
- 640 minimum credit score

michigan saves SM

AUDIT PROCESS

- Standard eligible measures list
- Additional eligible measures that also qualify for financing
- Variable audit costs of $49 - $500 depending on contractor and available utility rebates
- Minimum auditor qualifications: BPI Certification or HERS with combined testing certificate

RESULTS

- *$1.5M in loans approved over 9 month period, with 70% approval rate*
- *Average loan size $7,000 (214 loans)*
- *All loans current*
- *Utilities to provide customer billing data to support M&V*

NEXT STEPS

- Working on state-wide commercial loan program
- Piloting interest rate buy-downs at 1.99% in select communities
- State-wide EE mortgage program to be rolled out Summer 2011 in partnership with Prospect Mortgage Company, and close coordination with utilities

10.6. Municipal Sector Finance Programs

New Hampshire offers three programs to finance municipal projects, each funded from a different source. Of all the programs offered in New Hampshire with a track record, PSNH's SmartSTART municipal program can be considered the most successful through its sustained funding through a RLF, as well as outreach and program structure adjustments to meet the needs of the various municipalities. The other two programs have either been met with lackluster uptake (Municipal Energy Reduction Fund), or are just getting off the ground and have little data to present (EECBG Block Grant). Table 10.4. gives an overview of these programs.

Financing projects through municipalities creates quite a challenge for four primary reasons: 1) Legislation stipulates that municipalities can only take out one loan per year, which must be voted on at a town meeting; 2) Legislation stipulates that any loan generated must be closed during the tenure of the administration that opened it, necessitating a short payback period; 3) Municipalities are cash-strapped, and thus often reluctant to devote up-front funds towards energy related projects; and 4) Typical audits performed on municipal buildings can range from the very basic, to comprehensive, making the true potential building energy savings unclear.

Table 10.4. Current Municipal Finance Programs

Program	Year of Program Inception	Funding Source	Interest Rate	Max Loan Term (years)	Finance Mechanism	Total Budget	Completed Projects: aggregate	Dollar Volume to Date
Municipal Energy Reduction Fund	2010	RGGI	2.5-4%	10	RLF	$1.5M	5	$1.3
PSNH SmartSTART Municipal	2004	RGGI	Flat 5%	7	RLF	$2M	150	$5.2
Unitil Municipal Loan	2010	RGGI	0%	10	RLF	$430,000	0	0
Nation Grid Municipal Loan	2010	RGGI	0%	2	RLF	$300,000	0	0
					Total	**$4.23M**	**155**	**$6.7M**

Municipal Energy Reduction Fund

The municipal energy reduction fund, administered by the CDFA, was capitalized in early 2010 with $1.5M. Structured as a revolving loan fund, the program serves municipalities with loans of $5,000 to $400,000, repayment terms of 3 to 10 years, and interest rates of 2.5-4%. This program is expected to continue in perpetuity through the RLF feature, or until all funds are exhausted.

This program has presently committed $1.3M of its allocation over five projects; one in 2010 and four in 2011. Projects have ranged from $27,000 to $400,000 with varying length of repayment terms. The CDFA stated that no calculations have been performed as to how much money the RLF will generate, or how many projects will likely be funded into the future. Assuming successful commitment of all $1.5M in funding, an average repayment term of 5 years, and 3% interest, it is estimated that this RLF will generate $320,000 annually from 2013 onwards, and will fund an estimated 2-3 projects per year.

The primary criterion for project approval is a reasonably justified analysis for energy measures. No formal audit is required, though the CDFA stated that most projects have had some type of audit performed. The application submission process includes bringing the project before a town meeting for voter approval. Due to the nature of the town meeting project approval process, the CDFA stated that substantial marketing and outreach was conducted for this program, mostly on a one-to-one basis. This included multiple workshop sessions with towns, presentations, individual meetings, and phone calls.

Public Service New Hampshire SmartSTART

The SmartSTART program (formerly PAYS) offered by PSNH offers loans of $200 to over $100,000, with a flat 5% fee and repayment terms of three to seven years with no upfront costs. While PSNH retains the option to offer this program to residential customers, the utility currently limits the applicant pool to municipally owned buildings. This program was implemented in 2004 and capitalized as a RLF with $2M. Through the RLF mechanism, PSNH has funded $5.2M in projects since inception. To ensure uptake in the program, PSNH worked with internal revenue to structure the program as a lease rather than a loan, with payments made through a municipalities' energy bill. With this structure, prospective projects are not subjected to the same approval procedures at a town level than a loan would be. The 5% flat fee paid by each project is deposited into a bad debt fund to cover any defaults. This program is expected to continue in perpetuity, or until funds are exhausted.

As of May 2011, the PSNH SmartSTART program has funded over 150 projects since inception in 2004, with an average project size of $35,000. In 2010, 32 projects were funded at a total cost of $1M and average project size of $31,250. The smallest project applied for was $238, and the largest was over $100k. Presently there are 18 projects in the pipeline for implementation in 2011, and a waiting list for further project approval. PSNH currently receives approximately $720,000 annually in loan repayments for this program, funding an estimated 23 projects based on average project costs.

This program has not experienced any defaults over its operational lifespan, and was able to accumulate a sizable bad debt fund through the 5% flat project fee. Due to unforeseen budget overruns in 2010, PSNH opted to use the entire bad debt fund to balance budgets in other programs.

Unitil and National Grid Municipal Loans

The municipal finance options offered through Unitil and National Grid are tied into the CORE programs. The programs became available to the public sector in 2010. Both are unsecured on-bill financing programs, offered at 0% for amounts up to $50,000. Unitil offers repayment terms up to ten years, while National Grid only offers a two year repayment term. Both programs use RGGI funds through a RLF, with $430,000 allocated to Unitil and $300,000 allocated to National Grid. As of this June 2011, neither program has initiated a project.

Recommendations

The municipal sector carries with it unique challenges and opportunities for energy efficient financing. While the challenges in the loan approval process can be daunting, PSNH's SmartSTART program has proven they are surmountable. The single biggest advantage to municipal finance is that it is an extremely safe capital risk. In general, municipalities do not default on debt, which is why the utilities feel comfortable devoting the bulk of financing funds into the municipal sector. There is a danger, however, that comfort on the part of the financing program can lead to complacency in that the municipal finance programs seemed to have evolved very little since their inception. The municipal market is still very tough to reach in New Hampshire because financing projects require town voting approval. The difficulties inherent in such a process have resulted in large portions of allocated funds remaining untouched, as is the case with two of New Hampshire's municipal finance programs. Because the state has the ability to advance municipal markets for energy efficiency retrofits, New Hampshire should be playing a much larger role in ensuring municipalities and the programs available within them are pursuing all avenues to advance energy savings goals. Key findings and recommendations on optimizing uptake of municipal projects are presented below.

- **Increase Education and Outreach Efforts.** Lack of awareness and knowledge of energy efficiency and retrofit financing seem to be the largest hurdle in achieving optimal program uptake for the municipal sector. Finance capital is clearly available, and program managers have cited a clear unwillingness on the part of voters to approve financing of municipal projects. A primary reason for this is fear that projected energy savings will not be realized, and the town could incur significant debt. Further, New Hampshire legislation mandates only one loan can be taken out within a given year per municipality, and that loan must be repaid during the tenure of the administration that approves it.

  The difference in uptake between PSNH's municipal loan program (which carries 0.5% interest and is oversubscribed), and the similar offerings from Unitil and National Grid (which carry 0% interest and have seen no applicants) reveals that program design may not be the primary driver of loan origination. This may be due, in part, to PSNH structuring the loans in a way that appear more like a lease, and can be approved without town meeting approval. According to Unitil and National Grid program managers, their loans can be structured in a similar fashion as well. Outreach and education tailored to town meetings could potentially be increased within Unitil and National Grid's programs. PSNH employs a group of community relations managers that meet regularly with the 211 cities and towns in its service territory. PSNH has been able to effectively generate loans, and their methods could be mirrored by the other utilities. The CDFA has stated that it is conducting significant outreach and education above what was originally budgeted to meet the identified need, however, the program still has not been able to allocate all of its finance capital. It is recommended that the CDFA and PSNH work to coordinate their municipal outreach strategies to most effectively allocate municipal financing funds available in New Hampshire.

  It is also recommended that education and outreach messaging be tailored to better fit the New Hampshire population, and goals of the state. This would require a more in-depth market analysis, surveys, and other methods to better understand the population.

- **Support standardization of municipal audit process.** As with the commercial and residential sectors, audit reports should be standardized. The utilities work from a 2-3 page walkthrough audit that focuses mainly on lighting and the "next best measure". While average payback for PSNH's projects is approximately five years, the relative safety and security of municipal projects should encourage more comprehensive projects with longer paybacks. The National Association of Energy Service Companies (NAESCO) recently stated that many municipalities are seeking projects with paybacks of 20+ years, increasing comprehensiveness of retrofits while keeping monthly costs ahead of projected savings and often creating positive cash flow.

  The New Hampshire Municipal Energy Working Group and the Sustainable Energy Association is presently finalizing a document called the *Field Guide to New Hampshire's Municipal Buildings and Energy Audit Guidelines* which was presented in draft form in April, 2011. This guide was created to achieve the following goals: 1) to set a far higher bar for quality, comprehensive audits and building assessments specifically relevant to New Hampshire's municipal buildings; 2) to serve as an educational tool for people to have a greater understanding of energy conservation and efficiency in their buildings in order to make informed management and planning decisions; and 3) to begin to set deeper energy reduction goals for municipal buildings which potentially could translate into more informed local codes and construction trades. It should also be noted that the TRC was recently awarded $300k in ARRA funds through the New Hampshire OEP for a project called the New Hampshire Local Energy Audit Exchange (NH LAX). NH LAX will conduct 30 -35 comprehensive municipal building audits with the funds. The results of these audits will be posted in full on a designated public website with a purpose of demonstrating the value stream of specific energy savings measures within municipal buildings. Both of these efforts are large and important steps in standardizing high quality municipal audit work in New Hampshire, and all efforts should be made to ensure successful outcomes in terms of project scope, and ultimately adherence to the guide and a mandated state-wide standardization of audit practices.

- **Engage ESCOs and utilize performance contracting.** Though successful municipal energy financing faces hurdles, municipal projects are fairly easy to characterize – buildings have regular usage patterns, and therefore are prime candidates for project implementation through energy service companies (ESCOs). Through performance contracting, the ESCO will perform a building audit, provide the financing and install recommended measures, as well as manage the process. The ESCO will then guarantee the level of energy savings, ensuring that the client does not incur any unforeseen expenses. This option may be particularly attractive for the New Hampshire market given the high level of skepticism that exists surrounding projected energy savings.

  It is recommended that New Hampshire engage ESCO performance contracting not only for municipal buildings, but also for colleges, universities, hospitals, and correctional facilities. There is a significant design and development cost associated with performance contracts, and therefore ESCO's typically only pursue projects where the annual energy cost is $500,000 or greater to ensure an overall cost effective process. Since New Hampshire has a limited amount of these large facilities, an option is to aggregate multiple smaller facilities to create an overall project size that would be attractive to an ESCO. Typically, such a process would be handled by a county development agency that would identify possible buildings projects, and issue a Request for Qualifications (RFQ), Request for Response (RFR), or Request for Proposal (RFP) for ESCOs to respond to complete the work. For example, the county development agency of Washington County, Rhode Island brought ten towns and seven school districts together and issued an RFQ for ESCO's to develop an aggregated performance contract. It should be noted that while most ESCO's will conduct the building audits and assume costs for development, if the project does not actually go to implementation the ESCO will require reimbursement of costs. In Washington County's case, ARRA funds were used to ensure all audit costs could be covered in the case that any project should not go to the implementation phase. New Hampshire has several programs to provide audits including the ARRA funded BEEP and the Jordan Institute, which possibly could be used as a backstop to coordinate necessary funding.

  One key issue that needs resolving in moving forward with performance contracting in New Hampshire is legislation that prohibits any performance contracts over ten years in length. This law was implemented over a decade ago, and has not evolved to keep pace with industry developments. As a comparison, Massachusetts has revised a similar law to allow performance contracts of up to 20 years. As a result of technology developments, and greater financing capabilities on the part of the ESCO, typical performance contracting periods are now 15+ years. The most sustainable and comprehensive technologies that are available today require much longer than a ten year payback period, and have a useful implementation life of even 30 to 40 years. To reach New Hampshire's energy savings goals and make most effective use of money already being spent on annual building energy costs, the ten year timeframe on performance contracting should be addressed and modernized.

- **Pursue a "Lead by Example" approach.** This chapter had identified multiple areas where increased education and outreach are necessary to help build and develop a market for energy efficiency retrofits. With the municipal sector, the state of New Hampshire has the opportunity to deliver this outreach and messaging through leading by example. In Massachusetts, the Department of Energy Resources has been established which has issued mandates for energy efficiency in government buildings, as well as promoted performance contracting as a method to achieve energy goals when project capital is not available. In many commercial and municipal cases, energy efficiency retrofit projects may not create a positive cash flow. In all cases however, projects will result in:

    - Energy saved
    - Reduced GHG emissions
    - Possible avoidance of capital expenditures to maintain or replace aging equipment

  By actively pursuing projects with the above characteristics, New Hampshire has the ability to set an example for other sectors in the state to follow, and take large steps towards long-term energy reduction goals.

10.8. Conclusion and Summary of Recommendations for New Hampshire's Energy Financing Programs

New Hampshire has taken important steps in providing effective finance programs to all market sectors, yet significant work still remains, not the least of which is developing and bolstering the market for energy efficiency retrofits. As mentioned above, finance is one tool that exists to reduce energy consumption. Like any project that requires many tools, the effectiveness of finance programs are largely dependent on the effectiveness of state energy policy, marketing and outreach efforts. In New Hampshire's case, it is necessary to develop all of these tools synergistically with each other to make optimal use of funding, and realize the greatest impact from efforts.

The table below presents an overview of the recommendations provided in this chapter in the order they appeared. Though some recommendations only appeared in one section, many are overarching and apply to multiple sectors.

Table 10.5. Summary of Recommendations for Energy Financing Programs in New Hampshire

Consolidate finance programs into a single-administrator, coordinated state-wide program (overarching) *Recommendation 10.1; Section 10.4*
• Create umbrella structure with single LLR facility to back commercial and residential loans • Coordinate and unify marketing and outreach • Unify lending and underwriting terms • Increase financial institution participation through greater scale of program size and loan pool • Reduce operating costs through single, centralized administration

Adopt "team" approach to unify finance programs (overarching) *Recommendation 10.2; Section 10.4*
• In lieu of single centralized program, coordinate programs within all sectors to unify messaging and program terms

Standardize commercial audit processes and requirements	*Recommendation 10.3; Section 10.4*

- Establish standard definitions for audit terms such as “comprehensive” and “Level II”
- Consider implementation of a state-wide commercial audit template to ensure consistency across projects and to optimize project funding across programs

Examine finance program design and outreach with respect to sector needs	*Recommendation 10.4; Section 10.4*

- Evaluate whether program approval criteria can be adjusted to enable broader customer qualification
- Modify marketing, outreach, and messaging presentation to more effectively reach target customers
- Focus program design to improve uptake from small and medium sized businesses

Address available finance capital levels and sustainability of capital post-ARRA and RGGI funding	*Recommendation 10.5; Section 10.4*

- Evaluate the possibility of using funding from three separate mechanisms to bolster available capital:
    - SBC-Funded utility programs
    - State-wide LLR serving the commercial sector
    - Advancing commercial PACE

Consider innovative program structures to address underserved market segments	*Recommendation 10.6; Section 10.4*

- Stay abreast of new program structures being developed within Michigan and Vermont such as the Public Purpose ESCO

Re-examine residential program structure and risk assessment	*Recommendation 10.7; Section 10.5*

- Establish program terms around *actual* versus *perceived* risk
- Evaluate possibility of modifying or establishing a tiered underwriting structure to appeal to broadest groups of consumers

Implement demand stimulation mechanism and allow more time for programs to become effective (overarching)	*Recommendation 10.8; Section 10.5*

- Refine messaging to effectively demonstrate value of energy efficiency to customers
- Implement contractor-driven sales network to stimulate and drive market demand for retrofits

Continue residential program coordination efforts	*Recommendation 10.9; Section 10.5*

- Bolster coordination across all programs to unify lending terms and outreach

Increase funding to sufficient and sustainable levels	*Recommendation 10.10; Section 10.5*

- Broaden geographic scope of BB program and reduce LLR reserve requirement
- Allocate New Hampshire QECB’s to establish a green community program
- Advance residential PACE programs

Increase municipal sector education and outreach efforts	*Recommendation 10.11; Section 10.6*
• Tailor outreach and messaging to demonstrate value of energy efficiency retrofits, both in monetary and non-monetary terms	
Support standardization of municipal audit process	*Recommendation 10.12; Section 10.6*
• Encourage or mandate adherence to forthcoming energy audit guidelines	

Engage ESCOs and utilize performance contracting	*Recommendation 10.13; Section 10.6*
• Evaluate and modernize legislation capping energy performance contracts at 10 years • Charge county development agencies, or the equivalent, with aggregating municipal projects and engaging ESCOs to perform retrofit work	

Pursue a "Lead by Example" approach	*Recommendation 10.14; Section 10.6*
• Use municipal projects to demonstrate the value of energy efficiency retrofits in terms of energy saved, emissions reduced, and reduced long-term capital expenditures on equipment; as well as in terms of project cash-flow savings	

Chapter 11: Community Planning and Municipal Engagement as Cornerstones of Sound Energy Policy

11.1. Introduction

New Hampshire has a long history of emphasizing community-based action and initiative to achieve important public policy objectives through the engagement and hard work of stakeholders and citizens. And during the recent era of rising oil and gasoline prices, combined with support from state and local energy initiatives, a buzz has developed throughout New Hampshire about community energy initiatives, Local Energy Committees, "Beacon Communities," and community-scale solar, wind, and biomass opportunities.

During much of the debate and discussion regarding Senate Bill 323, there was a focus not only on how state policies and regulation could foster more energy efficient and sustainable energy use, but also on how municipal government and citizens might take action at the community level to reduce dependence on imported energy and help meet the state's energy goals. In the bill's final language, these broader concerns fall generally under the need to increase energy conservation and to take action at both the state and community levels.

One area of community planning that can have a significant impact on energy consumption is land use planning. In New Hampshire, municipalities are in the center of most major land use zoning and development issues. A recent study conducted for the U.S. Environmental Protection Agency found that, in general, households in single family attached housing (for example, townhouses) use 8% less energy than those in single family detached housing.[1] Households in multi-family housing use 22% less energy than those in single family detached housing. If housing is shifted from rural or suburban locations to village and town centers where ride sharing, van pools, or mass transportation services are available, total household energy consumption drops to as much as 51% of those living in single family detached housing located in suburbs. Such savings not only have broad energy conservation and environmental implications, but also can have significant positive economic impacts for households.

Presented below is a discussion of the impacts that a variety of public policies at the State, regional, and local levels have on land development patterns in New Hampshire, and the energy consumption that is inherently embedded in various development patterns. This is followed by discussion of the potential changes in policy (and behavior) that could reduce the level of energy consumption driven by land development patterns, and a recognition of the incredible impact locally-based stakeholder engagement, community organizing, and social networking is having on advancing energy efficiency and sustainable energy use throughout the state. Presented in Appendix D: Bibliography, are a variety of planning and smart growth references and resources.

11.2. Community Energy Consumption

The most complete and detailed municipal energy information available for New Hampshire communities comes from Clean Air – Cool Planet's (CA-CP) Municipal Energy Assistance Program, discussed in further detail below. But in summary, after collaborating with 48 New Hampshire municipalities (ranging from Dorchester (population 373) to Bedford (population 20,807), CA-CP found that these communities

[1] Location Efficiency and Housing Type, Boiling it Down to BTUs, U.S. Environmental Protection Agency, http://www.epa.gov/smartgrowth/pdf/location_efficiency_BTU.pdf

had a collective annual municipal energy bill of nearly $9 million, or an average of some $192,000 for a community of approximately 4,800 people.

CA-CP's experience was that a 30% reduction in the municipal energy bill could be achieved with only modest expense. Groveton saved $4,000 (19% of its local energy bill) by turning off twenty-nine street lights. The key to success in this area is having a strong local advocate for energy reduction. Efforts to support groups like the local energy committees and commissions will yield strong, positive local savings. Successful efforts from across New Hampshire are detailed below.

When thinking about energy consumption at the municipal level, there is a tendency to focus primarily on costs associated with heating town halls and fueling municipal vehicles. However, public energy issues in New Hampshire communities are far more complex than the heating of municipal buildings and the fueling of snow plows and fire trucks. The development patterns that result from state and municipal regulations and policies have a significant impact on how individuals, businesses, and institutions consume energy. For a long time, when planners and others have promoted the benefits of mixed use developments on a denser scale, the response from builders and developers was that that it is not what the market wants to buy. The National Association of REALTORS sees things differently these days. In their most recent national publication, they report that:

"*As the real estate market evolves toward a new normal marked by growing urbanization, greater sustainability and more transportation choices, the recession may also be remembered as a tipping point for smart growth.*"[2]

New Hampshire needs to prepare for a shift in market preferences. New Hampshire communities have evolved to reflect a wide variety of social and economic considerations, including the energy resources and transportation options available during particular points in time. This is demonstrated in the discussion of the development Concord, New Hampshire, below. As a period of inexpensive and abundant energy ends, it becomes important to consider how energy is being used locally, and what can be done to reduce energy use and the associated costs and emissions.

11.3. Concord, New Hampshire: A View of Development over the Years

Concord is indicative of development patterns throughout New Hampshire. We have become a mobile community of suburbs and ex-urbs, and less a community of central places, dense neighborhoods, and mixed use development. The energy implications and sustainability issues resulting from these development patterns are profound.

State House, Concord, New Hampshire

The following census statistics are assembled for Concord and its ten near neighbors. The area's development is a pattern first of centralization, and then of dispersal, a pattern that needs to be considered carefully in the future. In the early years of the Republic, New Hampshire was essentially an agrarian economy. Most goods were grown or produced

[2] *On Common Ground, National Association of Realtors,* Summer 20011, p. 5. http://www.realtor.org/government_affairs/smart_growth/on_common_ground

locally. Towns were small and decentralized. Within this region, Concord itself held only 17% of the population in 1820.

There were many economic factors that came together after the Civil War to foster the importance of central places: the mill economy was booming, hill farms in New Hampshire were losing population to the fertile grounds of the Midwest, and the railroad was increasing the importance of communities that had access to it, and decreasing the importance of those who did not have access to this new technology. In addition to being the State capital, Concord had both mills and the railroad, and represented 50% of the region's population in 1880.

The early 1930s found this situation on the brink of tremendous change. Railroads were on the cusp of losing the battle with private automobiles and trucks. New England was facing increased competition from Southern mills, a battle that it would soon lose. The Great Depression was about to sweep through the region. On the crest of this wave, Concord swelled to 69% of the region's population. Although it was likely not recognizable at the time, this was really the beginning of the end of an era, an era where all new development and activity since the coming of the railroads and the mills had been focused almost exclusively in central places.

Interstate 93
East Concord, New Hampshire

In 1960 Interstate 93 was completed to Concord. Interstate 89 would follow shortly thereafter, as would many other road improvements. Gasoline was under $0.30 per gallon. Concord would remain a major employment and shopping center, but the move to the surrounding communities for new residences arrived with a vengeance. Between 1960 and 2010, Concord's share of the region's population fell from 65% to 47%.

This pattern of development over the last 50 years is not sustainable. The population forecasts for the Concord region suggest that the current population of 90,000 will reach 120,000 sometime around 2020, maybe a bit later if the current economic recession continues. It appears that in the current economic and regulatory climate, the New Hampshire Department of Transportation will be unlikely to add additional road capacity in the area. The road system that is in place now is likely the one that will be available to commuters and commercial traffic for the foreseeable future. Highway engineers estimate that without additional road capacity, commuting times from downtown Concord to places like Contoocook, Canterbury Village, and the Epsom traffic circle, will double if the ex-urban development trends of the recent past continue into the future.

Case Study: Leading the Way with Local Planning and Energy Reduction
Dover, New Hampshire

Dover is located twelve miles up the Piscataqua and Cocheco Rivers from the open ocean and claims a lot of firsts. Not the least of which is being the first settled community in New Hampshire, dating from an encampment on Dover Point in 1623. More recently, Dover is leading the way in fostering energy efficient development.

In the 1980s, Dover undertook substantial re-investment in its downtown infrastructure, fostering road and sidewalk improvements along Central, Washington, and Main Streets. It has undertaken downtown events, including an Apple Festival that draws over 10,000 people into the downtown. When the State of New Hampshire wanted to re-locate the district court to the Strafford County Farm complex outside of downtown, the City invoked RSA 9-B and forced the new facility to build in the downtown adjacent to City Hall. As the student population outgrew the downtown middle school, the City converted it into the McConnell Center, a home for a wide variety of non-profit organizations.

Street Activity
Dover, New Hampshire

More recently, in 2008 the City of Dover undertook what became the first form based code in Northern New England. While, in the same way that traditional zoning is concerned about the use on a particular parcel of land, form based codes are equally concerned about building form and their placement on a parcel. It recognizes that new development should respect and complement existing development. Retail is retail is retail, but downtown is not the place for strip malls. Dover, like many communities, had experienced a number of strip malls in unfortunate locations in the 1960s and 1970s.

Washington Street Mill
Dover, New Hampshire

Under the new ordinance, all new construction in the downtown area *must* be built at the back edge of the sidewalk. And while there are maximum building heights, there are also minimum building heights. Any new construction in the downtown *must* be at least two stories tall. The second story does not need to be finished off initially, but it needs to be there. Additionally, Dover now permits residential activity on the upper floor of all buildings in the downtown area. As a former mill community with lots of vacant space on the upper floors, this will undoubtedly add to downtown vitality. And on the outskirts, the planning board has adopted a series of changes that make open space development mandatory when subdividing in a wide variety of areas.

The local Energy Committee is also very active. Its members have embraced energy audits and infrastructure improvements for municipal buildings. They conducted an extensive educational program for residents promoting energy efficiency and LEED development. Dover is indeed an energy conservation leader in New Hampshire.

Dover Planning Office –
www.ci.dover.nh.us/planhome.htm

11.4. Guiding Growth at the State Level for a Sound Energy Future

As noted, Concord and New Hampshire are not alone in exhibiting this energy consumptive, commuter-driven pattern of development. Nor will they be alone in exploring how to reverse it. And their success in that effort will not likely be easy or quick. It has taken fifty years, and some would argue longer, to evolve into this pattern. It will likely take some years to evolve out of it.

But, it is important that Concord, and other communities, do so. Expensive gasoline is draining money out of our local and state economies. Pollutants from all of those vehicle miles driven are contributing to the detriment of our environment and accelerating climate change. Slower, longer commutes consume more energy and take time away from family, friends, and local institutions for whom drivers and passengers might be volunteering.

Fortunately, New Hampshire still has the remnants of its former centralized development pattern, remnants that might become the roots of a reversal. In Suncook, there are still partially used mills that could become housing units for a village residential development, a development that might become the site of a park and ride system, or even connected to Concord employment centers by shuttle buses. The City of Concord has identified its former rail yards as a potential development site, an area that might host mixed use development, including residential, commercial, and retail spaces. The local housing group in Concord is beginning the construction of a mixed-use, market rate housing project on Main Street.

Former Page Belting
Elderly Housing Above & Commercial Space Below
Concord, New Hampshire

In New Hampshire there are both good examples and good opportunities for fostering more energy efficient development patterns at the State, regional, and local levels. And there are good examples from away. The following materials are meant to foster discussion, to change behavior, and to serve as a resource for those interested in seeing a more energy efficient development pattern evolve in New Hampshire.

RSA 9-A, State Development Plan[3]

As noted previously, New Hampshire's energy policy is limited at best. RSA 378:37 speaks to this point, but primarily from the perspective of the Public Utilities Commission. New Hampshire does, however, have a legislative placeholder where a broader policy might be created. In 2000, the Legislature re-formatted, and provided further detail on the elements of a previous requirement for the preparation of a State Development Plan. This is presently outlined in RSA 9-A. The development plan is to be prepared every four years, by the Governor (assisted by the New Hampshire Office of Energy and Planning) and delivered to the General Court. In format, it is to follow the framework of a local master plan but with a view from the State level. It is to have a Vision Statement, a variety of topical chapters and policies (Housing, Transportation, Cultural Resources, etc.), and an Implementation Chapter.

[3] http://www.gencourt.state.nh.us/rsa/html/I/9-A/9-A-mrg.htm

This effort has two unfortunate flaws. First, although many of the required topics might be reviewed as being related to energy, when that specific topic was added to the master plan statutes as a recommended chapter for local master plans (RSA 674:2-III (n)) in 2008, it was not added to the required elements of the State Development Plan. More importantly, although the first of the four-year plans was supposed to be delivered to the General Court in October 2003 that was not done. In fact, there has been no plan prepared or delivered since the State Development Plan statute was revised in 2000. If the State is serious about establishing a broadly applicable energy policy, resources should be provided to the Office of Energy and Planning so as to allow it to assist the Governor in the preparation of a State Development Plan, including an overall Energy Policy Statement.

RSA 9-B, State Economic Growth, Resource Protection, and Planning Policy[4]

As a companion piece to the State Development Plan, in 2000 RSA 9-B was also developed. This statute recognizes that the State of New Hampshire can, and does, have an impact on development patterns across the state. In the vernacular of the time, it was called Smart Growth legislation. Ten plus years later, it could just as easily be referred to as Sustainable Energy and Resource Conservation legislation. Essentially RSA 9-B recognizes that the State, through its agencies, can have an impact on development patterns in New Hampshire communities in three specific areas:

- **By its own real estate decisions** – Does the State locate its offices in downtown areas, in existing buildings, or does it choose "greenfield" or other outlying sites? There are both good and bad examples on this count. The redevelopment of the State Hospital grounds in Concord as a State office park is an excellent example. The current effort to reorganize and centralize some Employment Security Offices is also a positive one. Hopefully these examples are setting a trend that will be continued.

- **By its rulemaking** – State agencies are charged with certain missions, and are generally very good at serving those. They are frequently given rulemaking authority to achieve those missions. On more than one occasion, the focus on serving an assigned mission has made it difficult for agencies to attend to broader issues. The difficulty in siting new school buildings on anything but "greenfield" locations is an example of this. Again, recent decisions to permit the redevelopment of several intown neighborhood school sites in Concord are excellent examples of recognizing the importance of central places. Similarly, the approval of an innovative community leach field so as to permit the redevelopment of the central village in Greenfield was an excellent one. Agencies need to be true to their missions, but also to be sensitive to other issues as well, some of which might be highlighted in a comprehensive State Development Plan.

- **By grant making** – New Hampshire does not award a lot of grants to communities and others, but it does award some. Frequently there are choices as to which projects to fund, such as, for example, a day care center in an existing building in a downtown area, or one in an outlying strip mall. Following the principles of RSA 9-B would dictate that the project in an existing downtown building should receive priority, other factors being equal.

RSA 9-B says that Smart Growth (read Sustainable Energy and Resource Conservation) is the Policy of the State of New Hampshire, and that State agencies should be sensitive to that when making real estate, rule-making, and granting decisions. While progress is being made, it would appear that that is not always

[4] http://www.gencourt.state.nh.us/rsa/html/I/9-B/9-B-mrg.htm

the case at present. A recommendation would be that the language be updated to reflect the current sensitivity to Sustainable Energy and Resource Conservation, and then that the principles be observed on a more regular basis as contracts go before the Governor and Executive Council, as capital budgets are prepared and approved, and as rulemaking proposals are reviewed by the Legislature.

Despite the critiques and recommendations noted above, there are good examples where the State is doing an excellent job in leading the discussion about energy and land use planning. Chapter 13 details the specific actions the State has been taking to reduce its own energy consumption. Additionally, the following efforts are noted and should be continued and expanded:

The NH Climate Action Plan (2009) and the continuing efforts of the NH Energy & Climate Collaborative – This ongoing effort to implement the Recommendations of the Action Plan can and should have a significant role in reversing the development patterns akin to those described in detail for Concord. In particular the recommendations focused on *Encouraging appropriate land use patterns that reduce vehicle miles traveled* are noted.

Technical Assistance – Clearly most land use and planning decisions are made at the local level, but the State's efforts to assist communities by putting sound resources in the hands of local decision makers is critical. The various Technical Bulletins and Model Ordinances available through the New Hampshire Office of Energy and Planning (NH OEP) and the Innovative Land Use Planning Techniques Handbook by the New Hampshire Department of Environmental Services (NH DES) are of particular note. The annual Planning Conferences and the recently initiated Local Energy Solutions Conferences should be supported and continued as valuable resources for local groups, both in terms of information and as a means of networking.

Research – Nearly ten years ago, the State undertook studies to document the amount of sprawl development in various parts of the State, and to look at the forces that were driving it. It is recommended that that work be updated, and that further efforts be undertaken to document the actual cost of sprawl to individuals, businesses, government entities, and others.

In terms of direct services to municipalities, the State has initiated the following programs, among others:

Better Buildings Program – This New Hampshire program promotes energy savings using deep retrofits and energy efficiency solutions for both homeowners and businesses. In 2010 the communities of Berlin, Nashua, and Plymouth were selected to be the focus of this $10 million U.S. Department of Energy funded effort. The project will work to achieve 30% energy use reductions in residential, commercial, and municipal buildings, and put the systems and supports in place that will then enable other communities to make the same improvements. The initial investments will be undertaken over a three year period.[5]

Municipal Energy Assistance Program – This effort was made possible through the New Hampshire Public Utilities Commission (NH PUC) and the Greenhouse Gas Emissions Reductions Fund and managed by Clean Air – Cool Planet. The purpose of the program was to provide a guided (and staffed) step-by-step process to help some four dozen New Hampshire communities become ready for energy conservation efforts. This guidance and assistance has allowed some communities to gain access to funding through state and federal programs for implementation projects. The activities were primarily focused on building audits for some forty-eight communities, with six of those receiving regulatory audits as well.[6]

[5] http://www.betterbuildingsnh.com/BetterBuildingsNH/Home.html
[6] http://nhenergy.org/index.php?title=New_Hampshire_Municipal_Energy_Assistance_Program

The State needs to continue the positive efforts noted, as well as correct areas where it could be doing an even better job.

11.5. Guiding Growth at the Community Level for a Sound Energy

The creation of local energy committees that began in 2007 brought the issue of energy supply and consumption to the attention of many New Hampshire communities for the first time. Some 164 municipalities (of 234) expressed concern regarding energy consumption at Town Meetings then and urged both national leaders and their communities to take action. Over 100 communities now have some group tasked with taking on this issue. In 2009, the legislature authorized these groups to be appointed by local officials as Energy Commissions.

These new committees and commissions have been seen as a major resource in many communities, as they have a perspective that has otherwise been lacking in local discussions. The successful energy groups quickly began to collaborate with other local boards and committees, demonstrating to them how both dollar and energy savings could be achieved. Building audits, street light inventories, and other local initiatives have resulted from these collaborations. In some communities, the Planning Boards have started to be engaged in conversations about energy. Some examples of local successes include:

Epping – In 2007 Epping adopted a zoning ordinance to encourage energy efficiency and sustainable design. Applicable developments are required to implement energy efficiency and production, energy conservation, and sustainable design principles as found in this ordinance.[7]

Keene – The City began its efforts to address climate change in 2000 with the formation of the Cities for Climate Change Committee. Since that time the City has completed greenhouse gas inventories, a Climate Change Action Plan, a Climate Adaptation Plan, and after updating the City's Master Plan it adopted a Sustainable Energy Efficient Development (SEED) zoning district. This is a voluntary urban incentive-based zoning overlay that proposes to promote "greenbuildings" and redevelopment in downtown Keene.[8]

Bicycle / Pedestrian Facilities
Keene, New Hampshire

Temple – In 2008, Clean Air - Cool Planet and the Town of Temple undertook a serious effort to examine municipal energy consumption. An energy inventory was prepared for all municipal buildings and services, and building audits were prepared. An Energy and Land Use Audit was also completed with participation from the Planning Board. The audit was a departure from a traditional smart growth audit that looks at the master plan and land use regulations for inconsistencies because it included the energy implications of these documents and their policies. All of these efforts resulted in Temple applying for and receiving major grant funding that led to building upgrades and other significant improvements that have reduced the town's energy bills.[9]

Lee – In 2010 Lee began work on a comprehensive Energy Plan for the community that will include building audits, and a review of its zoning, subdivision regulations, and other development controls to evaluate their sensitivity to energy consumption. The community recently hosted a highly successful

[7] http://www.ci.epping.nh.us/art%2022%20Energy%20Efficiency%20&%20SD%2010.pdf
[8] http://www.ci.keene.nh.us/sites/default/files/DOC111010_0.pdf
[9] http://www.nhenergy.org/images/6/61/Temple_Case_Study.pdf

energy fair for local citizens. A major focus of the work will be a feasibility study for distributed energy and a district heating system to serve the municipal buildings in the village center: police, fire, library, school, as well as town offices.[10]

Peterborough – Through a series of zoning changes made to implement the community's master plan, Peterborough triggered two positive developments. When the village of West Peterborough was zoned for mixed use development, the vacant Union Mill was thoughtfully redeveloped to accommodate ten residential and ten commercial units using "greenbuilding" and energy conservation practices. The resulting development has increased the number of residents in the village, while also re-introducing retail uses to the historic mill village. Adjacent to this project, a co-housing project known as Nubanusit Neighborhood and Farm was then developed to include a cluster of LEED certified homes with district heating and an organic farm.[11]

Mixed Use Development Downtown Exeter, New Hampshire

Plainfield Elementary School – The school is the largest municipal facility in the small town of Plainfield, and is the educational and activity center of the town. Like many schools there were problems with the facility including old air exchange systems, poor heating and ventilation, and a decaying building envelope. In 2008 the Facilities Committee of the school board decided to address these issues in a series of phases to create an energy efficient school. The first phase resulted in a 30% reduction in the amount of energy used compared to the 2005 baseline. The next phase of renovation included deep energy retrofits to one of the school's wings for additional savings. The final phase is underway now and includes deep energy retrofits of the original 1972 building, which is expected to result in an overall 90% reduction in energy use and pave the way for renewable energy projects to achieve a zero net energy school.[12]

11.6. Guiding Growth at the Regional Level for a Sound Energy Future

The nine regional planning commissions in New Hampshire have long been a source of technical assistance to their member communities. As the energy issue has moved to the forefront, this has been an area of their support as well. They have been working with local planning boards to examine the energy implications of their local land use regulations. They are currently seeking federal support for the creation of sustainable development plans for each of the regions. If successful, this effort will significantly advance sustainability discussions at the community level.

Other grassroots efforts are developing as well. The Plymouth Area Renewable Energy Initiative (PAREI) was formed in 2004 by a small group of determined volunteers in response to concern over global energy issues. Its mission is to encourage energy conservation and energy efficiency practices and to promote the use of renewable energy in the Plymouth, New Hampshire, region. This is accomplished through education, community building, increasing accessibility to professional energy-related services, and by developing and sharing the organization's model with other communities.

[10] http://www.leenh.org/Pages/LeeNH_BComm/Energy/index
[11] http://www.nh.gov/oep/programs/SmartGrowth/westpeterborough.htm
[12] http://www.plainfieldnh.org/energy.html

Since organizing, PAREI has grown from informal meetings to an organization of over 400 families and businesses. To advance this model throughout the State and country, PAREI offers a PAREI Toolkit and Community Partner membership. http://www.plymouthenergy.org/

Several additional energy initiatives have now been started in places from Maine to Washington State using this Renewable Energy Initiative (REI) model. In New Hampshire, efforts have started in Canterbury and Belmont, in the Sandwich/Tamworth/Moultonborough area (STMAREI), in the Seacoast (SEAREI), in the Conway area (TINREI), in the Bethlehem area (SUNREI), and now in the Wolfeboro area through the organization Global Awareness Local Action (GALA), and soon to be in Bedford.

The question has been raised as how best to foster and support these regional initiatives. On the one hand, their success has been due, at least in part, to their informality, of like-minded people coming together for a common purpose. One doesn't want to interfere with that, but it is recommended that technical assistance and support, whether it is from the New Hampshire Office of Energy and Planning, or New Hampshire Cooperative Extension, or others is necessary to support and encourage these home grown initiatives. One observation is that the regional efforts are primarily based in areas where there was a strong, active Local Energy Committee present in a core community. Thus, supporting the local efforts is seen as doubly important, as it appears to generate regional benefits as well. The case studies on the Town of Plymouth and the PAREI model point out this mutually reinforcing pattern.

And networking is critically important. In Plymouth a handful of energy-minded individuals happened to know each other and were motivated to do something, so they founded the effort that became PAREI. In other locations, similar processes are evolving. The New Hampshire Office of Energy and Planning has identified a number of successful social marketing principles that seem to create an environment in which these efforts have the best chances to succeed:[13]

- Create social capital (person to person)
- Show, don't tell
- Allow for testing before commitment
- Promote the "We" frame, not the "Me" frame
- People feel good when part of something bigger
- People feel good when they are successful
- First consideration has more weight (status quo, $$)
- Identity/context at time of decision frames the decision

Given the importance that personal connections have in establishing these efforts, looking for ways to link interested parties in a particular region with each other would seem to be important. Perhaps the Local Energy Committees could be used as a start, and Facebook or other social networking pages could be sponsored by the NH Office of Energy and Planning as a low cost way of networking people. Hosting annual conferences and other networking opportunities for Local Energy Committees is important as well. And learning from PAREI and others who have already gone down this road is also important.

[13] (See http://www.nh.gov/oep/recovery/rfps/documents/OEPbehaviorslides5_20_11.pdf)

Case Study: Reduce then Produce - The Renewable Energy Initiative Model
Plymouth, New Hampshire

The Plymouth Area Renewable Energy Initiative (PAREI) was formed in 2004 by a small group of determined volunteers in response to concern over global energy issues. Its mission is to encourage energy conservation and energy efficiency practices and to promote the use of renewable energy in the Plymouth, NH region. This is accomplished through education, community building, increasing accessibility to professional energy-related services and by developing and sharing the organizations model with other communities.

PAREI's Motto
"Get Energized! Plan for Your Energy Future"

PAREI's membership is based in the communities around Plymouth, NH, and since organizing has grown from informal meetings to an organization of over 400 families and businesses. The services offered include professional home energy audits, energy saving house walkthroughs, solar site visits and reports, volunteer solar energy raisers and housewarmings, membership meetings, an energy advisor network partnering members with volunteers, professional installations as well as Do It Yourself support for installing solar. To advance this Renewable Energy Initiative (REI) model throughout the country PAREI offers a toolkit and community partner membership.

Since 2004 over 155 renewable energy systems have been installed and many structures have benefitted from energy conservation projects. Fifteen community partners have also been established so far in places from Maine to Washington State using this REI model. Here in New Hampshire efforts have started in Canterbury, Belmont, the Sandwich/Tamworth/Moultonborough area (STMAREI), the Seacoast (SEAREI), the Conway area (TINREI), the Bethlehem area (SUNREI), and now in the Wolfeboro area through the organization Global Awareness Local Action (GALA).

"In the end everyone will be affected by high energy prices."

The REI model has been successful because it strengthens local relationships and networks, builds knowledge and capacity, focuses on the financial reasons for action, stays non-political, and encourages volunteerism and experimentation. To do this required bringing people along step by step, focusing on what was working, setting egos aside, and committing to a narrow mission statement.

Given the importance that personal connections have in establishing these efforts, looking for ways to link interested parties in a particular region is an important aspect of fostering more REI's. Local Energy Committees are one place to start, and Facebook or other social networking pages can be used as a low cost way of networking people interested in this model. Hosting regional workshops and an annual conference for Local Energy Committees and groups working with the REI model are useful and effective as well.

Plymouth Area Renewable Energy Initiative –
www.plymouthenergy.org

11.7. Summary of Community Planning Recommendations

As noted, New Hampshire is not alone in having created an energy-inefficient pattern of land use and development. Inexpensive fossil fuel has led most of the United States in that direction. And it has taken fifty-plus years to get there, so it is a pattern that will take time to reverse.

Village Center
Washington, New Hampshire

However, New Hampshire already has a useful framework for moving towards that reversal at the State level, and we also have good examples of how to do it at both the regional and community levels. To build on the success and capture the efficiency and clean energy resources that are available, we have made the recommendations noted in the table below.

These actions are necessary to change our pattern of choices and behavior over the last fifty years in New Hampshire. As noted above, that pattern is not sustainable. As we are unlikely to have funds for new roads or new lanes to accommodate more traffic, the "Live in Loudon/Work in Concord" model will become increasingly difficult to accomplish. The commute will get longer and longer. The energy and time costs will increase. And we are already hearing from both national REALTOR groups and local individuals that living in town increasingly meets people's needs. Some people already want to be able to walk to the store to meet some of their daily needs. They don't want to have to drive an automobile to meet all of their shopping and other needs.

New Hampshire is fortunate to have a landscape that accommodates these new trends. Historically we have been a community of central places. We are a landscape where at least some people walked to school and to work. We don't need to create this development pattern anew. We simply need to re-invigorate what is already here. The actions recommended above will allow us to begin to do that.

Amend RSAs 9-A and 9-B to convert the language from "Smart Growth" to Sustainability and Energy Efficiency *Recommendation 11.1, Section 11.4*
• The legislature should amend the language in RSAs 9-A and 9-B, and reinforce the State's Energy Policy from RSA 378 within the framework of the State Development Plan.

Complete efforts to finalize and publish the State Development Plan required by RSA 9-A *Recommendation 11.2, Section 11.4*
• OEP and the Governor's Office should also include a more broadly applicable Energy Policy.

Use the sustainability and energy efficiency principles outlined in RSA 9-B when State Agencies are making real estate decisions, grant making decisions, and when undertaking rulemaking. *Recommendation 11.3, Section 11.4*
• These principles should be abided by all Executive and Legislative Branch parties when evaluating office locations, reviewing pending agency rules, making granting decisions, and preparing and adopting the biennial Capital Budget.

Emphasize positive, energy related activities New Hampshire has accomplished and is currently engaged in *Recommendation 11.4, Section 11.4*
• Including the recommendations of the New Hampshire Climate Action Plan, and the NH Energy and Climate Collaborative.

Continue to offer regular training and guidance to municipalities to assist them in promoting compact, nodal development *Recommendation 11.5, Case Study: Dover*
• NH OEP, in partnership with other entities, should offer these trainings and guidance by the use of Form Based Codes and/or other means.
• Education regarding the linkage between sound planning and energy efficiency needs to be a key component of this effort.

Take a leadership role in documenting the financial and other impacts of sprawl on the communities of New Hampshire *Recommendation 11.6, Section 11.4*
• The NH OEP should update its previous sprawl analyses and undertake new efforts that document and evaluate the cost of sprawl to individuals, government entities, and others.

Establish mixed use development in central places (whether they be village cross roads, town centers, or urban downtowns) as a goal for all state agencies *Recommendation 11.7, Section 11.3*
• To that end, there should be increased cooperation between such entities and agencies as the New Hampshire Housing Finance Authority and the New Hampshire Community Development Finance Authority, especially through its Community Development Block Grant Program.
• This mixed use, nodal development will create the opportunities for improved transportation systems and less reliance on single occupant vehicles.

Facilitate networking opportunities through the NH OEP website *Recommendation 11.8, Section 11.6*
• Individuals interested in forming a PAREI-type regional effort in their part of New Hampshire could connect with like-minded individuals in their region via this website.

Continue to provide networking opportunities for local boards and commissions through such sessions as the annual Planning Conferences and the Local Energy Solutions Conferences *Recommendation 11.9, Section 11.6*
• Annual conferences are critically important for local boards and commissions, both for information transfer and for networking. NH OEP should continue to support their development.

Case Study: Local Energy Committee Engages the Community
Plymouth, New Hampshire

Located between the Lakes Region and White Mountains, Plymouth serves as a regional center, providing educational opportunities, health care, and shopping for the surrounding towns. It was one of the towns in New Hampshire that passed a resolution related to climate change in 2007. It established an Energy Committee soon after. In 2010, the Plymouth Energy Committee became one of the state's first Local Energy Commissions.

Town Hall in the center of downtown

This activity has been significant in this small community. Although the town operates as a regional center, nearly two thirds of its 6,700 residents are students at Plymouth State University. The evolution of the Plymouth Area Renewable Energy Initiative (PAREI) helped raise awareness and draw attention to energy as a critical issue, but the town itself was not engaged in this dialogue. The Energy Commission is now in its fourth year and has many success stories to share.

The Energy Commission conducted an inventory of greenhouse gas emissions for the Town of Plymouth's municipal buildings. The goal of this inventory was to establish a baseline for emission reduction targets and to identify areas of inefficient energy use. The Commission's efforts have focused on the fact that the least expensive energy is energy that is never generated and never used. The first actions based on this conclusion included the passing of a resolution at Town Meeting to require all future municipal buildings to be high performance structures, and to create a partnership with the New Hampshire Electric Co-op to inventory and reduce the Town's street lights. Other initiatives include:

- An anti-idling campaign with local schools, the University, and on municipal property.
- A partnership with Plymouth Parks and Recreation and local businesses to install bike racks on Main Street.
- Adoption of a Renewable Energy Tax Exemption.
- Establishing an energy section at the Public Library.
- Selected to participate in the "Better Buildings" program.
- Assisted the Planning Board with drafting an Energy Chapter for the Master Plan.

The Better Buildings Program
Plymouth, New Hampshire

In March of 2010 Plymouth was awarded $231,000 in energy grants from the New Hampshire Office of Energy and Planning. The grants funded audits of municipal buildings, energy efficiency work on the Plymouth Water and Sewer office building, and installations of Photovoltaic Panels on Plymouth Village Water and Sewer, Plymouth Elementary School, and the Plymouth Town Library.

Plymouth Local Energy Committee www.plymouth-nh.org/committees/energy-committee

Chapter 12: The Importance of Building Energy Codes and Code Enforcement in Market Development

12.1. Introduction

Buildings accounted for 50% of New Hampshire energy expenditures in 2009.[1] Buildings last for decades (or more), and are simpler and more economical to design and build efficiently from the beginning than to improve upon once constructed. For these reasons, it is logical and effective to build new buildings as efficiently as possible considering additional design and construction cost compared to expected savings. Many of the savings last the life of the building and are difficult and more expensive to add after construction. In addition, major renovation project also present opportunities to increase performance and efficiency of buildings. Analysis of the costs of energy code compliance has shown that for each dollar invested, six dollars of energy savings are realized.[2]

As building science advances and energy costs rise, an increasing amount of efficiency is justified in new construction. Organizations such as the International Code Council (ICC) exist specifically to determine what building methods and materials are well justified given their current cost relative to their proven performance. When the ICC's updated codes are adopted at the state level, local stakeholders are typically provided the opportunity to consider the requirements in the context of the area's climate and market conditions, and the codes may be amended to adjust to local conditions.

Nationwide, building codes are becoming more stringent with the help of the requirement by the U.S. Department of Energy (DOE) that states receiving federal American Recovery and Reinvestment Act (ARRA) funding adopt the 2009 International Energy Conservation Code (IECC) and that at least 90% of new and renovated residential and commercial building space meet or exceed the IECC (for residential buildings) and ASHRAE Standard 90.1-2007 (for commercial buildings) by 2017. The 90% compliance requirement is considered a major hurdle by some, and may be challenging to achieve in a state such as New Hampshire, where codes can be viewed as excessive government intervention.

To date, over one half of US states and territories have adopted the 2009 IECC for residential buildings and the equivalent for commercial buildings, and several more have adopted the code with a later effective date. By continuing to build to the latest versions of the IECC, by 2025 the United States could save approximately 3% compared to baseline estimates of future electricity use.[3] This energy does not need to be imported or generated, and is the result of cost effective building improvements that also increase the comfort and durability of buildings. Furthermore, unlike money spent on imported fuels for heating, dollars spent on making buildings more energy efficient are likely to be spent in the local or regional economy by the tradespeople doing the work. In addition, the savings experienced by building residents may recirculate in the local or regional economy through consumer purchases and/or various forms of savings or investment.

Building codes and code enforcement are important drivers in the development of energy efficiency markets. Presented below is a discussion of the Energy Code in effect in New Hampshire, efforts underway to increase code compliance, and outreach and education initiatives directed at code officials,

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[1] EIA, State Energy Data, Table F28, http://www.eia.gov/emeu/states/hf.jsp?incfile=sep_fuel/html/fuel_te.html
[2] Institute for Market Transformation, http://imt.org/files/FactSheet-EnergyCodeComplianceFunding.pdf
[3] Institute for Electric Efficiency, May 2011, "Assessment of Electricity Savings in the U.S. Achievable through New Appliance/Equipment Efficiency Standards and Building Efficiency Codes (2010 - 2025)."

contractors, building assessors, realtors, and consumers. The discussion addresses both code compliance in new construction and in existing buildings, both of which are important are important in New Hampshire given the age of the building stock, significant winter heating requirements, and increasing summer cooling demands.

12.2. Towards Achieving New Hampshire's Energy Code, and Beyond

Recognizing the increasing attention to energy code adoption, education, and outreach efforts in New Hampshire, the national Building Code Assistance Project (BCAP) identified New Hampshire as one of the "Top Ten Places to Watch in 2010." BCAP notes that by 2030, if New Hampshire were to achieve 100% code compliance with the 2009 IECC, the state will save - each year - $31 million dollars, an estimated 3 trillion Btu of primary energy, and more than 200,000 metric tons of carbon dioxide emissions.[4] In New Hampshire, building codes are adopted by the State Building Code Review Board, which consists of licensed professionals such as master plumbers and residential building contractors. After a new code is adopted by the Board it is considered to be in effect, though the General Court must also concur with the Board's decision or the code reverts to the previous one.

Recommendations

- **Continue to work aggressively to achieve 90% compliance with the 2009 IECC, or better.** This will involve a wide range of activities, as noted below and addressed also (in great detail) in the *New Hampshire Gap Analysis Report* completed by the BCAP.[5]

  - **Urge the New Hampshire General Court to concur with the New Hampshire State Building Code Review Board's adoption of the 2009 IECC for residential buildings as well as the equivalent for commercial buildings**. The State Board has adopted the code but the General Court has not yet ratified the Board's decision. It is strongly recommended that the General Court confirm the decision of the Board in adopting the 2009 IECC (along with more than half of the United States). Buildings built in compliance with the code should experience average annual cost savings of 11.6% in climate zone 6 and 10.3% in climate zone 5 (where most New Hampshire residents live) compared to buildings constructed in compliance with the previous building energy code (the 2006 IECC.)[6] Climate zones use average conditions to determine levels of insulation and other efficiency requirements. The southern and coastal areas in zone 5 have relatively mild conditions and therefore, lower requirements. Previously, New Hampshire was considered to have one climate zone; the more rigorous northern zone was applied over the entire state, requiring a relatively higher level of efficiency in the southern countries.

  - **Adhere to and enforce the High Performance Building Code for state buildings**.[7] A new High Performance Building Code went into effect July 1, 2011 that requires new state buildings and major renovations to attain a higher efficiency standard than required by code. This standard will be reviewed and updated annually to ensure State buildings are using as little energy as practical and therefore saving taxpayers money. It is strongly recommended that this new code be adhered to and enforced.

[4] Building Code Assistance Project, "New Hampshire Code Overview." http://bcap-ocean.org/state-country/new-hampshire
[5] http://www.nhenergycode.com/live/code_docs/New-Hampshire-Gap-Analysis-Report.pdf
[6] ICF International, "ICF's Analysis of the Energy Savings achieved by the 2009 IECC," 2008. http://www.thirtypercentsolution.org/solution/ICF-data.pdf
[7] RSA 155-A:13 and Executive Order 2011-1, Item 8.

- **Encourage the use of more stringent building codes and state-of-the-art green building practices that go beyond current code.** The ongoing Build Green New Hampshire initiative promotes the National Association of Homebuilders' (NAHB) National Green Building Standard. Currently the NAHB standard is designed to achieve 15% savings over the 2006 IECC. This compares to the 2009 IECC, which is expected to result in about 12% savings compared to the 2006 IECC. As such, Build Green New Hampshire is supporting a standard that goes beyond what 2009 IECC is expected to achieve, which is terrific. That said, state of the art green building practices can achieve efficiency levels well beyond the NAHB Green Building Standard and the 2009 IECC. Standards and rating systems such as Home Performance with ENERGY STAR^R, Leadership in Energy and Environmental Design (LEED), Passive House, and the upcoming International Green Construction Code by the ICC encourage homes and other buildings that require significantly less energy than buildings built to code.[8] Ways to promote these higher standards include:

    - Allowing municipalities to adopt more stringent codes than the state;
    - Offering incentives for meeting one of the green building rating systems; and
    - Establishing an even more aggressive code than 2009 IECC. Several states have adopted optional stretch codes, which are then sometimes adopted as minimum energy codes by municipalities.

The State of New Hampshire allows municipalities to adopt stricter codes and at least one town has done so. Epping, New Hampshire passed Energy Efficiency and Sustainable Design standards in 2007.[9] The code awards points for orienting a building for passive solar gain, use of local and recycled materials, tight building envelopes, and installation of renewable electricity and heating systems. More points are required for larger building, an indication of their greater impact as well as larger budget and opportunity for advanced systems. Additionally, Durham adopted the more rigorous climate zone 6 of the 2009 IECC, and downtown Portsmouth has a floor area ratio incentive for buildings achieving LEED Certification.

12.3. Building Energy Performance Labeling in New Hampshire

In the fall of 2010, the New Hampshire Energy and Climate Collaborative (the Collaborative) formed a work group focused on thinking about ways to meet state goals for efficient buildings. One outcome was the creation of a Home Energy Sticker initiative which can help emphasize the energy efficiency of both new and existing buildings. The idea behind the initiative is to allow buyers to compare energy use among buildings, and to inspire consumers to value efficiency by making it more understandable and by demonstrating the economic savings that are possible. Building performance labeling can be an effective form of education and can help consumers make good buying and renting choices without needing to know building science. Positive labeling indicates achievement of a certain standard such as LEED or Passive House, while comparative labeling shows where the building falls within the range of other buildings. The work group coordinated with the NH PUC and the DOE and was successful in securing New Hampshire's role as a participant in DOE's Home Energy Score pilot program.

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[8] Information about ENERGY STAR for homes incentives and other efficient homes construction programs is presented in Chapter 4.

[9] Town of Epping Zoning Ordinance, Article 22 Adopted Town Meeting 2007 Energy Efficiency and Sustainable Design, http://ci.epping.nh.us/art%2022%20Energy%20Efficiency%20&%20SD%2010.pdf

An important design consideration in comparative labels is the choice of comparisons. Existing buildings of different ages and types, existing buildings after weatherization or a deep energy retrofit, new code-compliant buildings, new best practice buildings, and passive and net-zero buildings make up a large range of energy use for potential comparisons. Using consistent units such as dollars, which are easily understandable and/or kWh (which do not depend on the price of energy assumed in the analysis) allow people to comprehend some of the effect of building efficiency. Avoiding use of energy or dollars per square foot is also advisable, as that can mask the overall higher total energy use of larger residences and buildings. Well-designed graphics, such as the familiar ENERGY STAR label seen on appliances, can quickly convey the relative efficiency of a building. It is important not to confuse consumers with competing labels. There are already several successful labels that are well accepted in the market, as well as other labels with lower market penetration. The existing labels should be kept in mind when deciding on new labels or changes to existing labels. A thoughtful comparative label can be an effective strategy in New Hampshire to increase the desire for, and understanding of, building efficiency.

Recommendations

- **Use building energy labeling as a means for increasing energy efficiency of existing buildings.**
  - **Leverage New Hampshire's participation** in the national Home Energy Score pilot program and use the experience gained from the pilot program to continue and expand effective building labeling activities in New Hampshire.

12.4. Energy Code Training and Enforcement Infrastructure in New Hampshire

As part of the State's commitment to improving building efficiency through energy codes, there are several projects underway or recently completed that emphasize the need for continued work to develop the energy code training and enforcement infrastructure in New Hampshire. One is the *New Hampshire Gap Analysis* published by the Building Code Assistance Project.[10] Another is the Energy Code Challenge initiated by the New Hampshire Office of Energy and Planning (NH OEP). Each is discussed below.

Building Code Assistance Project

In the BCAP's *New Hampshire Gap Analysis*, the strengths and weaknesses of current building code adoption and implementation policies in New Hampshire are addressed, and 28 recommended actions are provided for the State, local governments, and others to increase both the training and enforcement infrastructure needed to achieve code compliance. The report provides important guidance to state and local officials interested in increasing energy code awareness and compliance. The report is very thorough and specific to New Hampshire. Given this, it was deemed not prudent to duplicate efforts in this study. Instead, the report is referenced in the recommendations below, as appropriate.

New Hampshire Energy Code Challenge

In 2010, the NH OEP hired GDS Associates (GDS) to conduct a survey of current code compliance and to create a plan to achieve 90% compliance with the 2009 IECC by 2017 (as required by DOE). Referred to as the Energy Code Challenge, NH OEP allocated $600,000 in ARRA funding for the program.[11] GDS

[10] http://www.nhenergycode.com/live/code_docs/New-Hampshire-Gap-Analysis-Report.pdf

[11] This is in addition to ongoing code education work being carried out by utilities and the Sustainable Energy Division of the New Hampshire Public Utilities Commission (NH PUC.)

had completed a code compliance survey previously in 2006, and once the ARRA-funded program started, they updated the survey for the Energy Code Challenge. Sixteen training workshops were held as part of the challenge in 2010 and sixteen more are underway in 2011 to educate code officials, contractors, appraisers, realtors, and designers about the 2009 IECC Energy Code. The daylong workshops are held at various locations throughout the state. Over 1,000 people had attended by mid-2011, indicating the extensive outreach resulting from the program. Information about the Energy Code, the workshops, and other educational resources is provided on the website, www.nhenergycode.com. Website resources are organized by audience (such as code officials, commercial builders, and homeowners) to enable ease of use. A public service announcement and other outreach methods are able being used to educate the public about energy codes. It is anticipated that such sustained consumer awareness efforts will create demand for code compliant construction and renovations, and for builders and code officials who are certified and who follow continuing education programs. Presently, the Energy Code Challenge is supported solely with ARRA funding and is not budgeted to be an ongoing program, post-ARRA funding.

Recommendations

- **Develop the ongoing energy code training and enforcement infrastructure necessary for ensuring code compliance.** Among other recommendations also noted in the *New Hampshire Gap Analysis Report*, this includes the following:

    - **Clarify roles and responsibilities for Energy Code enforcement** between the state and municipalities, and establish Energy Code compliance verification methods.

    - **Establish minimum certification and licensing requirements** for code officials and contractors.

    - Encourage partnerships between the state, trade associations, utilities, and contractors that result in **ongoing and periodic outreach, education, and training** for code officials and contractors.

    - **Provide code officials and inspection departments** with the training, tools, DOE materials, and other resources to improve energy code enforcement.

- **Continue outreach and education (post ARRA funding) that helps stimulate demand for energy efficient buildings and supports code compliance.** Continuation of periodic public outreach and education campaigns can stimulate demand for energy efficient buildings, and create market activity which results in increased code compliance. Continued outreach and education can also help encourage design and construction professionals to construct and market energy efficient buildings to distinguish themselves in the marketplace. And it may increase awareness among new stakeholders, as well. ARRA funding provided a special opportunity for New Hampshire to make huge progress in developing the training and infrastructure needed to achieve code compliance. Special attention to finding new funding mechanisms to support periodic training, outreach, and education for code officials, contractors, and others post-ARRA funding is recommended. This could be achieved in a variety of ways, including the following:

    - **Assess a permit or development fee** to pay for the ongoing infrastructure needed to ensure code compliance.

12.5. Conclusion and Summary of Recommendations for Building Energy Codes

New Hampshire has taken several steps and begun processes to improve the energy performance of new and renovated buildings. Following through with these efforts and keeping up with evolving building practice will save state residents millions of dollars, keep more money that is spent local, and increase building comfort and durability. An integrated approach to building codes includes effective policies for adoption, enforcement, and measurement of building performance and will result in optimal savings from efficient building practices. The *New Hampshire Gap Analysis* is an excellent tool to improve the performance of New Hampshire's buildings and is an important resource to guide future policy development in the state.

The Energy Code Challenge currently underway should result in a significant increase in awareness and understanding of the Energy Code. Newly invigorated implementation efforts including the www.nhenergycode.com website, public service announcements, and training workshops are important outreach and education strategies. That said, enforcing the code and achieving code compliance is more challenging and requires substantial effort to achieve. Municipal code officials are typically very busy, may not be familiar with the Energy Code, and may have limited time and resources to devote to verifying code compliance. It will take substantial effort over multiple years to develop a widely used and effective approach to code enforcement and verification in New Hampshire. Shared or regional code inspectors are one option for using the expertise of existing code officials while minimizing additional costs for verification. Funding for code officials and the training required for their role could potentially be raised, or at least offset, through permit and development fees. Continued consumer awareness is required to build the market for code compliant construction and renovation and so taxpayers understand the value of their local code officials. Presented in Table 12-1 is a summary of recommendations noted above.

Table 12.1. Summary of Building Energy Code Recommendations for New Hampshire

Continue to work aggressively toward 90% compliance with the 2009 IECC, or better *Recommendation 12.1; Section 12.2*
• Urge the General Court to ratify the 2009 IECC, and maintain the State Building Code Review Board's authority to adopt codes.
• Adhere to and enforce the new High Performance Building Code for state buildings.
• Encourage the use of more stringent building codes and state-of-the-art building practices that go beyond code ("stretch codes").
o Allow municipalities to adopt more stringent codes than the State's codes.
o Offer incentives for meeting a green building rating system and/or standard.
o Establish a more aggressive code (or standard) than 2009 IECC.
Use building energy labeling as a means of increasing energy efficiency in existing buildings *Recommendation 12.2, Section 12.3*
• Leverage New Hampshire's participation in the national Home Energy Score pilot program to continue and expand effective energy efficiency building labeling.
Develop the ongoing energy code training and enforcement infrastructure necessary for ensuring code compliance[12] *Recommendation 12.3, Section 12.4*
• Clarify code enforcement roles between the State and municipalities, and establish compliance verification methods.

[12] Many of these recommendations (and more) are also noted as important in the *New Hampshire Gap Analysis*.

•	Establish minimum certification and licensing requirements for code officials and contractors.
•	Encourage partnerships among the State, trade associations, utilities, and contractors that result in ongoing and periodic outreach, education, and training for code officials and contractors.
•	Provide code officials and inspection departments with the training and tools needed to improve code enforcement.
•	Provide code enforcement in unincorporated areas and jurisdictions.
Conduct Outreach and Education to Stimulate Demand for Energy Efficient Buildings *Recommendation 12.4, Section 12.4*	
•	Assess a permit or development fee to pay for the ongoing infrastructure needed to ensure code compliance (knowing that investment in code compliance pays back six times over savings).[13]

[13] Institute for Market Transformation, http://imt.org/files/FactSheet-EnergyCodeComplianceFunding.pdf

Chapter 13: State Government Leading by Example

13.1. Introduction

State Government (the State) is the single largest user of energy in New Hampshire. The State owns over 500 buildings and more than 2,600 vehicles. Building and process energy uses include office buildings, correctional facilities, hospitals, a veteran's home, the community college system of New Hampshire, liquor stores, Fish and Game facilities, State Police, wastewater treatment facilities, and Cannon Mountain. The vehicle fleet includes almost 1,000 medium and heavy duty trucks over 10,000 lbs. To heat, cool, electrify, and fuel these buildings and vehicles, it cost the State of New Hampshire over $22 million in 2010. Presented below is a discussion of energy efficiency and sustainable energy initiatives underway by State Government in New Hampshire as well as recommendations for enhancements in the future. Emphasis is placed on the important role State Government can play in stimulating development of energy efficiency and sustainable energy markets in New Hampshire.

13.2. State Government Energy Policies, Programs, and Initiatives

New Hampshire State Government has demonstrated a strong commitment to energy efficiency and sustainable energy in numerous and diverse ways. In Executive Order Number 2011-1, issued in April 2011, Governor Lynch reiterated the goal established in RSA 21-I:14-c to reduce fossil fuel use in New Hampshire by 25% from 2005 levels by the year 2025. The Executive Order also sets goals of reducing greenhouse gas emissions to 25 percent below 1990 levels by 2025 and to 80% below 1990 levels by 2050. In addition, a variety of ambitious goals, policies, and practices are established that continue an already impressive record of energy savings by State Government. These include, for example:

- The State of New Hampshire shall work towards reducing fossil fuel use in its facilities by 25% over 2005 levels on a square foot basis by 2025.[1]

- Participation in the New Hampshire Energy and Climate Collaborative, a partnership of government, utility, non-profit, and business and industry, which seeks to meet the goals set forth in the *2009 New Hampshire Climate Action Plan*.

- The establishment of an Interagency Energy Efficiency Committee (IEEC) which is the lead sponsor of the *Climate Action Plan*. The IEEC also promotes the Building Energy Conservation Initiative (BECI) which uses performance contracting to identify and finance energy improvements.

- Implementation of an innovative Request for Proposal process proposed by the New Hampshire Climate Change Collaborative that makes state energy use data available to the public, so that businesses with expertise in energy efficiency and sustainable energy could identify, propose, fund and implement projects designed to reduce energy use. This plan will build on and augment the BECI. The goal is to foster entrepreneurial solutions as opposed to soliciting prescribed solutions. The IEEC is now looking to implement this new idea.

- An order for all agencies to work with the State Energy Manager to implement energy efficiency and cost savings measures.

[1] Chapter 328 Laws of 2010 (SB73).

- The requirement that all Agencies and Departments track energy and water usage in order to benchmark their facilities' usage, and to develop a plan to reduce use.

- The requirement that all new equipment purchases (such as office equipment, appliances, lighting and HVAC) must be ENERGY STAR® rated.

- The requirement that all new construction projects be built to the High Performance Building Code, and shall consider installing renewable energy generation where practical.

- A Clean Fleet vehicle purchasing policy is in effect that requires minimum mileage and emissions standards.

- The New Hampshire Department of Environmental Services (NH DES) runs an alternative fuel, advanced technology program that seeks to reduce fuel use and emissions through alternative fuels, lighter vehicles, reduced idling, tire pressure optimization and other measures.

- NH DES and the New Hampshire Department of Transportation (NH DOT) have partnered with ten other eastern states to form the Transportation Climate Initiative, which seeks to reduce emissions from the transportation sector through land use decisions, alternative vehicle infrastructure improvements, and reduction of congestion and freight improvements.

- Participation in ISO New England's demand response program which pays for the capacity of customers to reduce demand when necessary in response to peak regional loads. The demand response money is dedicated to invest in new energy efficiency projects.

- A Dark Skies initiative designed to reduce the unnecessary use of and waste from streetlights.

- A partnership with NHSaves and local hardware stores to hold Change a Light/Change the World events at state agencies to promote the use of efficient lighting.

- The sponsorship of Energy Fairs at industrial or business facilities to promote efficient equipment. Typically two have been held per year, and have been in partnership with local vendors of equipment and the host business.

13.3. State Government Energy Savings To Date

New Hampshire State Government has undertaken a wide range of activities over the last six years, since setting the goal in 2005 of reducing energy usage in State buildings by 10% per square foot. The State achieved, and exceeded that goal, and has reduced energy use on a square foot basis by 16% thus far.[2] Examples of the projects completed include: lighting, lighting controls, street lights, boiler replacement, commercial clothes washing machine replacements, and various plug load measures. The efficiency projects saved a total of $3 million between 2005 and 2010, and will continue to save energy and taxpayer money for every additional year the measures are in place. In addition to efficiency projects, the State has entered into a contract with a multi-fuel energy marketing company to ensure that at least 25% of electricity purchased by the State will be derived from renewable energy sources.

[2] Energy Management Annual Report, November 2010, http://admin.state.nh.us/EnergyManagement/index.asp

Table 13.1. New Hampshire State Government Building Square Footage and Energy Use

Area in Square Feet		Total kBTU			Energy Use per Sq Ft		
2005	2010	2005	2010	% Change	2005	2010	% Change
7,811,035	8,675,030	977,558,319	921,828,350	-5.7%	120	101	-15.8%

Table 13.2. New Hampshire State Government Energy Costs

Energy Cost per Sq Ft			Total Energy Cost		
2005	2010	% Change	2005	2010	% Change
$ 1.95	$ 2.37	21.5%	$ 16,370,418	$ 22,007,230	34.4%

About $10.7 million of the ARRA funds received in New Hampshire from the federal government are being used for energy improvements to state buildings as part of the State Building Energy Efficiency and Renewable Energy Program. The improvements include boiler and chiller replacement, window and insulation upgrades, and a wood chip heating and cogeneration project. These projects will contribute greatly to future savings and will help meet energy reduction goals. An additional $2.6 million in ARRA funds went to energy efficiency projects at the University of New Hampshire's three campuses and to the seven campuses of the Community College of Southern New Hampshire. By investing in energy efficiency and sustainable energy projects for state facilities and operations, New Hampshire helps support growth and development of efficiency and sustainable energy markets in the state. By purchasing efficient equipment and sustainable energy technologies from local vendors, the State uses its purchasing power, demonstrates to others that the technology is available, and proves that there is a qualified and experienced installation infrastructure available to complete projects.

13.4. The Economic Impact of Energy Efficiency and Sustainable Energy Improvements

As with other New Hampshire consumers, State Government relies on imported fossil fuel for a majority of space heating, 41% of electricity generation, and all transportation. Since New Hampshire has no oil, gas, or coal reserves or production, these expenditures create a drain on the state economy. As noted in a recent article, in 2008 New Hampshire purchased $79 million in coal from Columbia and Venezuela alone.[3] In addition, a portion of fuel oil used in the state is imported from Canada and the Mid-East. There is a direct link between projects that result in savings of both fossil fuels used for heating and electricity, and a reduction in the amount of money sent out of state through the purchase of fossil fuels. Simply put, State Government efficiency and sustainable energy projects reduce expenses paid for with taxpayer dollars, and keep more taxpayer money in New Hampshire overall.

Perhaps the flagship of public-private collaboration in sustainable energy development in New Hampshire is the wood chip heating and cogeneration plant owned by Concord Steam Corporation. The plant is located adjacent to the former State Hospital Complex and provides heating to 200 commercial, institutional, and State Government buildings in downtown Concord as well as electricity to the grid. The plant uses wood chips, construction waste, recycled waste oil, and natural gas to produce steam. The plant consumes about $8 million per year of wood fuel, most of which is procured from New Hampshire. The energy is distributed to end users through a district heating system, including State Offices located off of

[3] Nashua Telegraph: http://www.nashuatelegraph.com/news/742706-196/report-psnhs-use-of-coal-drains-green.html

South Fruit Street. The State intends to support the construction of a new, more efficient Concord Steam wood-fired cogeneration plant through a long term power purchase agreement in the future.[4]

13.5. Recommendations and Conclusions

Building upon Executive Order 2011-1, and the State's track record of saving tax payer dollars through efficiency and sustainable energy projects in State Facilities, New Hampshire State Government is poised to continue leading by example. In doing so, the State can have a large impact on future efficiency and sustainable energy market development in New Hampshire, and can help open up markets for public and private entities. Overall the State is doing an excellent job on a number of fronts to reduce energy use, reduce emissions, and save taxpayer money. Presented below are recommended enhancements that would build upon the successes to date.

- **Achieve full implementation of Executive Order 2011-1.** This is not only good business, but it will save tax payers money as well.

- **Educate and inform the public.** As noted in the goals of the New Hampshire Office of Energy and Planning (NH OEP): "NH OEP's intent is to demonstrate the State's progress in reaching energy efficiency goals, and doing so with measures that are duplicable by other public and private entities."[5] The state can be a leader and mentor in energy efficiency and sustainable energy for the private sector in New Hampshire. To do this effectively will require a long-term sustained effort directed at improving state facilities and operations, which is already happening, and an extensive outreach and education effort focused on telling the state's story. The State should celebrate and promote its energy efficiency and sustainable energy achievements, and in so doing help stimulate market demand in New Hampshire. In the future, the NH OEP plans to conduct outreach through at least 20 media exposures including stories in newspapers, on the radio, and on television. In addition, the State may seek to hold open houses to show off their projects and to develop case studies sharing their lessons learned.

- **Leverage purchasing power.** The State purchases a lot of equipment due to its sheer size. This purchasing power can be leveraged to gain favorable pricing and to transform markets. Some state governments have negotiated group discounted pricing for items such as low wattage fluorescent lamps and high performance ballasts. This is achieved by putting out an RFP for bids and selected a qualified (and typically lowest bidder) to be the exclusive distributor for a predetermined length of time. In some cases, municipalities and public schools are also eligible to take advantage of this discounted pricing, further promoting the purchase of energy efficient equipment.

- **Promote residential efficiency to state workers.** Opportunity also exists for the state to promote residential efficiency programs to State workers through outreach and education. The state could sponsor and host events for employees to promote taking action at home. Increased partnering with the utilities to promote residential efficiency programs could benefit all parties. New Hampshire has over 25,000 State employees, including 16,000 full and 9000 part time employees.[6] The total number of residential customers who participated in the electric utility programs in 2010 was about 3,700. If even a portion of State employees took action to save energy as the result of State outreach efforts, it could have a big impact on the overall number of households engaged in energy efficiency improvements throughout New Hampshire.

[4] Information provided by the NH PUC.
[5] Office of Energy and Planning website: http://www.nh.gov/oep/recovery/sep_programs/state_building_eerep.htm
[6] US Census data, revised January 2011: http://www.census.gov/govs/apes/index.html

- **Extend maximum performance contract terms.** The current state law limits performance contract terms with State Government to ten years. This limits the scope of larger projects which may have paybacks of ten years or more, but which are cost effective. Renewable energy projects and boilers or chillers are examples of large energy users/producers with long lifetimes. While the state makes effective use of performance contracting through the Building Energy Conservation Initiative, and plans to do more with the proposed new RFP initiative, even more and bigger projects will be eligible with a longer contract term.

- **Work in close collaboration with the utilities.** The recent influx of ARRA money has provided capital for a number of ambitious energy efficiency and renewable energy projects. But now that the ARRA funds have been allocated and spent, the State should continue to work closely with the CORE energy efficiency programs administered by the electric and gas utilities.

Presented below is a summary of these recommendations noted above.

Table 13.3 Summary of Recommendations for State Government

Achieve Full Implementation of Executive Order 2011-1	*Recommendation 13.1; Section 13.5*
Educate and Inform the Public	*Recommendation 13.2; Section 13.5*
Leverage State Government's Purchasing Power	*Recommendation 13.3; Section 13.5*
Promote Residential Efficiency to State Workers	*Recommendation 13.4; Section 13.5*
Extend Maximum Performance Contract Terms	*Recommendation 13.5; Section 13.5*
Work in Close Collaboration with Utility Energy Efficiency Programs	*Recommendation 13.5; Section 13.5*

Chapter 14: Conclusion

New Hampshire has a broad array of energy efficiency and sustainable energy policies, programs, and initiatives in place that are helping residents, businesses, industries, government, and other institutions lower their energy bills and diversify their energy supply to include more indigenous and sustainable energy sources. This study confirms there is great interest throughout the state among many diverse stakeholders in continuing to increase energy efficiency and increase reliance on indigenous, sustainable energy resources. The numerous and impressive efforts already under way provide an important framework for the future. New Hampshire has the potential to provide even greater benefits to its citizens and communities in the future by further developing energy efficiency and sustainable energy markets in the state. By continuing along this path, New Hampshire can:

- Reap even more economic benefits from further developing the clean economy in the state;
- Reduce reliance on imported fossil fuels even further;
- Continue to diversify its energy mix; and
- Benefit from the quality of life and health benefits of more efficient and cleaner energy use.

Presented below is the study team's assessment of the current energy policy context in New Hampshire followed by the seven steps (or actions) recommended by the team for New Hampshire. The seven steps represent the most important overarching policy-level recommendations resulting from this study, for consideration by the Legislature, the Executive Branch, the Public Utilities Commission, and other state entities. The seven steps focus on areas of opportunity for improvement in energy policy that will make a significant and lasting difference to the citizens of New Hampshire, and to the state's energy future. The steps highlighted below draws upon numerous conclusions and recommendations presented previously in each chapter for the key areas reviewed and assessed in this study. While all of the recommendations in this report are important, the seven steps highlighted below are the foundational "must dos" that are the critical strategic steps required, if New Hampshire is to be successful in truly developing and transforming energy efficiency and sustainable energy markets in the state. The remaining more "granular" and program- level conclusions and recommendations discussed in the preceding Chapters are largely directed at those charged with administering and implementing the array of programs and initiatives resulting from state energy policies.

The Policy Context in New Hampshire Today

New and exciting opportunities exist for the State of New Hampshire to play a leadership role in advancing energy efficiency and sustainable energy development and use. The study team recognizes that despite all of the initiatives under way – many with governmental and regulatory support and funding – there is ongoing uncertainty in New Hampshire among some policy leaders about the appropriate role of government in helping to grow these markets. This uncertainty results in some significant barriers in New Hampshire to increased energy efficiency and sustainable energy development and use including a:

- **Lack of a single, clear overarching policy** to guide energy efficiency and sustainable energy regulation, public investments, and market development in New Hampshire;

- **Level of regulatory and programmatic complexity** that is actually holding back development of markets.

- **Lack of consistency and coordination among program offerings** and in the education and outreach done to market the programs; and

- **Lack of funding** that is adequate, sustained, and focused on investments that will fully develop and ultimately transform markets for energy efficiency and sustainable energy.

For the ratepayer-funded, utility-administered energy efficiency programs, New Hampshire has more than a decade of experience that provides the foundation to address these issues in the future. As noted in the utility restructuring legislation passed in the 1990s that inspired the first generation of regulated efficiency programs in the state:

> **"Restructuring should be designed to reduce market barriers to investments in energy efficiency and provide incentives for appropriate demand-side management and not reduce cost-effective customer conservation. Utility sponsored energy efficiency programs should target cost-effective opportunities that may otherwise be lost due to market barriers."**[1]

Subsequently, in November 2000 the New Hampshire Public Utilities Commission further articulated its views as follows:

> **"The most appropriate policy is to stimulate, where needed, the development of market-based, not utility sponsored and ratepayer funded, energy efficiency programs, a principle that the Legislature incorporated into RSA 374-F… We believe that efforts during the transition toward market-based [demand side management] programs should focus on creating an environment for energy efficiency programs and services that will survive without subsidies in the future... We cannot emphasize enough our belief that these programs must complement the new energy markets and not hinder their development."**[2]

This Order and the thinking embedded in it are more than ten years old. It articulates the belief (at least at that time) that public involvement in energy efficiency markets may be a questionable "interference" in the markets that would otherwise find their own way to broad adoption of efficiency without "subsidies." This approach tends to preclude discussion of how sustained, systematic, and intelligent investment in energy efficiency markets can actually contribute to developing those markets. This approach is considered dated now, based on subsequent market development and transformation success that has been achieved in other jurisdictions since 2000.

The underlying assumption in the November 2000 PUC Order issued in November 2000 (and repeated in some subsequent Orders) appears to be that markets should (and will) provide efficiency services on their own, and that the first goal is to avoid interfering with that market process.[3] However, somewhat ironically, the state has tended to allow the utilities to implement programs that for the most part have not been designed or implemented with a strong market orientation. Rather, the regulated programs thus far in New Hampshire have been mostly focused on resource acquisition, with some but not maximum impacts on long-term market development and market transformation.

[1] RSA 374-F:X Electric Utility Restructuring, 1996.

[2] New Hampshire Public Utilities Commission, Order No. 22,875

[3] We note that in the last two orders issued approving Core Programs it is the actual language of RSA 374-F:X, not the language in Order No. 22,875, that is cited by the Commission.

The result is that while the NH PUC has continued to approve efficiency CORE Program funding at a relatively stable rate, there is little focus on fundamental questions such as:

- **Do the savings goals represent the appropriate level of effort for New Hampshire efficiency markets?**
- **Are these programs helping develop and mature the energy efficiency markets in New Hampshire? Are they evolving over time to support the goal of market transformation?**
- **Are the programs gaining savings efficiently and reaching all market sectors?**
- **Are robust evaluation, monitoring, and verification programs in place to ensure continuous program improvement?**

It is these questions that regulators must use to guide a serious market development approach for the utility efficiency programs. Recent statements by the Commission, including a recent report to the Legislature on the System Benefits Charge ("SBC"), begin to signal a possible shift in approach:

> **"Two principal Goals, cost-effective energy savings and transforming the market for energy efficient measures, continue to guide program design though demand response also is important due to significant increases in peak load growth and the potential capacity payments for eligible demand resources."[4]**

This shift is important because, as noted previously, it is widely recognized that there are real and pervasive market barriers and market failures that warrant strategic intervention in energy efficiency and sustainable energy markets nationwide. A recent study of Energy Efficiency Resource Standards (EERS) documents the evolution of energy efficiency policy among U.S. jurisdictions and identifies how leading states have moved to aggressive energy efficiency investment strategies.[5] The evidence is substantial that these markets will not "automatically" figure out how to maximize energy efficiency benefits for consumers. Instead, regulators must help utilities and other stakeholders design and implement strategic programs that help grow, and sometimes create, energy efficiency markets.

It is critically important for regulators to be precise in defining and overcoming market barriers by supporting adoption of appropriate strategies to address them for each market segment. The point of the programs and interventions should be to develop, engage, and help mature the markets**.** A lack of clarity about just what the rules of engagement are for New Hampshire programs and investments inhibits the focus needed on performance and progress on market development.

Research and assessment of energy efficiency and sustainable energy activity in New Hampshire, and in other states across the country, leads the study team to recommend the following approach for informing energy efficiency and sustainable energy investment going forward:

- The primary justification for conducting energy efficiency and sustainable energy programs, services, and other market interventions should be that the **actions help to develop markets and overcome deeply embedded market failures (such as too much or unreliable information, complex decision-making processes, lack of adequate capital, and**

[4] Report to the Legislative Oversight Committee, October 2020, p.2
[5] Energy Efficiency Resource Standards: State and Utility Strategies for Higher Energy Savings, by Seth Nowak, Martin Kushler, Michael Sciortino, Dan York and Patti Witte, published June 2011, Report Number U113, ACEEE.

split incentives) that prevent traditional markets from optimally delivering energy efficiency and sustainable energy.

- Investments must **result in both near-and long-term benefits** to consumers, communities, and the New Hampshire economy. With energy efficiency the challenge is often to gain acceptance of measures that are already cost-effective. With sustainable energy the challenge is to gain market acceptance and build capacity that will drive costs down.

- If efficiency and sustainable energy services are not meeting these standards, they should be **re-focused to do so**. Where the market is already working well, direct intervention should be strategically reduced and phased out. Strong evaluation, measurement, and verification (EM&V) are critical components of achieving this.

- **New products and savings opportunities should be continuously identified** and strategic focus should give them priority, support, and adequate funding.

Formally committing to the goal of developing dynamic energy efficiency and sustainable energy programs that provide benefits to consumers, businesses, and the economy can unleash innovation and a dramatic mobilization of resources. New Hampshire can lower customer bills, improve reliability, reduce reliance on fossil fuels, and grow the state's economy. Presented below are the seven most important next steps recommended by the study team for New Hampshire. They feature policy level recommendations for consideration by the Legislature, the Executive Branch, the Public Utilities Commission, and other state entities, drawing upon the more program-focused conclusions and recommendations in preceding Chapters of this report.

Step 1 – Refocus and Clarify the State's Energy Policy Direction

Despite a long history of legislation and many regulatory dockets concerning energy issues, New Hampshire lacks a clear over-arching policy direction for both energy efficiency and sustainable energy efforts. While there are a variety of programs and initiatives under way in multiple sectors, the lack of a clearly articulated policy hampers efforts to have a sustained, coordinated, adequately-funded approach that results in full market development and steadily increasing consumer benefits.

Energy Efficiency

- **Review multiple energy policy statements developed over the years and enact a single, comprehensive, energy policy statement that provides clear policy direction for energy efficiency.** While there is language in RSA 378:37, the so called New Hampshire Energy Policy passed in 1990, that approaches this recommendation, it lacks the linkage to specific governmental and regulatory actions that is an essential component of an effective policy framework.[6] An overarching policy should:

    - Shape the direction of future electric and gas regulation;
    - Address the efficiency of delivered fuel usage;
    - Inform public policy across state and local governments;
    - Promote coordination of energy efficiency efforts and initiatives; and

[6] **378:37 New Hampshire Energy Policy –** The general court declares that it shall be the energy policy of this state to meet the energy needs of the citizens and businesses of the state at the lowest reasonable cost while providing for the reliability and diversity of energy sources; the protection of the safety and health of the citizens, the physical environment of the state, and the future supplies of nonrenewable resources; and consideration of the financial stability of the state's utilities.

- Provide clear and consistent policy signals to the growing energy efficiency and sustainable energy markets in New Hampshire.

A sample policy for consideration in New Hampshire is presented on an accompanying page.

- **Enact a general policy of support for sustainable energy.** While there is language in the Purpose statement for the New Hampshire Renewable Portfolio Standard law that articulates the value of stimulating investment in renewable energy,[7] there is currently no general legislative policy outlining the state's support for this sector more broadly. Although the Governor has articulated a broad goal in his "25 by 25" Executive Order, it is strongly recommended that an overarching legislative policy be enacted that outlines the state's support for activities that encourage investment in sustainable energy across the spectrum of implementation strategies and renewable fuel sources. This policy should identify the value to the state of sustainable energy investment to:

    - Support New Hampshire's economy, including local economies that have significant natural resources;
    - Promote resources that serve to displace and thereby lower regional dependence on fossil fuels;
    - Improve air quality and public health;
    - Mitigate against the risks of climate change;
    - Contribute to lower and more stable future energy costs; and
    - Keep jobs and ratepayers dollars in the state.

While all of these goals may have informed adoption of the RPS in New Hampshire, they are not clearly stated to guide its ongoing implementation and to shape the other initiatives that are needed to reach a high adoption rate for sustainable energy resources. The sample policy presented in the accompanying page seeks to accomplish this (as well as the energy efficiency objectives noted above).

Step 2: Develop Clearer Regulatory Guidance

Once there is a single, clear, and comprehensive energy policy enacted as legislation that addresses both the energy efficiency and sustainable energy policy direction for New Hampshire, the VEIC study team recommends clearer regulatory guidance confirming how the state will carry out the intent of the legislation. These should include a combination of:

- An Energy Efficiency Resource Standard (EERS);
- A Least Cost Procurement requirement (LCP);
- Continuation of the System Benefits Charge (SBC), ideally at a higher level, guided by the EERS and LCP policies; and
- Modifications to the existing Renewable Portfolio Standard (RPS).

This combination of new and/or modified regulatory guidance would provide clearer and more consistent direction to utilities, project developers, and stakeholders, and would likely result in more proactive, ambitious, and innovative approaches to further developing the marketplace for energy efficiency and sustainable energy in New Hampshire.

[7] RSA 362-F: Electric Renewable Portfolio Standard, 2007.

- **Adopt a new Energy Efficiency Resource Standard (EERS)** that either sets specific efficiency targets for the state over multiple years, or establishes a clear mandate for setting such targets on a recurring basis and directs state regulators to ensure that process occurs. Combined with the clear policy statement discussed above, this action would:
    - Provide further clarity about the role and mandate for utilities in efficiency activities;
    - Decrease regulatory uncertainty about how far and how fast utilities should be investing in energy efficiency; and
    - Create a clearer context for stakeholder input during program design and budget planning cycles. Discussions can then focus on how best to meet the stated goals, rather on than whether there should be goals, or what the goals should be. Stakeholders can focus on what resources are needed to accomplish the goals, whether implementation activities are as efficient and effective as possible, and how the state can leverage more resources to go even further.

Leading efficiency efforts in the U.S. are currently yielding savings from 1.5 to 2.5% of annual utility sales, while currently New Hampshire is yielding savings of about 0.6-0.8%. A national review and assessment of how Energy Efficiency Resource Standards (EERS) are stimulating efficiency investment in the U.S. provides useful information and guidance for New Hampshire.[8] Two types of state implementation efforts are defined in the assessment, both of which can result in energy savings increases that double or even triple current savings levels. The first is "Established Saver" states that are already performing at a high level of energy efficiency savings. The second is "Rapid Start" states that are planning for rapid acceleration of savings, even though they may not have the benefit of long-established programs to build upon.[9,10] The assessment notes that in addition to having an EERS in place, both Established Saver states and Rapid Start states are using four key strategies for developing and transforming energy efficiency programs. These states are:

- Establishing supportive utility regulatory guidance and direction;
- Establishing complementary policies to capture non-program savings;
- Involving stakeholders in collaborative processes for program development and implementation; and
- Increasing program funding.

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[8] An EERS can be in the form of a specific legislatively adopted energy efficiency savings targets for utilities, or in the form of a clear mandate for "Least Cost Procurement" ("LCP") that requires ongoing acquisition of all energy efficiency that is "lower cost than supply."

[9] While the terms "market barrier" and "market development" are used in discussion of both energy efficiency and sustainable energy markets, it should be acknowledged that there are differences between the two types of markets. In general, efficiency resources as they are identified in current program practice refer to measures that are already demonstrably cost-effective and lower cost than alternative sources of supply. The challenge is to identify the barriers and move the efficiency measures to greater market acceptance, and ultimately full market penetration. With sustainable energy, these resources (solar, wind, biomass, etc.) are valued for potential environmental, economic, and price stability attributes. They may cost more than current market prices (which also often have embedded subsidies in them) and the goal of market intervention is to drive costs down by improving market acceptance, supporting technology innovation, and recognizing other benefits that may be external to market pricing structures. As such it may not be clear that such measures are "least cost" at the present, but the assumption is that their potential value warrants support for product improvement and deployment. In the case of sustainable energy investments the challenge is to provide efficient and effective strategies that support sustainable market development and state development goals.

[10] "Many of these new state EERS policies have established energy savings requirements that are quite challenging. In some cases, well-established programs must double or even triple historical savings. In other cases, states with relatively little historical experience with large-scale energy efficiency programs have established similarly large energy savings goals over time (e.g., as much as 1.5% or 2% savings per year after a period of ramp-up.) (ACEEE, Executive Summary, p.iii)

To achieve these goals, five significant strategies are identified that utility or program administrators in other jurisdictions are using to meet the new Energy Efficiency Resource Standards:

- Identifying and prioritizing targeted technologies and end uses;
- Developing programs capable of delivering "deep" savings first, then seeking "broad" participation;
- Creating programs for new and emerging technologies;
- Extending portfolios with programs to reach new and under-served markets; and
- Taking on innovative advertising and promotional channels and increasing incentives to raise customer participation.

New Hampshire is not identified in the national assessment as being either an "Established Saver" state or a "Rapid Start" state. The study team is persuaded that adopting an Energy Efficiency Resource Standard (EERS) is essential for enabling New Hampshire to expand the level and scope of its energy efficiency investment, consistent with mobilizing markets. The challenge of establishing through an EERS just what the ramp-up to higher levels of energy efficiency investment should be is the appropriate discussion once a clear overarching state energy policy is established.

- **Enact a Least Cost Procurement (LCP) requirement** that directs utilities to procure the least cost strategies for meeting customer energy needs. Such a requirement would direct utilities to acquire the most cost-effective energy resource for their customers, be it traditional energy supply or demand-side management. Meeting energy needs by reducing demand typically costs a third less than by generating power.[11] Therefore, in effect, a least cost procurement requirement would result in utilities pursuing all cost effective energy efficiency, up to the cost of supply. Least cost procurement legislation in New Hampshire would likely stimulate a major increase in energy efficiency investments, while also maintaining profitability for energy delivery companies. Under a LCP approach, the budget available for utility-administered energy efficiency programs would not be limited by the System Benefits Charge but would also be determined by what is deemed achievable and cost effective for the utility to invest in.[12] To establish a least cost procurement approach in New Hampshire, the first step would be to pass legislation establishing LCP as the policy of the state and directing the utilities to procure energy accordingly. Current legislation falls short of providing such clear and specific direction. The legislation should clearly indicate which entity will be charged with determining the cost of supply. The next step would be to draw upon experience from neighboring states and others with prior experience with least cost procurement to establish sound regulation relating to regulatory incentives, proper rate setting, etc. in order to ensure that efficiency opportunities are maximized and utilities remain profitable while pursuing those opportunities.[13]

- **Increase the System Benefits Charge (SBC)** to enable additional investment in energy efficiency in a manner that appropriately supports both an Energy Efficiency Resource Standard and Least Cost Procurement. Revenue generated from the SBC should continue to be used to support energy efficiency and economic assistance services, following the structure and approach currently in place in New Hampshire in which a portion of SBC revenue provides bill paying assistance to low income customers, while the balance supports the regulated energy efficiency

11 The Case for Least Cost Procurement in New Hampshire Natalie Hildt, Manager of Public Policy Outreach Northeast Energy Efficiency Partnerships, 2009

12 Maximizing Energy Efficiency as a Resource in New Hampshire: Leveraging Rate Structures and Capturing all Cost Effective Efficiency Natalie Hildt, Manager of Public Policy Outreach Northeast Energy Efficiency Partnerships, November 2009

13 The Case for Least Cost Procurement in New Hampshire Natalie Hildt, Manager of Public Policy Outreach Northeast Energy Efficiency Partnerships, 2009

programs.[14] The intent in this recommendation is to not modify that structure, but to increase the pool of resources available to fund that structure. The SBC in New Hampshire currently accounts for an estimated $1.98 per month on a typical residential electric bill[15] and generates approximately $35 million per year in revenue.[16] A calculation of the net benefits of energy savings resulting from the regulated efficiency programs indicates $90 million worth of societal benefits annually as a result of the programs. This includes customer savings, avoided generation, reduced transmission and distribution costs, quantifiable resource conservation impacts (reduced water use, etc.), and an adder for non-quantifiable benefits (e.g. environmental, public health, and other benefits).[17] This indicates positive net societal benefits from current investments in energy efficiency in New Hampshire, and provides the basis for recommending an increase in the SBC in the future.

- **Update New Hampshire's Electric Renewable Portfolio Standard (RPS)** to supports in-state market development, consider all mechanisms to support a fuel-neutral RPS, and adopt such a mechanism to ensure the full range of renewable and sustainable energy sources are eligible for both electric and thermal energy production.

- **Establish a permanent source of long-term funding for sustainable energy support.** At the current stage of New Hampshire's markets, further development based on investment in sustainable energy will not occur at the levels necessary to benefit the state without a long-term, permanent source of funding to support market development. It is strongly recommended that a long-term, stable funding source be established for sustainable energy investment, to serve as leveraged funding through the mechanisms currently in place, and to enhance future development. Sources of funding could include, for instance, allocating a portion of RGGI funds, or using a portion of Forward Capacity Market proceeds.

Step 3 – Improve the Regulatory Environment and Modify Performance Incentives

Energy Efficiency

As discussed in detail in Chapter 9: Utility Performance Incentives Review and Assessment, while the current utility performance incentive structure for CORE program delivery has a number of positive attributes, the current system and its mode of operation does not promote securing high and increasing levels of efficiency savings, and it does not facilitate full development and transformation of energy efficiency markets. If New Hampshire sets more clear policy guidance and more aggressive goals such as an EERS some modification and re-design of the performance incentive will be warranted..

- **Move carefully to greater decoupling of utility revenues**. Once an Energy Efficiency Resource Standard and Least Cost Procurement are in place, New Hampshire should continue to

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[14] The System Benefits Charge for electricity produces funds that are typically characterized in terms of mills (one-tenth of a cent) per customer kWh of use. In New Hampshire, 1.8 mills (.018 cents) per kWh is the rate allocated to regulated energy efficiency programs, and 1.5 mills to the Electric Assistance Program (EAP). In 2010, New Hampshire Senate Bill 300 directed the NH PUC to temporarily increase the EAP portion of the SBC from 1.5 mills to 1.8 mills per kWh and the energy efficiency SBC share was reduced from 1.8 mills to 1.5 mills per kWh. The re-allocation of funds expired on June 30, 2011, and reverted to the prior rates.

[15] Assumes 600 kWh monthly household consumption.
http://www.puc.nh.gov/Electric/REPORT%20on%20SBC%20TO%20THE%20LEGISLATIVE%20OVERSIGHT%20COMMITTEE%20Final%20October%202010.pdf

[16] EIA Electric Power Annual Report 2009 reported electric sales of 10,698,493 MWh multiplied by SBC charge of $0.0033 per kilowatt-hour (kWh)

[17] Present value of total benefits as reported in Attachment D-G and Exhibit B of the 2011-2012 Core Electric Energy Efficiency and Natural Gas Efficiency Programs..

make progress in decoupling utility revenues from their electric sales. This helps remove the disincentive that the current regulatory system creates for utilities to reduce sales through energy efficiency, net metering, or combined heat and power (CHP). Because energy efficiency investment, net metering, and CHP installations can have the effect of decreasing sales, decoupling strategies help ensure utility companies have the ability to meet fixed costs and earnings targets despite lower sales volumes. In New Hampshire, the current decoupling provision is discretionary and there has been little advancement in this important policy area. The study team believes strongly that it is essential that any further considerations of "revenue decoupling" take place in a context in which an aggressive EERS is adopted and thoughtfully implemented. The team is not persuaded that simply offering more performance incentives or offering the risk mitigation afforded by "decoupling" will motivate utilities to aggressive efficiency implementation in the absence of a clear mandate to do so.

- **Establish a formal and structured collaborative process for developing new program plans and budgets.** It is recommended that a focused, efficient, collaborative process be instituted with technical support from an independent third-party with knowledge and expertise in developing program investment strategies that result in mature and robust markets. It is recommended that this process not be held in an adjudicated setting, to simplify and streamline the planning and collaboration work, and to minimize legal costs for participating parties. In the collaborative context, utilities should be expected to be thinking not just about how to meet this planning cycle's goals, but also about what it will take to meet higher goals in the future.[18] This collaboration would focus on the filing of long term and annual plans with state regulators, would draw upon current committees and working groups, and would increase the impact and focus of those groups. Once the proposed program plan is developed through the collaborative effort, then it can be proposed and reviewed through the adjudicated regulatory process. Experience in other jurisdictions indicates that when done well, a structured, professionally managed, collaborative approach to utility energy efficiency program goal-setting, program design, and program budgets results in a broader consensus among parties and less regulatory complexity.

- **Ensure that program goals are aggressive, and that there is a sustained commitment to meeting the goals and increasing the goals over time**. This is important in New Hampshire. While utilities have demonstrated a sustained commitment to meeting program goals, goals for next year's program are sometimes set below what was actually achieved the following year. In jurisdictions with the most effective regulatory and programmatic structure, typically program goals increase over time, and are set beyond what was actually achieved in previous years. Experience in high-performing energy efficiency markets indicates that in exchange for having aggressive and increasing goals to achieve, utilities should have significant flexibility to adjust programs and respond to improved understanding of the markets, new products, new costs, and new opportunities.

- **Strengthen the performance-based approach to implementation of energy efficiency programs** by the regulated utilities, and ensure utilities have the proper incentives for meeting aggressive program and market development goals. Currently, New Hampshire's performance incentive can be anywhere from 0-12% of utility efficiency spending, and is tied to

[18] The study team has found that as utility energy efficiency and sustainable energy strategies move to market development and transformation approaches, there is need for a longer-term planning horizon than one or two years. In upstream marketing, code support and development, training and certifying a Home Performance with ENERGY STAR builder network, and commercial and industrial account management, it becomes clear that one, or even two-year planning cycles tend to discourage investment by implementing entities in strategies that will not yield significant savings in the third year and beyond. And yet, if the goal is developing markets, those are just the sort of market interventions that should be encouraged.

the utility's performance in the amount of electricity saved compared to the goal for that year, and to the cost-effectiveness of the programs compared to the goal for that year. The incentive is designed to give an award of 8% of utility spending if the energy saving and cost-effectiveness goals are met. However, the design also encourages utilities to strive to exceed the goals by increasing the incentive with increasing performance, until a cap of 12% of efficiency spending is met. If the energy saved is less than 65% of the goal, or if the cost-effectiveness ratio [19] is less than one, then the incentive associated with that metric is not awarded. Some major advantages of the incentive design include:

- **Performance Basis:** The incentive is based on key metrics of performance that, if achieved, assure that ratepayers benefit from the efficiency spending.

- **Scalability** The incentive increases with increasing performance, thus creating an incentive for the utilities to continue program efforts even once goals have been reached (or once it is clear goals will not be reached.

- **Simple:** The formula to calculate the performance incentive is simple, easy to follow, and transparent. It is very clear how different utility actions will affect the size of the incentive.

However, although New Hampshire's performance incentive has been a success overall and has contributed to millions of dollars of ratepayer savings a few adjustments to the incentive formula are recommended that will achieve better alignment between the incentives of the utility and the incentives of the ratepayers and society at large. The recommended changes include the following:

- **Base goals on net savings:** Currently, savings goals are based on gross savings, which do not include freerider[20] and spillover[21], instead of net savings. Even though it is somewhat tricky to calculate freerider and spillover, it is very important; basing savings on gross savings creates a strong perverse incentive where utilities are best off financially by running large yet ineffective efficiency programs. This is especially true in a state such as NH with no decoupling – by incenting measures with large amounts of freeriders, the utilities could earn the full incentive without losing many electric sales.

- **Verify gross savings:** Currently, the New Hampshire incentive is based on utility reported gross savings. Even the best intentioned parties make mistakes in calculating savings; some sort of independent verification of gross savings is important to ensure the ratepayers are indeed getting the benefits they are paying for.

- **Increase oversight in goal setting:** Performance goals are currently set by the utilities with little oversight or input from other stakeholders. As a result, it appears utilities set conservative goals that they are likely to exceed and thus earn the full performance incentive. As a result, utilities routinely earn close to the 12% cap on performance incentives.

[19] The cost-effectiveness ratio is a ratio of the total benefits of efficiency to the total costs. If the ratio is 1.0, that means the benefits exactly equal the costs, and there is no net gain to society.
[20] A freerider is someone who took a utility incentive, even though he would have installed the efficiency measure without the program.
[21] A spillover is someone who was influenced to install an efficiency measure by the utility program, but who did not claim any incentive.

- **Raise minimum performance incentives and/or lower incentive amount.** Currently, if a utility achieves 65% of both goals, it will still receive an incentive of 5.2% of the program budget. This seems high for that level of achievement. Consider lowering this amount and/or raising the minimum threshold at which utilities are eligible for the performance incentive.

- **Cap incentive for each metric:** The specifics of the incentive formula are such that even if the utility fails one goal, they can still earn close to the full incentive if they achieve very well on the other incentive. Separating the metrics so that each could earn a maximum of 6% would easily address this.

- **Change/add metrics:** While it is good that New Hampshire has multiple performance metrics, the two used are highly correlated and do not go far enough to discourage cream-skimming. Consider changing one of the goals and/or adding others to include factors such as depth of savings, market transformation, customer equity, demand reduction in capacity constrained areas, or other important policy objectives that may be discouraged by relying solely on savings metrics.

- **Tie incentive to budget, rather than actual spending:** A recent change to the New Hampshire incentive structure has made the shareholder incentive dependent on actual spending instead of planned spending. This potentially creates a perverse incentive for the utility to spend more money to achieve the same goals, so that the incentive can be increased. The amount of the incentive should not increase if the utilities spend more to achieve the same goals. Rather, incentives are best aligned with ratepayer interests when the utilities are motivated to achieve the goals at lowest possible ratepayer cost.

- **Allocate 3-7% of program budgets to evaluation, measurement, and verification (EM&V),** and ensure EM&V is conducted by a **third party evaluator operating independently** of the party being evaluated. Currently in New Hampshire, about 5% is set aside in program budgets for EM&V, which is good, and there are many evaluation reports on file that review program results. A cursory review of the reports indicate that many of the reports were contracted directly by the utilities, and that evaluators were reporting directly to the utilities while conducting their reviews and reporting their results. The study team recommends that this practice be modified somewhat, and that program evaluators operate more independently of the party whose program they are evaluating in the future. This will help ensure an appropriate level of objectivity on the part of the evaluator.

- **Develop and require the use of standard and consistent reporting formats and metrics for regulated efficiency programs.** In 2009 and 2010, some gas program filings were submitted for a 6-month and 12-month period, and others were submitted for an 18-month period (while the gas utilities synchronized their reporting periods with electric utilities). Over the years, reports made publicly available in the Dockets did not always the same metrics or use a standard format or template. Consistency across utilities, years, and between electric and gas programs going forward would make evaluation, monitoring and verification of program success more effective and transparent.

Sustainable Energy

- **Allow fund administrator(s) to respond to a growing and dynamic market.** The current policy framework requires legislative action to authorize each change to the current mechanisms for providing financial support for sustainable energy activities. It is recommended that long-term plans be established and approved to support sustainable energy market development that include performance goals, and that program administrators be authorized to manage these programs independently in an approved market-responsive manner to achieve those goals.

- **Encourage utilities to invest in sustainable energy distributed generation.** The state's distribution utilities are interested in pursuing further investment in sustainable energy. Investment in this type of distributed generation has real benefits in terms of energy, capacity, and reliability and could (if applied strategically) help defer or avoid transmission and distribution upgrades. Effective mechanisms for supporting appropriate investment should be developed. It is recommended that the state investigate and address obstacles to speedy project review at the state and local levels. The study team's review of RSA 374-G: Electric Utility Investment in Distributed Energy Resources 2008 suggests that this legislation has not provided a clear path to developing valuable projects, and its provisions need to be revisited.

- **Establish permitting and other infrastructure to support community-scale sustainable energy development.** Community-scale planning and development is becoming one of the most effective channels for investment in energy efficiency and sustainable energy. Examples include biomass-fueled district heating, community-scale solar projects, and group buying programs for renewable technologies. Continuing to refine permitting, group net-metering and interconnection requirements, and other standards and model ordinances that provide appropriate support for community-scale projects will further enable such investments in the future.

Step 4 - Increase Program Coordination and Further Streamline Administration

Once an Energy Efficiency Resource Standard is in place, the need for streamlined program delivery, coordinated implementation, and an increased focus on customers and market development will become more obvious priorities. Increased consistency among programs creates opportunities for meeting goals more effectively and building the market infrastructure so that energy efficiency and sustainable energy become part of the service offering of more and more businesses.

- **Continue ongoing efforts among utilities to increase the consistency in offerings, rebate and incentive levels, eligible technologies, etc. across energy efficiency programs.** New Hampshire is fortunate to have a well-developed team of utility program managers and administrators with a long history of thinking and working together on program designs. Examples of the questions to keep asking, as existing programs are reviewed and evaluated, and as new programs are developed include:
    - How can New Hampshire increase consistency among program offerings so that customers and trade allies find consistent offerings (including consistency in modifying offerings) in the marketplace?
    - How can the electric and gas energy efficiency programs be better coordinated so that customers receive a full suite of services from an informed single point of contact?
    - How best can an "all fuels" approach to delivering customer energy efficiency services be adopted on an ongoing basis so that the majority of New Hampshire citizens who use oil, propane, and other delivered fuels for heating obtain equal service with electric and gas utility customers? How can New Hampshire best leverage the lessons learn from an

initial fuel neutral residential pilot program and the fuel neutral Pay for Performance program currently offered for the C&I sector?

- What are the opportunities for upstream marketing and leveraging of high-efficiency technologies so that manufacturers and wholesalers contribute to lowering measure costs, customer confusion is reduced, and dealer purchase and stocking patterns change?
- Should New Hampshire adopt and use a single, statewide identity for energy efficiency savings that improves customer recognition and increases participation? NHSaves was a step in that direction when it was created, but is not being used fully in that way at this time. When done well, such an entity can successfully serve all market sectors, from residential to large C&I customers.
- How does New Hampshire begin to identify new and underserved market sectors and develop strategies to address them?
- How should other New Hampshire priorities be integrated with the regulated energy efficiency programs, such as:
  - Codes and standards;
  - Financing strategies for different market segments;
  - Integrated and complementary use of other funds; Partnerships with community and regional energy efficiency and sustainable energy initiatives;
  - Tax policy; and
  - Locally-based economic and energy initiatives?
- How can New Hampshire establish a more effective and efficient EM&V system that features third party review and is contracted and operated with the right mix of independence and partnership in effective program improvement. A new, structured collaborative process (discussed above) could provide an effective setting for further addressing these questions, building upon the existing committees and working groups already in place.

- **Continue to strengthen and enhance coordination of low income weatherization services** between the utilities and the New Hampshire Office of Energy and Planning, and develop shared IT resources to strengthen program management.

- **Develop a single source of contact for energy efficiency and sustainable energy programs and services**, building upon and expanding the early efforts originally focused around the brand, NHSaves.

Step 5 - Use Public Policy, Funding, and Scaled Program Structures to Attract and Leverage Private Investment

A clear state policy and an Energy Efficiency Resource Standard can guide the emergence of New Hampshire's energy efficiency and sustainable energy industries by promoting development of innovative ways to make funding available for the up-front costs of efficiency and sustainable energy investments. While the state can enhance and expand certain state lending functions already in place, the most comprehensive and effective approach may be to create a single administrator state-wide. This type of structure not only unifies messaging, lending terms, and underwriting criteria, but also streamlines program access and reduces operating and administrative costs. A single state-wide structure also allows a pooled risk model, which can significantly broaden capital access to New Hampshire's presently undeserved residential sector. Equally important, this structure would bring enough scale to attract lending capital from financial institutions.

Attracting and leveraging private investment concurrently with market development and demand stimulation is critically necessary to achieve adequate and sustainable energy financing. Further, sustainable capital and cost effective program structures will ensure program longevity and reliability, imparting a level of trust which is currently lacking throughout New Hampshire. Though interesting options are available to pursue on-bill financing, it is recommended that utilities coordinate with a state-wide energy finance program to utilize the lending expertise and capital available from financial institutions. It is recommended that in identifying new lending strategies, planners and implementers recognize that financing efforts need to be responsive and tailored to the needs of different market sectors, and the various constituents within those sectors. In this context, state and utility planners should:

- **Leverage New Hampshire Qualified Energy Conservation Bonds (QECBs**), and state and federal grant dollars to serve as the financial backbone for finance programs and to fund a state-wide loan loss reserve in order to forge banking relationships and mobilize as much private capital as possible.

- **Enhance or implement** coordinated and focused outreach and marketing, and locally based contractor sales networks.

- **Support PACE and other small customer- and community-focused lending strategies** with legislation and strategic capability building.

- **Wherever possible, have loans be available for all cost-effective energy efficiency and sustainable energy investment** even if the program providing the financing is tied to a single fuel or to regulated fuels.

- **Have banks do what they do well: lend**. All other utility efforts and incentives can be designed to drive customers to the available financing.

- **Recognize that codes and standards development and support represent a form of leveraging and financing**, as they require consumer investments in higher efficiency buildings and products (resulting in savings), and therefore drive the market to more efficient norms.

- **The state can also take the lead** in supporting and advocating for increased federal weatherization funding, and take the lead on addressing the need for energy efficiency funding for delivered fuels, such as heating oil, propane, etc.

Step 6 - Create a Home for Energy Efficiency and Sustainable Energy Implementation Support and Oversight in State Government

While there are a number of Commissions, agencies, divisions, and Boards within state government that each have a share of the responsibility for guiding energy efficiency and sustainable energy policy in New Hampshire, there is no single entity with lead responsibility to make sure New Hampshire citizens gain the greatest possible benefit from energy efficiency and sustainable energy. The lack of such an entity accentuates some of the weaknesses in New Hampshire's approach. Currently, the New Hampshire Public Utilities Commission is the adjudicative body that regulates the electric and gas utilities, and ultimately makes the final decisions about the regulated programs. However, it is not currently also charged with implementing overall state policies with regard to energy efficiency and sustainable energy. Because of this, it is recommended by the study team that a single entity within New Hampshire state government be designated as having the broad ability to operate across government departments and divisions and that the entity be:

- Charged with and provided support **for implementation of state energy efficiency and sustainable energy policies and goals**.

- Chartered to **advocate for energy efficiency and sustainable energy** in both governmental and non-governmental forums including:
    - Advocating at the NH PUC and in other appropriate forums;
    - Consulting with and advising the CORE programs and other energy efficiency and sustainable energy implementation efforts in New Hampshire;
    - Coordinating with other agencies of state government on energy efficiency and sustainable energy matters; and
    - Supporting community energy efficiency and sustainable energy initiatives.

- Provided with the resources to **conduct analysis that will contribute to regulatory, legislative, and governmental decision making** that will lower consumer bills, increase energy independence, strengthen the New Hampshire economy, and foster public/private partnerships.

This entity could be:

- An **existing Board or Council** (such as Energy Efficiency and Sustainable Energy Board currently attached to the NH PUC) with staffing and resources to carry out its new roles;

- An **existing division within the New Hampshire Public Utilities Commission** (such as the Sustainable Energy Division which has planning and program administration capability but not the regulatory oversight role of the Electric Division which could otherwise create a potential conflict of interest if and when advocating for energy efficiency and sustainable energy);

- A **new entity administratively attached to the NH PUC** (similar to the way the Office of Consumer Advocate is structured); or

- A **stand-alone State Energy Office** not directly attached to the Governor's Office, which would help de-politicize the SEO's role.

Step 7 – Encourage State and Local Government to Lead by Example

As the single largest user of energy in New Hampshire, state government can play, and already is playing, a large role in stimulating and developing energy efficiency and sustainable energy markets. The state has already shown leadership in implementing energy efficiency and sustainable energy in government facilities and operations. The impressive performance to date emphasizes the importance of strong policy and executive leadership as a driving force that can yield savings in other parts of the market.

- **Use the purchasing power of state government as the largest energy consumer in New Hampshire to stimulate and develop energy efficiency and sustainable energy markets.** As it continues to implement specific strategies to install energy efficiency measures, track energy (and water) use to create a benchmark for future savings, guide new purchases of high-efficiency equipment, and include energy efficiency and sustainable energy in new construction and major renovations, the State of New Hampshire can accomplish several important objectives simultaneously:

  - Save the taxpayers of New Hampshire money;
  - Model the behavior that others can follow by being an efficiency and sustainable energy leader and innovator;
  - Draw on technical guidance from CORE Programs in purchasing decisions, and provide feedback to those programs about technologies and practices that promote increased savings and improved performance.
  - Use the state's buying power to stimulate the market to stock, recommend, and install high efficiency measures by demonstrating that they work and are reliable;
  - Practice the art of identifying and overcoming market barriers by identifying barriers in State facilities and testing new ways to address those obstacles that will also apply in the private sector; and
  - Demonstrate the kind of coordination and resource mobilization that will be needed throughout the state.

  Government leadership can also get its own house in order so that in its institutional structure and its policies, programs, and other actions it becomes a demonstration of "systems" thinking in a way that effectively supports the energy policies it has adopted. Government action should:

  - Provide clear guidance to utility regulators regarding energy efficiency and sustainable energy policy and funding.
  - Support a performance-focused approach to energy efficiency and sustainable energy implementation that builds public confidence, supports markets, and ensures effective program implementation and thorough documentation and feedback.
  - Promote administrative clarity so that roles and responsibilities within government are supportive of underlying energy efficiency and sustainable energy policy and complement each other rather than adding complexity.
    - Use CORE programs effectively in its own implementation efforts;
    - Use federal funding to coordinate and leverage utility CORE program funding and private financing; and
    - Demonstrate land use planning and decision-making that advances long term energy policies.
  - Facilitate coordination and integration in statewide efforts, so synergies are gained and markets are given clear signals. Tax policies, codes and standards, transportation efficiency, and all-fuels initiatives can all be designed to support and complement the underlying energy efficiency and sustainable energy policies.

- **Leverage the momentum of the more than 100 Local Energy Committees in New Hampshire**. LECs have been demonstrated to be a means by which individuals, communities, and non-governmental organizations can both initiate and partner with other ongoing energy efficiency and sustainable energy efforts. They represent innovation and a pragmatic approach to addressing real opportunities and they draw on the civic leadership and initiative that are so important to lasting change.

- **Recognize the importance of land use planning and zoning** in the energy requirements needed for transportation, and better integrate land use planning and zoning issues in both state and local energy initiatives in the future. If New Hampshire is going to reduce its energy consumption, and in particular its gasoline consumption, it will have to reconfigure its development patterns. And that will take a concerted effort at many levels. At the state level, New Hampshire can foster a re-emergence of the importance of central places by:

    - Ensuring that state offices, courts, and other facilities are centrally located in downtown settings;
    - Sensitive rulemaking that permits (and encourages) central places as the location for schools, allows innovative septic designs in villages, and in other ways; and by
    - Giving priority to projects located in downtowns and town and village centers when it awards grants funds.

    At the regional level, Regional Planning Commissions have traditionally assisted local communities with land use issues. They are continuing to do that, and moving on to energy issues as well. Increasingly, starting in Plymouth and now spreading to multiple areas across the state, there are citizen-based volunteer groups assisting each other on energy issues, helping people install solar panels, insulate their homes, and, in general, becoming much more energy independent. These efforts should be supported and encouraged as well.

    Energy is a major expense at the community level. Recent studies have shown that in an average New Hampshire community (4,800 population), the cost to heat municipal buildings, fuel the vehicles, and turn on the lights is nearly $200,000 per year. Local Energy Committees, Boards of Selectmen, and others are working hard to tighten these facilities to reduce costs. Additionally, Planning Boards and others are examining local zoning ordinances and other codes to see if there are ways to encourage more energy efficient development: can housing units be placed in the village center, is mixed use development a possibility, etc. All of these efforts should be encouraged and supported wherever possible in the future.

A Sample Policy Statement for New Hampshire

A sample policy statement is presented on the following page for consideration in New Hampshire. It provides one approach to a statement of energy policy, creates an Energy Efficiency Resource Standard, establishes a stable funding mechanism, strengthens the current Renewable Portfolio Standard, and creates (or designates) an entity within state government that could provide a focal point for leadership on energy policy. (The EESE Board is used as an example. A number of other entities could be substituted instead, if desired.)

The enactment of such a policy in New Hampshire would provide important clarity and would dramatically alter the regulatory context and the implementation direction in the state. The numerous and specific recommendations made throughout this report would be facilitated by the adoption of such a policy and structure. The policy might be implemented by modifying existing legislation, such as RSA 378:37, the state energy policy, RSA 362-F, the RPS, and/or RSA 9-A, the State Development legislation.

Proposed Energy Policy Statement for New Hampshire

Whereas, New Hampshire has the opportunity to dramatically lower costs and bills for customers, communities and the State by increasing investments in energy efficiency and sustainable energy, while at the same time creating local jobs, helping stabilize the state's energy infrastructure, and improving our quality of life;

Whereas, renewable sources of energy can diversify New Hampshire's energy portfolio, stimulate the local economy, and help stabilize energy costs over time;

Whereas, energy efficiency is a non-emitting stably-priced and indigenous energy resource that keeps customer dollars in-state;

Whereas, it costs roughly one third as much to meet electricity requirements through energy efficiency vs. new power generation; and significant benefits are available from energy savings in natural gas;

Whereas, it is possible to maximize energy efficiency by aligning the interests of ratepayers, utility companies, and the public good, allowing for major increases in energy efficiency investments while maintaining profitability for energy delivery companies; and

Whereas the inefficient and wasteful use of energy resources runs contrary to the state's economic interests and values,

It is the general policy of the State of New Hampshire:

To assure, to the greatest extent practicable, that New Hampshire meets its energy needs in a manner that is reliable and sustainable; that assures affordability by reducing customer bills; that encourages the state's economic vitality; that advances the efficient use of all types of energy resources; and that promotes the state's goals with regard to greenhouse gas reductions and the development of indigenous renewable energy sources; and protection of New Hampshire's environmental quality; and

To promote, for the benefit of New Hampshire's residents, businesses and communities, the acquisition of all cost-effective gas and electric energy efficiency and demand resources that can be obtained at a lower cost than conventional supply, and develop a diversified portfolio of in-state renewable energy resources

Therefore, the legislature hereby charges the Energy Efficiency and Sustainable Energy (EESE) Board with advancing these policies by crafting recommendations for their implementation in coordination existing State entities responsible for energy planning and energy efficiency and renewable energy implementation and with the New Hampshire Public Utilities Commission (NH PUC).

Further, it is the directive of the General Court that:

It shall be the policy of the State of New Hampshire that the electric distribution companies and gas distribution companies shall, at least every two years, each jointly prepare and submit to the New Hampshire Public Utilities Commission statewide plans for energy investment, on or before April 30. Both the gas and the electric plans shall provide for the acquisition for all available energy efficiency and demand reduction resources that are lower cost than the cost of supply. The plans shall contain savings targets, preliminary budgets, and be prepared in coordination with the EESE Board.

The plans shall maximize the development of service delivery systems that overcome obstacles to customer investment in efficiency. The plans shall provide integrated service offerings that are both convenient for consumers and facilitate development of supportive private-sector efficiency infrastructure. The plans shall include robust plans for evaluation, monitoring and verification, as well as methods for continuous program improvement.

The PUC shall review the Plans, and if it finds them to be cost-effective and therefore lower cost than other supply options, it shall authorize funding of the Plans through a fully reconciling funding mechanism. The EESE Board is authorized to convene utility and other public and private stakeholders in a collaborative process to establish and implement savings targets, ongoing program review and input, and evaluation and measurement consistent with the Policy.

The EESE Board shall be funded annually with proceeds from the System Benefits Charge (SBC) and/or other efficiency funds as determined by the NH PUC. The funding shall be adequate for the EESE Board to secure technical expertise needed to review the ratepayer-funded electric and gas programs and also to advocate for strategies that take into account opportunities to use all fuels more wisely as well as holistic approaches to building energy efficiency. The EESE Board is specifically authorized to participate in proceedings before the PUC in support of policies, plans, and proposals that advance the Policy and the directives of this legislation. The technical expertise providing support to the EESE Board shall review and make recommendations to the Board on the CORE efficiency programs and any other public policy measures that it may choose to consider for recommendation to the Legislature, Governor, or Public Utilities Commission for future action.

In Closing

It is important to note that the study team is choosing to not make a recommendation in this report for a new implementation structure for the energy efficiency programs currently administered by the electric and gas utilities in New Hampshire. This is not because the team is not aware of the success in other jurisdictions with developing a coordinated delivery mechanism for delivery of such services, through an entity outside of the existing utility structure, such as Efficiency Vermont and the newly launched Washington, DC Sustainable Energy Utility. Rather it is because of the team's belief that with new direction, coordination, financing, and oversight, the CORE programs could provide substantially increased benefits to New Hampshire. While creation of an Energy Efficiency Utility (EEU) or non-utility implementer could be an alternative way to achieve greater savings, the focus in the near term should be on providing clear guidance to utilities and regulators, and to providing stable planning and funding of investments in a way that is performance-based, market responsive, intelligent, and dynamic.

The risk in recommending a specific change to the implementation structure at this time is that the need for a clearer policy decision about the "what and why" may get lost in the structure debate about the "how". The study team suspects that in some instances in the current discussions in New Hampshire the debate over whether or not to develop a single, coordinated Energy Efficiency Utility serves as a proxy for the underlying policy debate that continues in the absence of more policy direction and clarity. The team is persuaded that if the policy, direction, and goals can be clearly articulated, and if there is a forum for public review, input, and discussion about how it is working and the best way to get it done, the actual performance of utilities will be the best guide in the discussion about whether an alternative structure for implementation is needed at some point in the future.

Overall, the seven high-level policy actions described above, as well as the more detailed recommendations suggested at the programmatic level in the previous Chapters, provide great opportunity for New Hampshire to build upon and continue to enhance the solid foundation of energy policies, programs, and initiatives already in place in the state. In doing so, the state can achieve important energy, economic, and environmental benefits for New Hampshire citizens and the industries and businesses located in the state.

Appendix A: Glossary of Acronyms

ACP - Alternative Compliance Payment
AMI – Advanced Meter Infrastructure
AMS – Advanced Meter System
ARRA – American Recovery and Reinvestment Act
ASHRAE – American Society of Heating, Refrigeration, and Air-Conditioning Engineers
AWEA – American Wind Energy Association
BB –New Hampshire Better Buildings Program
BEEP – Business Energy Efficiency Program
BECI- Building Energy Conservation Initiative
BCAP – Building Code Assistance Project
BFA – Business Finance Authority
BIA - Business and Industry Association
BPI – Building Performance Institute
CAAs - Community Action Agencies
CCSNH- Community College System of New Hampshire
CEE – Consortium for Energy Efficiency
CDFA – Community Development Finance Authority
CHP – Combined Heat and Power
C&I - Commercial and Industrial
CINH - Construction Institute of NH
DAS- Department of Administrative Services
DG – Distributed Generation
DR – Demand Response
DRED - Division of Economic Development
EE- Energy Efficiency
EECBG - Energy Efficiency and Conservation Block Grant
EE/RE- Energy Efficiency/Renewable Energy
EEF- Energy Enterprise Fund
EIA- Energy Information Administration
ESCO – Energy Service Company
ESO- Employment Security Office
EV – Electric Vehicle
FHFA – Federal Housing Finance Agency
FI – Financial Institution
GHGERF- Greenhouse Gas Emissions Reduction Fund
GJGNY – Green Jobs Green New York Program
GLP- Green Launching Pad
GPB – Retail Merchants Association Giving Power Back Program
HBRANH - Home Builders and Remodelers Association of NH
HEA- Home Energy Assistance Program
HPwES- Home Performance with ENERGY STAR®
ICC – International Code Council
IECC- International Energy Conservation Code
IEEC- Interagency Energy Efficiency Committee
IRB – Interest Rate Buy Down
kW - Kilowatt
kWh – Kilowatt per hour
LLC – Limited Liability Company
LEC- Local Energy Committee/Commission
LEED – Leadership in Energy and Environment Design
LEWG- Local Energy Working Group
LLR- Loan Loss Reserve
Loan Fund – The New Hampshire Community Loan Fund
MEAP- Municipal Energy Assistance Program
MEWG/LEC WG- Municipal Energy Working Group/Local Energy Committee Working Group
MMBtu – One million British Thermal Units
MW - Megawatts
NAESCO – National Association of Energy Service Companies
NASCSP - National Association for State Community Service Programs
NBTWG - Northeast Biomass Thermal Working Group
NEEP - Northeast Energy Efficiency Partnerships
NGBS - National Green Building Standard
NHEC- New Hampshire Electric Co-op
NH DES – New Hampshire Department of Environmental Services
NH HFA - NH Housing Finance Authority
NH LAX – New Hampshire Local Energy Audit Exchange
NH OEP- New Hampshire Office of Energy and Planning
NH PUC- New Hampshire Public Utilities Commission
OCC – Office of the Controller of the Currency
P4P- Pay for Performance
PACE – Property Assessed Clean Energy
PAREI – Plymouth Area Renewable Energy Initiative

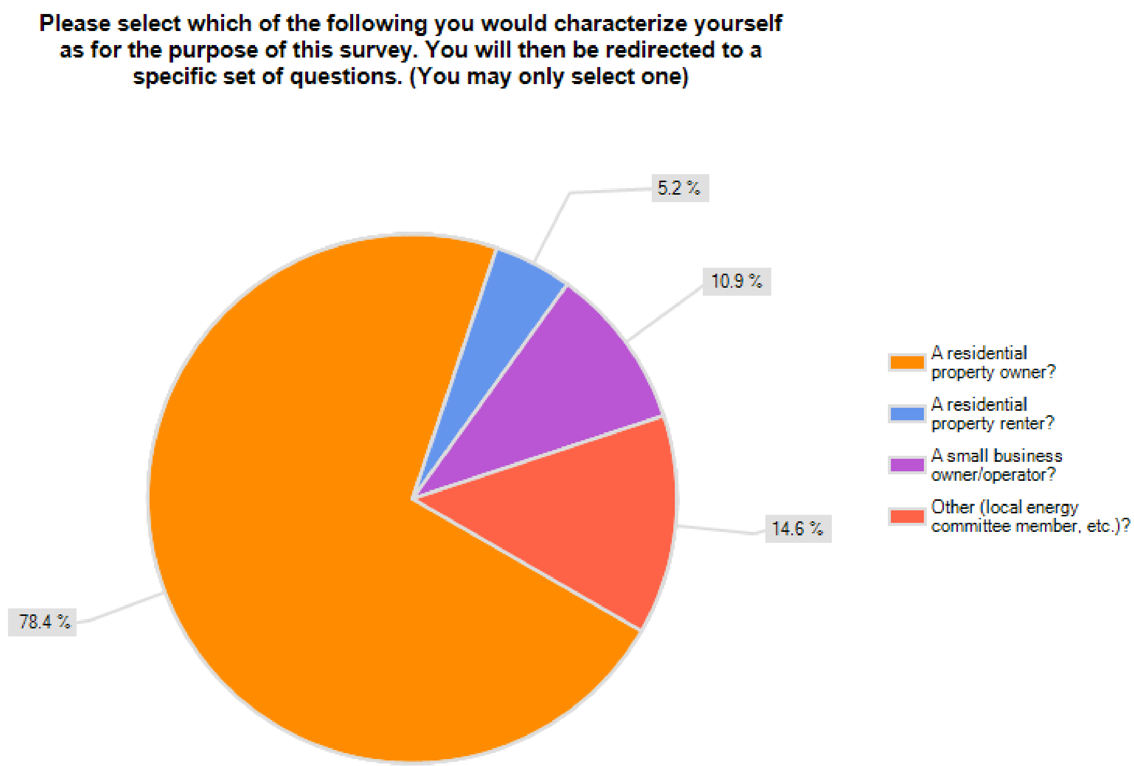
PPESCO – Public Purpose Energy Service Company
PSNH – Public Service of New Hampshire
PVE- Petroleum Violation Escrow
QA- Quality Assurance
QECB – Qualified Energy Conservation Bond
RE- Renewable Energy
REF- Renewable Energy Fund
REI - Renewable Energy Initiative
RGGI – Regional Greenhouse Gas Initiative
RLF- Revolving Loan Fund
RMANH – Retail Merchants Association of New Hampshire
RPS – Renewable Portfolio Standard
SBC - System Benefit Charge
SE – Sustainable Energy
SEEARP - State Energy Efficiency Appliance Rebate Program
SEED – Sustainable Energy Efficient Development
SEP - State Energy Program
UNH - University of New Hampshire
VEIC- Vermont Energy Investment Corporation
WAP- Weatherization Assistance Program
Wxn- Weatherization (in reference to WAP)

Appendix B: New Hampshire Energy Survey

B.1. Introduction

This online survey was developed to provide an opportunity for members of the public to participate in the *Independent Study of Energy Policy Issues* (as called for in a bill passed by the Legislature in 2010 referred to as "SB 323"). The survey was developed with input from members of the EESE Board and posted on *Survey Monkey* for April and early May of 2011. Several agencies and utilities, and the Public Utilities Commission, publicized this effort through their websites and email contacts. A total of 751 responses were collected. This data provides important insight into the views of New Hampshire citizens on key energy issues in the State, and will be used by the study team as part of the research for the *Independent Study of Energy Policy Issues*.

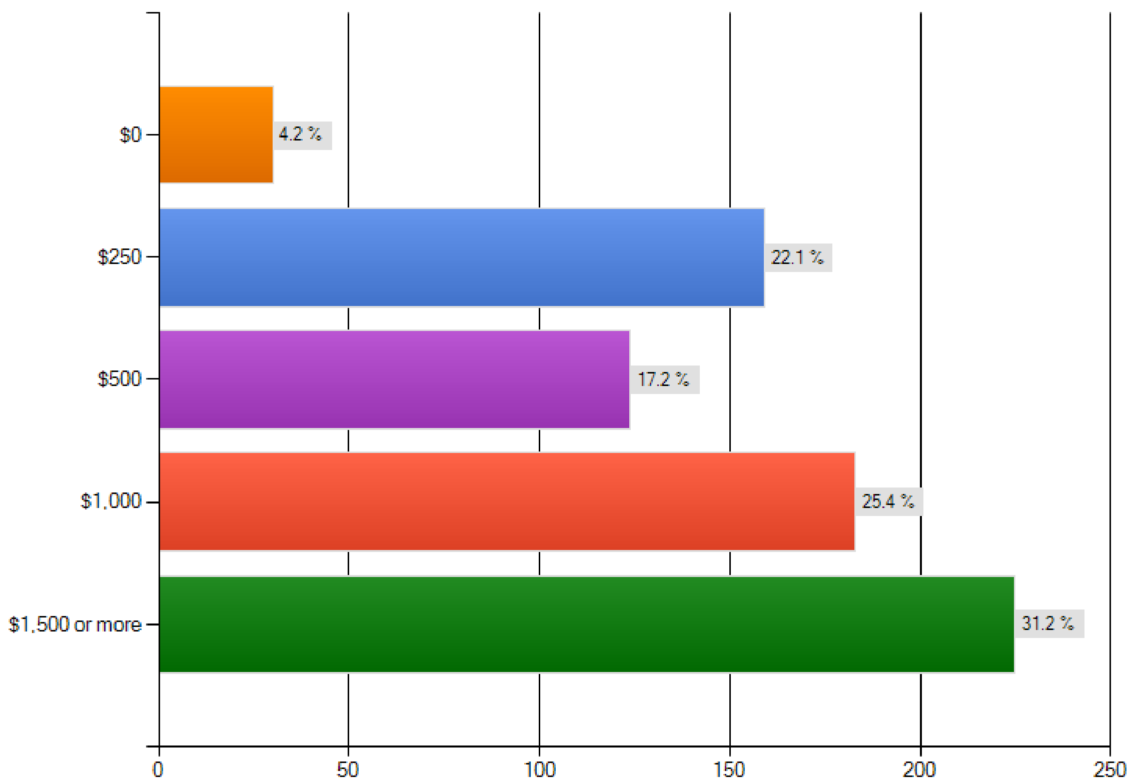
Nearly half of the respondents (47.7%) reported to have an Energy Committee in their community. The majority of respondents identified themselves primarily as residential property owners. The "other" category included children of property owners, local officials, and employees of New Hampshire based businesses.



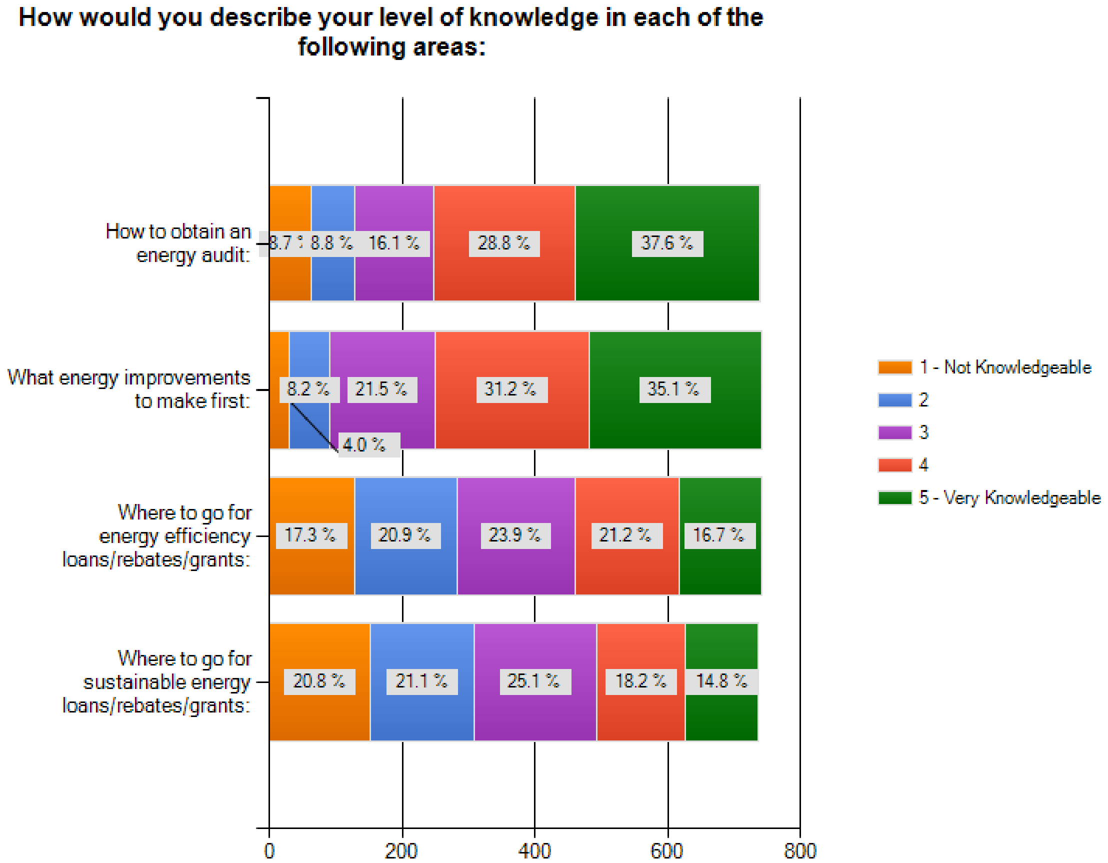
The majority of respondents (78.7%) feel it is very important for New Hampshire to increase energy efficiency, increase sustainable energy use (75.9%), and decrease use of fossil fuels (67.8%). A small number of respondents (3%) do not feel that decreasing the use of fossil fuels is important, and as a result do not support increasing sustainable energy use. These respondents do support energy conservation, but are only willing to spend $0 - $250 of their own money to achieve energy savings of $250 annually.

Eighty-four percent of respondents that indicated a willingness to spend $250 or more to save $250 on energy annually have already started implementing energy related improvements on their properties.

If you could save $250 per year on your energy bill, how much of your own money would you be willing to spend to achieve those savings?



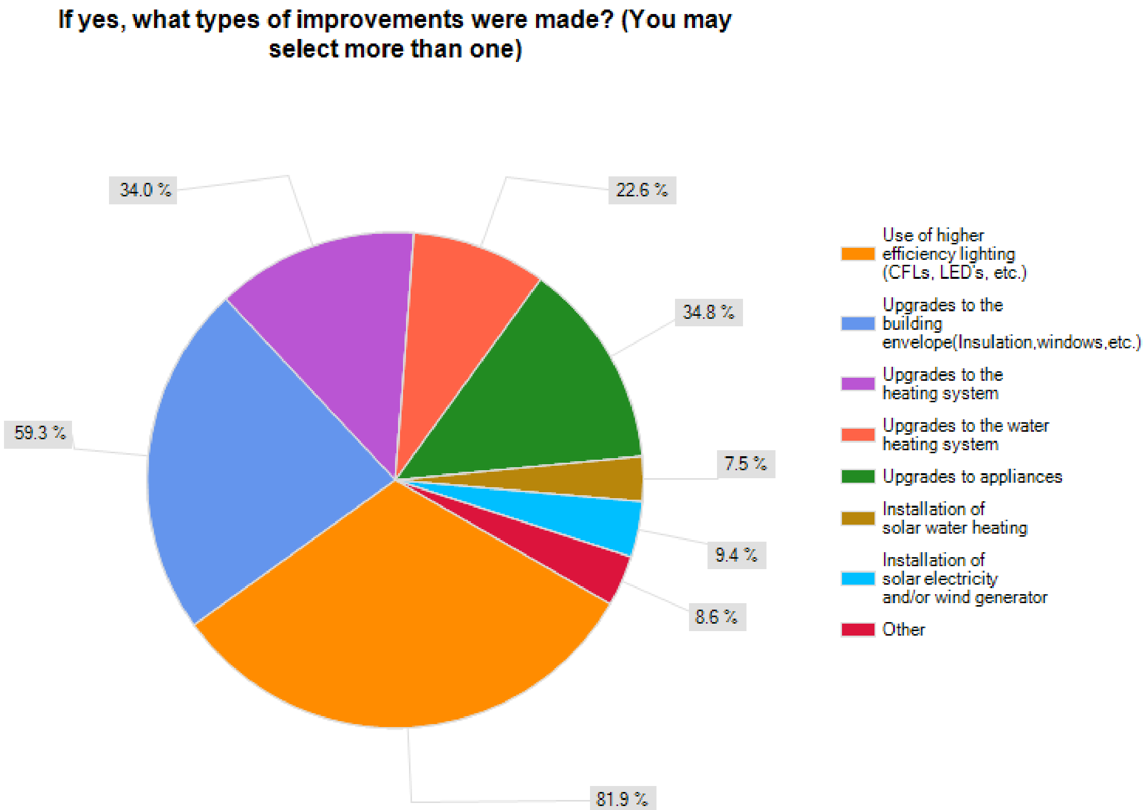
When asked about their level of knowledge on how to obtain an energy audit, make improvements, and access funding or financing the results were mixed:



B.2. Residential Property Owners and Renters

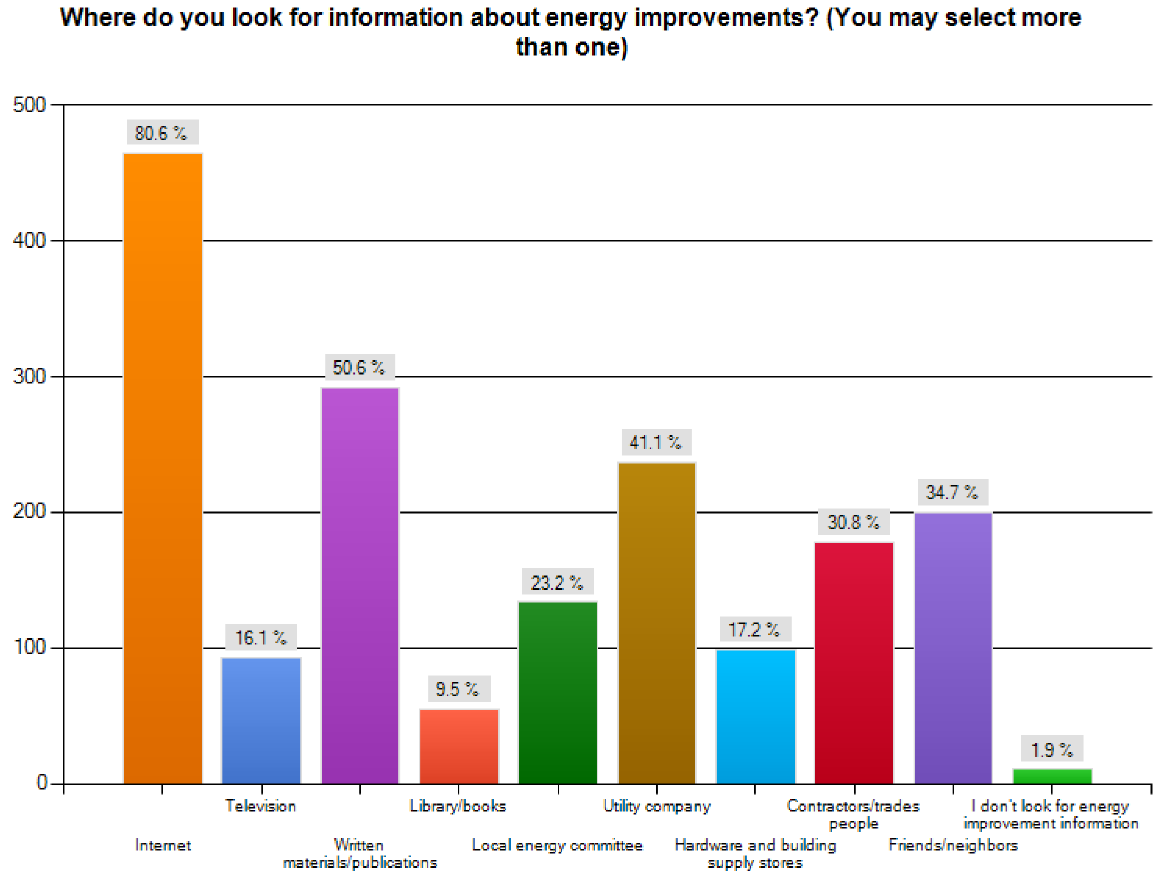
Residential property owners and renters reported that reducing their energy bills was important (77.7% Owners; 71% Renters), and within the past 12 months 83.8% of Owners and 56.4% of Renters reported making energy related improvements to their properties. Many Owners (31%) have plans to make energy improvements in the next 12 months with the biggest focus being on upgrades to the building envelope. The biggest focus for Renters is on higher efficiency lighting.

The improvements made to date by Owners included:

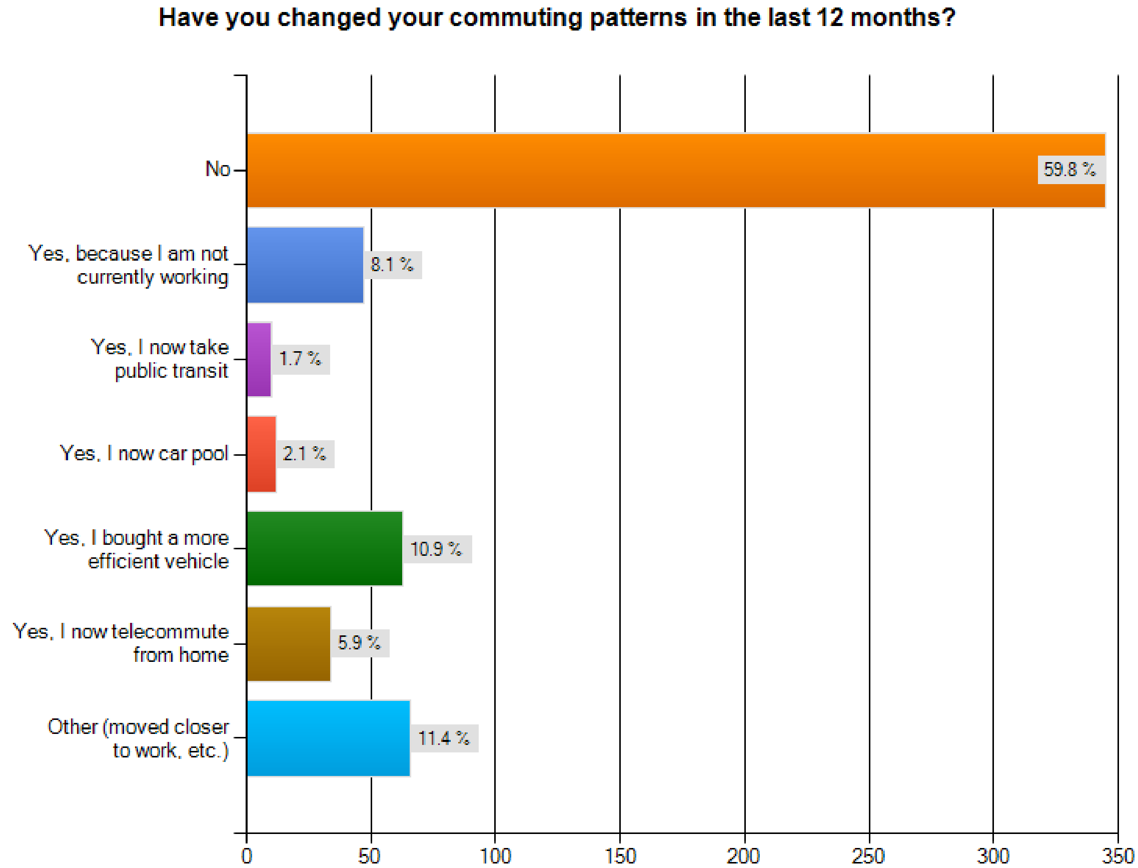


The Owners and Renters primarily reported reducing their energy use to save money (35%) and because of concern for the environment (40%). Increased fuel cost was only a motivation for 17.6% of Owners, but it was a motivation for 23.7% of Renters.

The following chart shows where residential property owners and renters look for information about energy improvements.



The majority of residential property owners and renters (59.8%) reported not making any changes to their commuting pattern in the last 12 months.



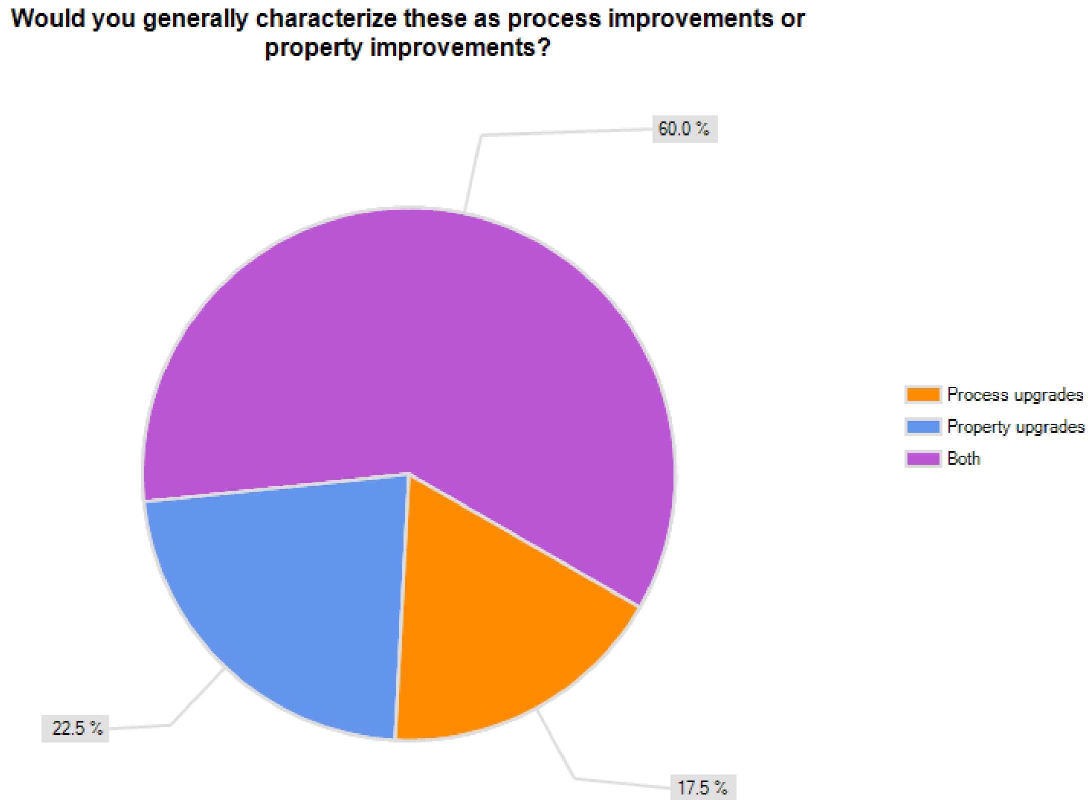
When asked what other energy-related issues they would like to convey to state legislators or the Public Utilities Commission in New Hampshire the comments from both groups included a similar range:

- Supporting alternative energy
- Energy efficiency, and
- The need for incentives.

The renters did also comment on the need for better public transit and green jobs. A minority of the responses from both groups ran counter to this and spoke in favor of fossil fuel use and against programs like RGGI. There were also opinions for and against the Northern Pass. A sample of these open ended responses has been included at the end of this document.

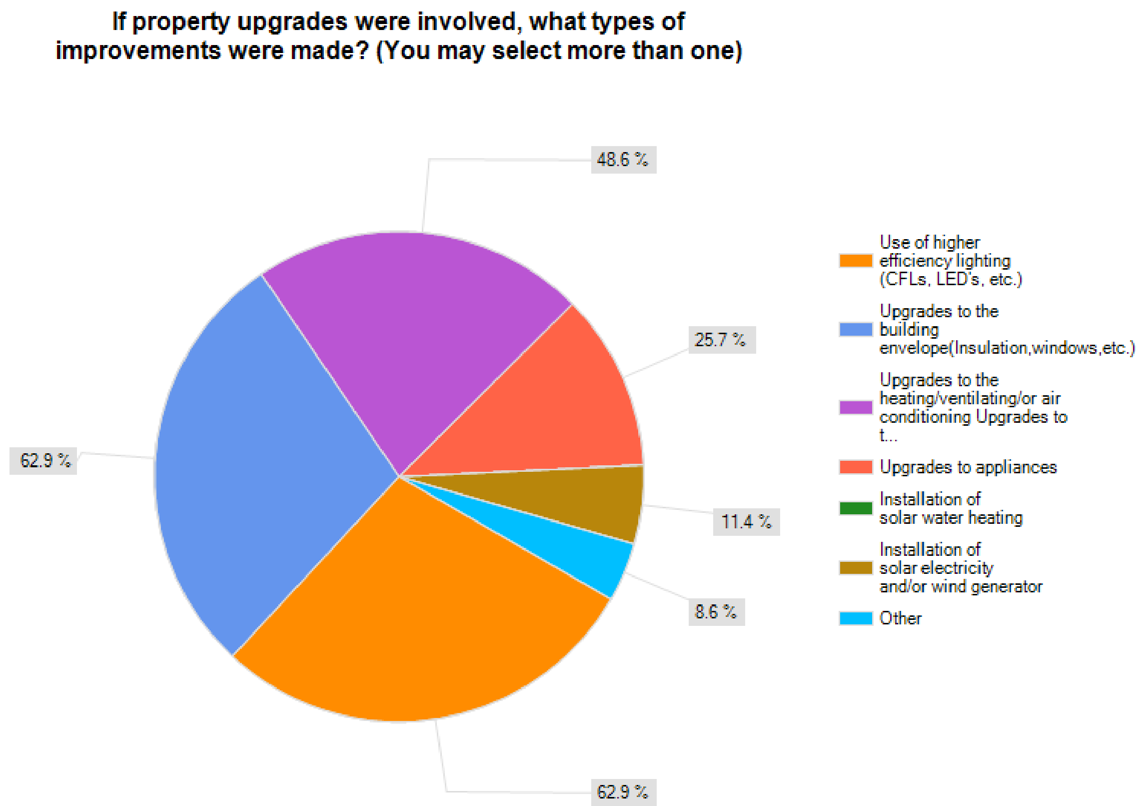
B.3. Business Owners and Operators

Business owners/operators reported that reducing their energy bills was very important (84.1%), and within the past 12 months 88.4% reported making energy related improvements to their properties.

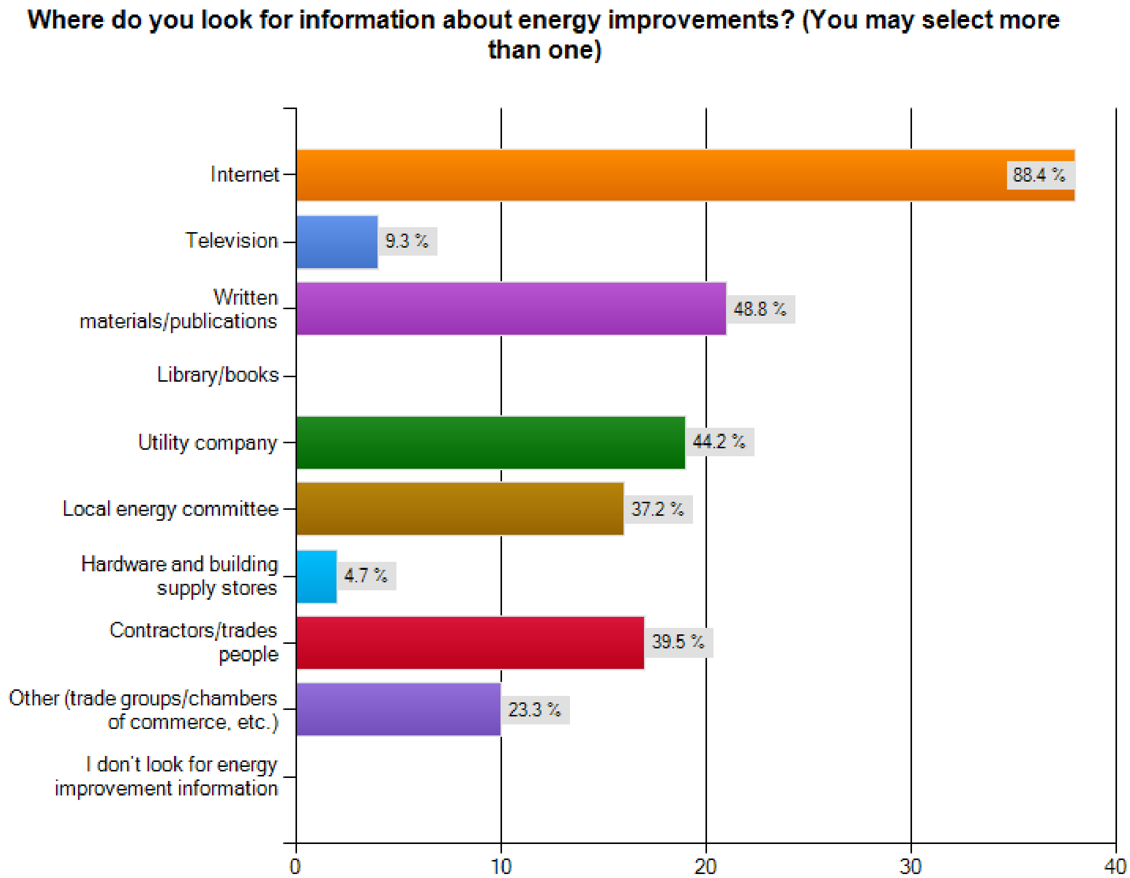


The majority of process related upgrades were related to increased recycling (62.5%) and improved scheduling (43.8%)

The reported property upgrades were mostly focused on higher efficiency lighting and upgrades to the building envelope:



The majority of businesses that have not made energy upgrades are considering higher efficiency lighting (22.7%) or upgrades to the building envelope (27.3%). Saving money was the biggest motivation for reducing energy use for businesses (44.2%).



When asked what other energy-related issues they would like to convey to state legislators or the Public Utilities Commission in New Hampshire the comments from business owners/operators focused on:

- A need for rebates and incentives
- Renewable energy
- Energy conservation, and
- Support for biomass including the proposed Laidlaw project in Berlin.

A minority of the responses ran counter to these comments and spoke against programs like RGGI. A sample of responses has been included at the end of this document.

Sample of Open Ended Questions By Category

When asked what energy issues affecting New Hampshire are on the minds of the respondents 977 responses were offered. The responses generally related to energy conservation efforts, the need for sustainable energy, the role of regulations (utility and land use), and funding issues or incentives.

Sample of Residential Owner Comments:

Assistance with **energy audits** should not just be limited to very low income. Others just above level may be more able to afford contributing toward improvements

I choose to be more **energy efficient** to reduce my carbon footprint, to reduce my energy costs, and to save the environment money. I just purchased a home and will take advantage of the energy tax credits.

Stop the discussion of using nuclear energy! It is nothing short of insane!!! Develop ways to support **alternative energy** use.....the sun should not be seen as an alternative energy source...it is the best energy source!!

I would like to see **more incentives** for commercial and public use of alternative energy - such as wind and solar. Public Service Co. could help by reducing costs for alternative energy use and lobbying for equalizing government subsidies between alternative energy and fossil fuels.

where can I find info. @ **windmills**?

Support the EPA's "SMART GROWTH" **zoning** initiative.

The utilities should be required to buy **renewable power** from individual sources at a fair price.

Large scale energy projects, even alterntive energy sources, can have large environmental foot prints. And importing **Hydro Quebec** energy has a massive and destructive footprint both in the source of the power and transmission of the power, plus contributes to the US's trade deficit.. Need to enhance net metering and other **decentralized systems**.

I am concerned about the issues raised with the **Northern Pass** plans, such as the destruction of the scenery in northern NH and the reduction of property values....BUT I realize we need the energy supplied by it.... so I don't know what path to take with my views.

Yes, knock off the hand wringing about **fossil fuels**. They aren't running out in your or my lifetime and can be made as clean as you would wish. Stop trying to terrorize people into LESS efficient methods. Sure, develop all the solar and wind you want, get real on it's possibilities.

Have the **PUC** spend less time and dollars on administrative fluff. Don't spend funding (**RGGI**) on projects that return little value or savings just for the sake of spending the dollars!

Need to have a way to add excess energy from individual locations to the main **power grid**.

Look for both short and long term **paybacks**, both big and small changes, direct and indirect benefits **-** big picture. Encourage conversion to occupancy sensors in office buildings, find ways to capture waste heat, provide landscaping advice for energy benefits, etc. There are infinite ways to maximize **energy efficiency -** encourage radical thinking with contests or other incentives.

Please **discourage nuclear** -- there's no safe place for the waste, nor a good post-decommissioning plan for protecting future generations for 24,000 years.

Telecommuting might be more popular with more fast broadband available. A North Country high-speed communication line is better than a highway.

I want them to fight to keep **biomass plants** running in the state of NH

The governor might leverage **myenergyplan.net** for the benefit of NH citizens.

We need to become more **self sufficient regarding energy**. the technology is out there. stop funding oil companies and start funding new energy technology for the future of our country.

The short term job creation for the **Northern Pass** project does not out weigh the negative impact to the State's natural resources which provide a longer term economic benefit to tourism and attraction to potential residents.

Going solar makes the most sense to me, but it ignores the fact that it is very expensive to switch over to. Perhaps suggesting a continuum of products which use less fuel and are more efficient and cost much less to install might create a stepping stone for folks wanting to reduce their use of fossil fuels (either at home or through the electricity they require). For example, there are great, highly efficient heaters and hot water heaters that use fossil fuels (Monitor ie), yet are monetarily available to more people. Purists want solar to be IT, and someday, as R&D makes it less expensive, more people will use it. I heat my house for under $800/yr with a Monitor. One tank of kerosene an year. If we could support people who wanted to move towards more efficiency without focusing solely on solar I think NH would reduce its footprint.

Sample of Renters Comments:

No money for **efficiency work** at state level, NH pulling out of **RGGI** a huge problem

Having the country become more self sufficient in producing energy, epically **green energy** such as solar, wind, and biomass.

I feel it is especially important for us in New Hampshire to find ways to decrease our consumption of energy through **energy efficiency** and changing our own habits, both at an individual and institutional level. After that, we should be investing in local solutions to replace our current energy production with renewable sources.

The **cost of Energy**

It's important that we reduce our own local **pollution and dependency**, but we need to put pressure on the rest of the country, as so much of NH's smog comes from the Midwest, too.

Why doesn't anybody ever talk about **conservation**? We need some leadership here, like the President of the US, not just price pressure from the gas pumps.

Energy independence for NH and US, for national security and economic stability. Building **clean energy jobs** with benefits in NH and New England. Reduce the worst mobile or stationary sources of pollution that impacts public health. Reducing our carbon footprint and slowing or adapting to climate change impacts such as severe storms, infectious disease, and flooding.

New Hampshire has an incredible wealth of building stock full of embodied energy that creates the ambiance and quality of life of the state. Increasing **energy efficiency** is important. Preserving the energy already invested into the state is also important. To be sustainable, we must draw on our past and honor the lessons it can teach us.

I'm very concerned about our reliance on power coming from out of state and/or country. I'm glad we've taken some steps lately to become more **energy self-reliant** by developing more local energy, eg, the Windmills in Lempter and various biomass plants, as well as some of the home efficiency measures that have been funded through RGGI. We need to be dong more of this.

Sustainable energy systems--fostering wind,solar, geothermal,green building models and incentives Northern Corridor Transmission Lines--do we need it& impact;Public Transit in more settled areas--plan now; Safety and Efficiency of Seabrook Nuke

We need to bring in more power at **lower prices**. Can we use the rail system to transport waste to a facility that recycles as much as possible and burns the rest to create heat energy?

The national debt can be decreased and the economy can be jumpstarted with a change to **GREEN ENERGY JOBS** which the incoming workforce desires.

Very important to stay in the **RGGI** fund, those funds and projects DO strengthen the local economy and achieve measurable outcomes in energy efficiency and community capacity building.

Please expedite the process of approving the **Burgess Biopower/Laidlaw** PPA. The PUC is dragging their feet when there are many people who need and want this to happen.

Our rural areas don't have sufficient **public transit**, and our state buses only go north/south along a path to Boston. We need more transportation options in NH, including buses that travel east/west.

Please work on **using less** instead of making more.

Start using **wind and solar energy** farms in Southern NH

It's important to counteract the active disinformation being published by anti-conservation forces like the Koch Brothers, and to make it clear that reducing waste will not only make NH "prettier" but will reduce costs by **increasing efficiency**, too.

Nuclear facilities are not the answer.!!! I hear NH is just the conduit for the **Northern Pass**, that NH won't necessarily have use of the power. This is senseless.

Focus on public buildings and school **energy efficiency** in order to best save taxpayer money.

The use of the term "sustainable energy" for alternative, **renewable energy** sources is confusing and inconsistent. I think that the specialized terminology of energy efficiency makes it difficult for an average citizen to feel competent discussion the issues.

I don't like the **Northern Pass** project that PSNH is proposing. I'm especially offended by the idea that they keep touting it as "renewable" energy. But it's just the same old paradigm: big government-subsidized energy imported from "away". I would rather have lots of small local providers than one big Goliath.

Need model ordinances, design stds for **energy efficient developments**, including condos. Also rehab standards and incentives; need to be engaging public in discourse about alternatives to fossil AND nuclear--neither is either cost or physically efficient and both are inherently risky technologies. Co-gen,wind, solar, neighborhood based grid compatible systems should be explored and fostered. Examine financial incentives with 5 year paybacks for investments

Sample of Business Owner/Operator Comments:

The quality of the natural environment is an extremely important component of New Hampshire's **economy** as well as our quality of life. Therefore, it is all the more obvious that increased **energy conservation,** promotion of **sustainable energy** sources using resources found within New Hampshire (wind, biomass, solar, hydro, e.g.), and development of an electric grid that does not detract from the visual beauty of our state are all win-win propositions that will enhance both our economy and our quality of life into the future.

Encourage more **LED lighting**

Keep the **rebates and incentives** alive and do not make PACE loans unworkable.

You need to streamline your rules and regulations to **encourage cogeneration** projects of any size and make the large utilities buy the energy at competitive rates. They have a monopoly so smaller players can't get involved or its not cost effective.

Provide **incentives** for increasing **energy conservation** Provide incentives for decreasing dependency on fossil fuels Provide incentives for increasing use of **alternative transportation** systems --public transit and rail, walking, car pooling, biking

1) Cost. **Rate** should be discounted for high usuage. 2)Place **smart meters** in businesses as soon a possible.

Support the **rebate incentives**. They have been very helpful in directing and focusing residents decisions.

In an age where efficient, environmentally responsible power production is on everyones mind, I can't understand why the PUC would delay permitting a project such as **Laidlaw Berlin Biopower**. The combined economic advantages derived from this project will serve to put Berlin on the leading edge of sustainable power production, while injecting a serious economic push toward the development of other industrial opportunities. Providing new life to an almost destroyed logging industry that has existed in the Berlin area for 150 years, is important to us. Additionally, the viability of the Gorham Paper Mill through the availability of hot water from the Laidlaw plant, along with methane gas availability from Mt. Carberry Landfill, will restore about 200 good paying **jobs**.

Our local government needs to step up and support our local **Biomass mills**. If we loose these mills our local economy will suffer greatly.

If NH is serious about **fossil fuel reduction** and reducing carbon emmissions we need to provide some **incentives** to help homeownwers and businesses to do so.

BIG Hydro-electric projects are not environmentally friendly!
Money spent on **renewable local energy** helps the local economy and helps create/retain jobs.

No more **Utility** Control - NO Future CSG type Control!!!!

Continue **rebates** for implementing energy efficiencies or use of renewable energy.

here is no question upfront on how important is it that New Hampshire increase **energy conservation**. Efficiency and conservation are two different things. Poor survey design from this point of view at least.

Let's look at creating jobs here in NH by creating more **alternative sources of energy** for NH instead of tearing our state apart to benefit other states...

Most legislators are not smart enough to understand the real **economics** of supporting **renewable** and, in particular, solar energy in this state. They do no want to understand the simple math and will continue to be short-sighted until it is TOO LATE. The time to act is now. Our state is being left behind. MA is beating us badly in our region and other states (see TN) are garnering the bulk of the new high tech jobs related to solar energy. We once compete nationally on hihg tech **jobs** - no more. Wake up now!

Low income people are the most in need and are the ones with the worst efficiencies - the greatest return for the investment is in the low income single family residence - NOT apartment buildings

The **Utilities** do not need to dominate and control the **auditing and weatherization** market to promote efficiency - in fact it has the opposite effect. They poorly manage their programs. They can pay their rebates based upon energy savings without dictating who, what, and the price. A competative free market can do it better. The CAPS should be limited to within 10-20% of the poverty level to keep the market with small businesses.

I would like to see **incentives** and other support for **commercial-scale biomass** thermal for both private businesses and public buildings to reduce reliance on expensive imported oil and keep energy dollars circulating in the local economy.

The **state vehicle fleet** is a perfect target for emission reduction, mpg increase and cost savings. When approached, the Dept of Safety, dismissed the opportunity. Huge savings could be realized with ROI of under 12 mos. We should be taking advantage of small, run of river **hydro projects**.

Level the economic playing field of energy production by either raising the taxes on **fossil fuels**. lowering the subsidies to fossil fuels, or create well thought out long term **incentives/subsidies** to renewable energy. Keep the enrgy dollars local. Force PSNH to be a transmission and distribution company and not a generator of power.

PSNH needs to not think that Hydro Quebec is going to meet their Carbon reduction goals. They are passing the buck. **Hydro Quebec** is not a good company to deal with . They refuse to buy back energy from people who make too much. we should not do business with them. PSNH needs to take real action. Solar farm, tide and wind farms

In answering your questions about energy improvements from a small business perspective, on thing that is difficult is to add energy facilities to **leased property**. The landlord must have an interest in order to move these projects forward.

Poor choices in the selection of projects for use of **RGGI** funds. You can buy tons of yogurt and send several NH students to Dartmouth for the money spent on their projects.

Repeal the NHDES **Climate Action Plan**. Repeal **RGGI**. Renewables don't work. CO2 is not a pollutant.

Evacuated tube **solar HW** systems are very efficient and affordable with the current **incentives**. Most people don't know anything about them. I spoke with a contractor installing systems on three homes in my neighborhood. The system is a relatively easy retrofit. Heating hot water is the largest single use of domestic energy use even in the summer. Removing that use from current electric and gas demand would be a huge benefit for this state.

Northern Pass in its current form would be a grave and disastrous project for NH. Energy generated by NP is not needed for NH (we are an export state), nor are there any potential benefits to be found. If $1 billion is going to be invested, let's invest smartly for REAL renewable energy!!

Continue to participate in **RGGI.** Maximize the incentives for energy efficiency upgrades. Require Energy System commissioning and retro commissioning on all new building. Install energy efficiency equipment on all State owned buildings to maximize efficiency.

Appendix C: Large C&I Customer Feedback

On April 26 and 27, 2011 site visits were conducted to three large commercial and industrial customers and company staff were interviewed to allow them to express their opinions about and experiences with the New Hampshire energy efficiency programs. All three were customers of PSNH for electricity, and have a demand of greater than 100 kW which makes them "Large Customers". All three also were natural gas customers who used gas for space heating, but not for process energy. The three customers interviewed were suggested by PSNH because they have completed a number of projects, and they each had experience with energy efficiency programs in other states. All were very proud of the work they had done and the savings they had achieved. In fact, all three customers had stepped into leadership positions to help their company's facilities in other states to save energy. The responses below are aggregated from these three customers.

What types of projects have you done? Technology and Retro/Market Op/New Const.

All three have completed a wide range of both facility and process projects involving lighting, HVAC, compressors, and controls (technology and process). Two had worked with an ESCO on some projects. At least two had entered into demand response programs to shed load during peak demand times. All three had participated in a full cross section of types of projects including new construction, retrofit, and market opportunity.

Have you participated in the RFP program?

One had participated twice, one had not had a large enough project to qualify, and one thought about it but was counseled by their account executive that other programs would better suit their needs. The motivation behind this question was to see if the RFP process was working as designed to identify the minimum incentive level that would cause the project to happen. There was not enough data from the interviews to form any conclusions.

What projects or programs have worked well? (Incentives, technical assistance, customer service)

All three customers stated that they thought the process to enroll and close out projects was streamlined and not too cumbersome or bureaucratic. They appreciated the support of their PSNH account representative, and found him to be very responsive. The account representative was empowered to take care of pre and post inspections and the paperwork. The customers found that the savings estimates prior to project implementation were accurate. In one case PSNH was able to supply valuable technical support in validating savings estimates that enabled the customer to apply for and win grants from other programs.

What projects or programs have not worked so well? (Program offerings, paperwork, responsiveness, incentive levels)

- Two customers stated that they had maxed out their available pot of money for a particular program in a single year, therefore preventing them from doing more projects.

- One customer stated that they were participating in the efficiency programs as much as they are as a result of the interaction between committed internal personnel, and a good utility account representative. In past years they did not have a committed person internally, and their old PSNH account rep was not as good. So it takes both internal and external people to make a relationship work.

- Two customers wanted more outreach and options with respect to sustainable energy programs. One stated they were interested in doing sustainable energy projects in NH, but was not aware of any programs. One stated they were interested in sustainable energy, but the NH sustainable energy programs did not compare well to programs in other states such as California and New Jersey.

- One customer mentioned that although they had done a number of projects and had both reduced demand and energy use considerably, the increasing charges for transmission and distribution were impacting the savings realized from the efficiency projects. Their impression was that the utility was making up for lost revenue from efficiency by increasing T&D charges.

Based on your experiences with other state programs, how does NH's programs compare?

All three customers thought that New Hampshire's programs were easier to participate in than programs they had worked with in other states, and the incentives levels in NH were higher. All three specifically mentioned difficulties in New York.

How does your company decide on which projects to do? (Payback, ROI, IRR)

- One customer looks at capital investment costs and available funds, and the return on investment, but will typically do projects with a two year payback or better.

- One customer looks for a 22% return on investment, or a 2.5 year simple payback.

- One customer looks for a three year simple payback or better. They suggested a sliding scale for incentives instead of strict cutoffs or a fixed percentage of the cost of the project.

- One company, when working with an ESCO, is willing to do bigger projects with as long as a 10 year payback in order to avoid costly failures such as with a boiler, or if the project is revenue neutral.

How much influence does corporate have in the decisions?

The responses ranged on this question, but all stated that their corporate headquarters or overseeing board was supportive. Specific responses were:

- Pretty involved both regarding the technology and financial aspects of the project.

- There is a corporate energy policy and overall company goals, but no input from corporate on how to reach the goals. Corporate is not a barrier to doing efficiency projects.

- The overseeing board is supportive and trying to bring efficiency lessons learned in NH to other facilities in other states.

For small prescriptive projects, is it a problem to get a signature on the forms?
What are the barriers to your doing more projects? (Time, money, identifying projects, other)

The intent of this question was to see if requiring a signature on a form was a barrier to engaging with the utility to get a rebate on a project that the company was going to do anyway. Sometimes getting an authorized signature on a form is such a difficult process within a company's bureaucracy that it is not worth the facility personnel's time to do the paperwork necessary to enroll a project in a utility program. That was not the case with these three customers.

What are the barriers to your doing more projects? (Time, money, identifying projects to do, other)

- Internal funding
- Caps on available funds from utility programs

Is your company looking at any sustainable energy projects?

- One company said not yet, efficiency makes more financial sense.
- One said they were looking at solar hot water, but did not know much about sustainable energy programs.
- One said they have done preliminary assessments to look at natural gas cogen, wood chip cogen, and wind, but to their knowledge there were no state programs available to assist them.

Have you done any residential projects at your homes?

- Two people lived in Massachusetts and therefore this question was not applicable.
- One person was aware of the NH Saves residential program and had used it to purchase CFLs and to obtain a rebate for a new washing machine. They had not participated in a utility program when adding insulation to their home.
- One person had built a home in 2002 that is heated primarily by a pellet stove and although aware of the residential programs, had only had opportunity to use it for CFLs and an appliance.
- One person had done extensive work at his home including: air sealing, insulation, low flow fixtures, appliances, ceiling fans, programmable thermostats, reduced domestic hot water temperature, and a fuel switch from electricity to oil. He was even considering installing occupancy sensors, but to date he had only participated in the residential utility programs to purchase CFLs.

Most of the customers, who were obviously very proud of their energy efficiency achievements both at home and at work, seemed surprised that there was a residential program beyond CFLs.

One customer had sponsored an employee fair with their utility at their business to promote the residential programs. This might be a very good way for engaged business customers to promote the residential programs to help both the utility and their employees.

Other interesting points that came up during the conversations:

- One customer, in addition to doing projects averaging 1,000 MWh in energy savings each year, had also cut their demand by about 1,000 kW, saving approximately $12,000 per month in demand charges.

- At least two of the customers were participating in a demand response program.

- One company mentioned they were active with the NH Manufacturing Extension Partnership.

- One company had tried a Kaizen blitz approach to energy savings. This is a process where a cross-functional team works together to make facility and/or process improvements in a short amount of time.

- One company was offered a $10,000 grant to cover the costs of a study to quantify potential energy saving for a chiller project as part of a NH Business Resource Center program. This program, which uses ARRA funs to do audits or evaluations, is called "Large Business Free Assistance." Unfortunately, the consultant that was specified by the Resource Center was interested in doing a study that would have exceeded the available grant, and was greater in scope than the customer felt was necessary. The free assistance was now no longer going to be free, and the customer saw it as a waste of taxpayer money. The customer declined the grant and worked with PSNH, who did provide the service for free, to evaluate the potential savings.

- One customer is moving to a new building, and while this move will save a tremendous amount of energy compared to their current situation, their power needs still required a new electrical service to be connected to the new building as part of the retrofit. The customer paid for the new transformer pad and all wiring from the transformer into the building. However the customer was upset that they were also going to be charged $16,000 by PSNH to make the connection from the power lines to the transformer, which is work on the utility's side of the meter. The customer claimed that had they been a new business moving into the state, they would not have been charged a fee to pull the primaries and make the connection to the transformer. The customer did say that they worked with their account representative from PSNH to appeal this charge to the Public Utilities Board, and were unsuccessful. They appreciated PSNH's support and effort during this appeal. Their complaint is that the Board is enforcing a double standard: companies moving into New Hampshire enjoy a service that companies already present in New Hampshire have to pay for.

- One company expressed a desire for more low interest financing for energy projects.

Principal Lessons Learned

- These large customers are committed to efficiency and happy with the efficiency programs and their account representatives.

- All three stated that they would do projects with two to three year simple paybacks, which is higher than the NH CORE programs stated one year payback.

- All three wanted more incentive money.

- Low interest financing for energy projects is desired, and can enable projects with longer paybacks if the projects can be made to be cash flow positive.

- They did not like being limited by caps on available incentives.
- Two out of three were interested in sustainable energy programs, and/or cogeneration projects.
- There was very poor awareness of and participation in the residential programs.
- The sustainable energy program is not well known and needs improvement.
- The NH Business Resource Center "Large Business Free Assistance" program overlaps with the Utility Core program's technical assistance.

Appendix D: Detailed Utility Performance Incentive Model Comparison

Shared Savings Model

The shared savings model is currently the most commonly implemented type of performance incentive. Under the shared savings model, utilities receive a percentage of the net economic benefits from the efficiency program. Key considerations when implementing a shared savings performance incentive include:

- **Performance based:** A key advantage of the shared savings model is that it is inherently performance based. Since maximizing net economic benefits is the primary goal of most efficiency programs, shared savings incentives naturally align utility incentives with this major policy objective.

- **Multivariate:** Shared savings incentive mechanisms naturally encourage both savings and cost-effectiveness. This is because the more cost-effective an EE program, the greater the benefit (and thus the incentive) will be for the same amount of program spending. Adding other goals, for example relating to market transformation, is theoretically possible though rarely implemented. This is partly because it can be difficult to estimate the ultimate fiscal impact of, for example, increasing the percent of net benefits received. As a result, it is difficult to provide a balanced portfolio of policy incentives under this approach. For example, a shared savings model can encourage cream skimming at the expense of comprehensive savings. In theory, one can use the shared savings model simply to define the total amount of funds eligible for award, with multivariate metrics to encourage other objectives to earn a portion of the award. However, this approach effectively will end up similar to a performance target mechanism.

- **Scalable:** Shared savings incentives naturally scale linearly with the amount of economic benefits. In most implementations, the percentage of the benefits received also increases once certain savings thresholds are passed. For example, a utility may receive 6% or net benefits for achieving 85%-100% of the goal, but 8% of net benefits for achieving over 100% of the goal. To protect ratepayers from having to pay out very large amounts, the total incentive is often capped at a percent of program spending (as opposed to net benefits).

- **Evaluation, monitoring, and verification:** The size of the incentive is highly dependent on evaluated net economic benefits. This creates many potential areas of contention, such as net-to-gross ratios, how non-energy benefits are included and calculated, the precise definition of net economic benefits, and how the third party EM&V process will be used to adjust savings claims. This is a key disadvantage of the shared savings model; in California, for example, the evaluators found much lower net-to-gross ratios than anyone had expected. The resulting reduction in net benefits created uncertainty as to whether the minimum performance threshold for an incentive was even reached, and the resulting controversy caused long program delays. In order to avoid uncertainties such as this, it is important to set clear expectations as to how net benefits will be measured and how reported savings will be adjusted based on evaluation results. These issues apply to any model, however, tying incentive amounts directly to net benefits fundamentally raises the importance of some issues around uncertainty, such as avoided costs, cost-effectiveness calculations, certainty of non-energy benefits, etc.

Performance Target Model

The performance target model is the second most common type of performance incentive, and is the approach that New Hampshire currently uses. Under this model, the total incentive amount is defined up front, and awards are dependent upon the utility's ability to reach one or more performance metric such as energy savings. Many jurisdictions set the total incentive amount as a percentage of the EE portfolio budget; however, the earnings are tied to performance. Many of the states achieving the highest levels of efficiency use the performance target incentive due to its ability to transparently allocate incentives based on multiple performance metrics, and its ability to clearly define potential costs to ratepayers. Key considerations about the performance target model include:

- **Performance based:** Although it is conceivable that a utility could receive a percent of total program costs regardless of its ability to reach performance goals, this should not happen under this approach. Indeed, the name Performance Target implies that the incentive is only available if some minimum performance is achieved. Care should be taken to avoid designing a PI mechanism that gives awards for simply performing certain actions rather than achieving measurable outcomes.

- **Multivariate:** It is very easy to apply multiple performance targets as a condition to getting the full incentive, and jurisdictions should do so. For example, if the PUC believes that one goal is twice as important than a secondary goal, then for a total incentive of 9% of efficiency spending, 6% would be available for meeting the primary target and the other 3% would be available for meeting the secondary target. As an added advantage, it is very easy for utilities and other stakeholders to calculate in advance how much money is at stake for meeting each target.

- **Scalable:** The performance target incentive is not quite as naturally scalable as the other incentive models. However, it is very easy to make the incentive scale with increasing performance in each metric, and this is typically done. New Hampshire's current PI mechanism is an example of this; however, some of the details of how it scales are not ideal. See the New Hampshire section for more detail.

- **Evaluation, measurement, and verification:** Under the Performance Target model, the size of the incentive is not as intimately intertwined with net societal benefits, and so there is often less contention over net-to-gross ratios, non-energy benefits used, and the details of the cost-effectiveness screening methodology.

Rate of Return Model

The Rate of Return model was very common in the 1980s, but has fallen out of favor as efficiency expenditures are not typically capitalized anymore. This model was in use until recently in Nevada, where it has now been replaced by a lost revenue recovery mechanism, and in Wisconsin, where it only applies to a single low interest loan program for C&I customers, run by Wisconsin Power & Light. Under the rate of return model, all efficiency expenditures are capitalized over the average life of the measures installed, and earn a similar rate of return as supply-side investments. In Nevada, in addition to recovering program costs through rates, the utilities could earn a rate of return on the investment 500 basis points over the allowed rate of return for supply-side investments. The supposed benefit of this approach is that it puts efficiency on equal financial footing with new supply. However, many argue that supply side investments are still more attractive financially than efficiency, since supply side investments are usually much larger in size, and therefore offer much higher total potential earnings.

A twist on the above rate of return model that has been proposed does not capitalize EE investments as part of the ratebase utilities earn a rate of return on, but rather provides an incentive in the form of some additional basis points added to the current utility rate of return on its existing ratebase. This approach can be viewed as simply defining the total incentive award differently, and can be designed to look very similar to a performance target or shared savings model in practice. However, because a utility's total ratebase is typically far larger than EE investments, extreme care must be taken to ensure that the basis point adjustments are extremely small, and do not result in unanticipated large windfalls to utilities from small improvements in EE performance. For this reason, other models are generally preferred.

- **Performance based:** While it is theoretically possible to make a rate-of-return incentive performance based, the formulae may get fairly complicated. Both states currently giving rate of return incentives give the same incentive regardless of actual program performance. As a result, these mechanisms tend to focus on spending rather than performance.

- **Multivariate:** While it is theoretically possible to create a multivariate incentive structure, the calculation will get fairly complex, and no examples currently exist.

- **Scalable:** Rate of return incentives scale with program spending, typically regardless of the actual savings. This potentially creates a situation where the utility has a financial incentive to run expensive but less cost-effective efficiency programs.

- **Evaluation, measurement and verification:** Since energy savings targets are not usually included in this incentive mechanism, any EM&V activities will not affect the size of the incentive.

Duke's Save-a-Watt Model

In 2007 in North Carolina, Duke Energy proposed a unique performance incentive mechanism it called "Save-a-Watt." Duke argued that in order for energy efficiency to be viewed as equivalent to supply-side investment, a utility would have to be compensated in an amount roughly equal to what it would have spent on supply-side resources in the absence of efficiency programs. Thus the proposed Save-a-Watt model would compensate Duke for 90% of the net present value of the avoided costs[1] of the efficiency program. This sum of money would be enough to cover program expenses, lost revenue recovery, and shareholder incentives. In essence, Duke proposed that 90% of the benefits of EE accrue to shareholders, with only 10% being retained by ratepayers.

The Save-a-Watt Model has the significant disadvantage that it makes efficiency almost as expensive as supply to the ratepayers. Further, this structure arguably makes efficiency much more financially attractive than supply-side investment, since most of the avoided costs represent costs for the materials and labor for power plants, and not profit for the utilities. Therefore, a large portion of the costs avoided thanks to efficiency that would otherwise have gone into the material, labor, and fuel for new supply, can now be kept as profit for the utilities. In theory, the model could be used with a lower portion of avoided costs accruing to shareholders, and designed to offer similar awards as other mechanisms. However, even then, this model can encourage cream skimming and result in other perverse incentives.

The original Save-a-Watt program was rejected by the PUCs of North and South Carolina. However, Ohio has adopted a version which enables Duke to receive 50% of avoided energy costs, and 75% of

[1] Avoided costs represent the costs that the utility avoids by not having to produce a marginal unit of electricity.

avoided demand[2] costs. In addition, Duke will receive lost revenue recovery for at least the first three program years. The model is quite controversial in Ohio, and the lost revenue recovery mechanism is currently being challenged by the Ohio Consumers' Counsel. Furthermore, measuring energy savings is extremely contentious under the Save-a-Watt model, as the entire premise of the model falls apart if the efficiency programs aren't actually avoiding new supply. Nevertheless, Duke is pushing ahead with implementation and has applied to implement the program in Indiana and Kentucky, and reapplied in North and South Carolina.

- **Performance based:** The size of the incentive is inherently tied to avoided costs, which increase directly with the kWh and kW savings. This creates a natural alignment of utility incentives and a major policy goal. Further, significantly under-performing efficiency programs have the potential to not even recover full program costs.

- **Multivariate:** Since the Save-a-Watt mechanism is designed to pay for program delivery, lost revenue recovery, and performance incentives, it can be very difficult to separate in advance the portion of the award that is profit to the utilities from the portion that is used for lost revenue recovery and program administration. Since the avoided costs are capitalized and earn a ROI, it is theoretically possible to increase the earned ROI based on performance in secondary metrics. However, these calculations can become even more complex and opaque than in the rate-of-return model, since even the amount of funds to be capitalized is unknown in advance. This makes it very difficult to design a save-a-watt type mechanism that does not simply encourage cream skimming, or that focuses attention on other policy objectives. Cream-skimming may still be a problem in states such as NH with other types of PIs. However, the Save-a-Watt model makes it much harder to design a performance incentive that properly discourages cream-skimming.

- **Scalable:** The amount of money received from the Save-a-Watt model naturally scales with avoided costs, and thus both kWh and kW[3] saved. The Ohio version provides another layer of scaling by increasing the earned ROI on the capitalized avoided costs in tiers as the efficiency goals are met and exceeded. However, as noted above, if pursuing a multivariate approach that encourages addressing other policy objectives besides capturing maximum avoided cost benefits, scaling becomes difficult because the amount of money available is integrally tied only to a single metric.

- **Evaluation, monitoring & verification:** Since the "Save-a-Watt" model typically distributes a much greater portion of the benefits to shareholders, rather than ratepayers, it is vital that all stakeholders are confident that the benefits claimed are real, and that the efficiency programs are in fact avoiding supply-side costs. Under this model, the precise value of uncertain parameters such as net-to-gross ratios and avoided cost definitions can make an enormous difference to the utilities bottom-line, and thus the M&V process is likely to be quite contentious.

[2] Demand is the rate of energy consumption. The electric grid is often capacity constrained during the summer peak electrical usage period. Electrically during the period of peak demand can cost an order of magnitude more than off-peak electricity. Efficiency programs produce benefits by both reducing overall annual energy consumption, and by reducing the rate of consumption (demand) during the summer peak period.

[3] kW (kilowatt) represents demand, or the rate of electric consumption. One kW of demand over a period of one hour represents one kWh (kilowatt hour), a rate of electric consumption

Table D.1. California Shareholder Incentives

Financial Level	Performance Based?	Multivariate?	Scalable?
$150 million per year penalty to a maximum of 12% of net benefits.	Yes. Based on evaluated net savings	Yes, with limitations. Must achieve a minimum of 80% of MW, GWh, and MMtherm goals AND an average of 85% of goals. However, incentive only scales with net benefits, and does not include secondary policy objectives.	Yes. scales with benefits, and incentive jumps from 9% of benefits to 12% once goals are reached

California has adopted a shareholder incentive mechanism for three year program cycles, starting in 2006-2008. In order to qualify for an incentive, the utility must meet a minimum of 80% of the goals for MW, GWh, and MMtherms, as well as 85% goals in all 3 categories, using a simple average. For this level of performance, the utility receives 9% of net benefits. This increases to 12% of benefits if 100% of the goals are met. The total incentive cannot exceed $450 million over 3 years. A penalty is incurred if the savings fall below 65% of goals. The penalty is the larger of a per unit charge per shortfall under goals, or all negative net benefits from the program, and is capped at the $450 million over three years. The figure below provides a visualization of how the incentive and penalty changes as performance increases in comparison to goals.

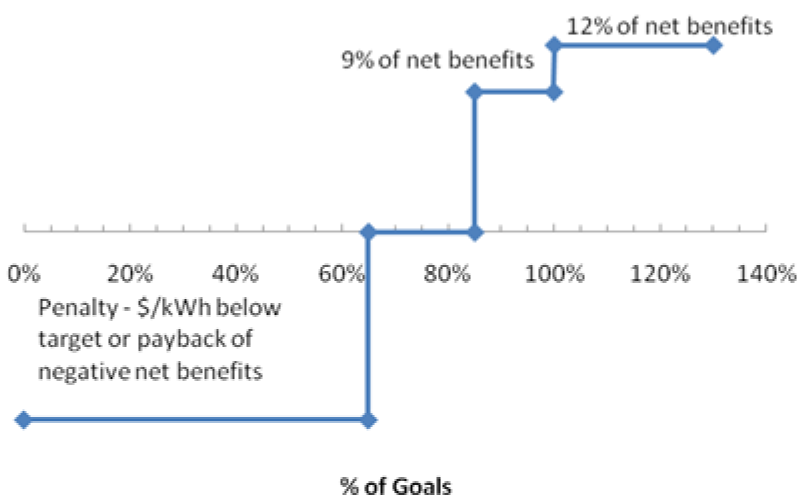


Figure 1 - California Incentive Structure

The savings goals for this program cycle were extremely aggressive; the goals were set to be higher than had ever been achieved in the past, and even the penalty threshold of 65% of the savings goals was higher than the actual efficiency achieved in any year between 1995 and 2003.

The incentives are paid in annual installments, with the third installment of every 3-year program cycle containing a true-up based on the results of a third party evaluation. Considerable controversy occurred in the 2006-2008 evaluation, when evaluators found net to gross ratios low enough that it meant some programs did not even meet the minimum threshold. This has yet to be fully resolved, but the utilities will probably end up earning around 1-2% of total profits as a performance reward[4].

[4]http://switchboard.nrdc.org/blogs/dwang/cpuc_shows_progress_making_eff.html

Key differences between California's mechanism and New Hampshire's mechanism include:

- **Very aggressive savings goals:** Even the threshold for earning a penalty in the 2006-2008 goals is higher than the actual savings achieved in California's entire history of providing significant energy efficiency. New Hampshire's 2011-2012 goals, by contrast, are lower than the actual savings achieved in 2008 and 2009. This demonstrates that the utilities are proposing conservative targets that they know to be easily attainable and not getting challenged by other stakeholders. In reality, performance targets should be higher from one year to the next even with similar budgets, as utilities gain experience administering efficiency programs.

- **Performance targets based on net savings:** Basing goals on net savings, rather than gross as in NH, encourages utilities to de-emphasize technologies that already have high market penetration. In theory, NH does this partially in an implicit way through the benefit-cost ratio part of the formula. However, the kWh impact portion is based on gross impacts, rather than those actually occurring from the EE effort, which blunts the benefit-cost ratio effect and drives NH utilities to continue focusing on technologies with high market penetration.

- **Tiered incentive structure:** In CA, once utilities achieve at least 100% of goals, the incentive jumps from 9% of net benefits to 12% of net benefits. This provides a strong incentive for CA utilities to reach 100% goals, as the performance incentive jumps up 3 percentage points. Further, for each dollar in benefit past 100% of goals, the utility now earns $0.12 as opposed to $0.09 cents, increasing the marginal reward for efficiency. In NH, there is no corresponding incentive to work extra hard to exceed goals.

- **Penalty for failure to achieve goal:** A scalable financial penalty is enacted in CA once program savings fall below 65% of goal, and no incentive is given unless the utilities reach a minimum of 80% for all savings targets (kW, kWh, and therms) and an average of 85%. In contrast, NH utilities can earn awards while failing to meet any particular level of energy savings, so long as they exceed performance in the planned benefit-cost ratio.

Table 2 - Connecticut Shareholder Incentives

Financial Level	Performance Based?	Multivariate?	Scalable?
1%-8% of program budget.	Yes. Incentive dependent on measurable targets. Must achieve minimum of 70% of goals to achieve incentive.	Yes, with limitations. While technically multivariate, a full	Yes Scales with, performance until savings exceed 130% of goal.

Connecticut's performance incentive is based on multiple goals for each EE program that are updated and evaluated yearly. Each goal is given a weighting factor based on the importance of the goal to the PUC, and calculated with:

$$Incentive = Total\ Spending\ (minus\ admin\ expenses) \times weight \times \%\ incentive$$

The program must achieve a minimum of 70% of the goal, at which the incentive rate is 1%. The incentive rate climbs to 5% for achieving 100% of goal and 8% for achieving 130%. See below for the approved 2011 performance metrics and weighting.[5] These performance metrics represent the roughly 80% of the incentive to be given for value. Note that although it looks like a whole ton of metrics, they are mostly built around getting savings and value, so they may not amount to much more than the savings and BCR metrics used by NH. However, the other 20% of the incentive is based on program specific actions, and thus encourages utility action in a broader range of areas.

Table 3 - Connecticut Incentive Structure

Description	Approved Weight	Approved CL&P $(000)	Approved UI $(000)
Home Energy Star $/kWh	0.0124	$50.0	$12.1
Home Energy Star$/kW	0.0124	$50.0	$12.1
Residential New Construction $/kWh	0.0124	$50.0	$12.1
Residential New Construction $/kW	0.0124	$50.0	$12.1
Performance Contract	0.0100	$40.4	$9.8
Long term Goals	0.0248	$100.0	$24.3
C&I code curriculum & Training for building trades	0.0100	$40.4	$9.8
All Res. Programs Sector Budget	0.1448	$584.3	$141.8
Net Res. Electric Sys. Benefit	0.1448	$584.3	$141.8
C&I Programs Sector Budget	0.2105	$849.7	$206.2
Net C&I Electric Sys. Benefit	0.2105	$849.7	$206.2

It is worth noting that a recent investigative report to the Connecticut Legislature has suggested the utilities have too much control in setting goals (the IOUs almost always receive at least 5% of the budget) and in setting the EM&V process. Key differences between the shareholder incentive mechanisms in Connecticut and New Hampshire include:

- **Multivariate:** The Connecticut mechanism awards performance in numerous metrics including, awareness and long term training goals. New Hampshire's only considers savings and cost-effectiveness, two goals which are closely related.

- **Incentive level:** the overall incentive levels in Connecticut are consistently lower than those in New Hampshire. Incentive levels in recent years have varied from between 3.9% and 6.6% in Connecticut, versus 10.32% - 11.87% in New Hampshire.

[5] DPUC Docket 10-10-03

Table 4 - Massachusetts Shareholder Incentives

Financial Level	Performance Based?	Multivariate?	Scalable?
Up to 8% of program budget (pre-tax)	Must achieve minimum of 75% of goals	Multiple performance metrics vary by program in three different categories	Incentive increases as performance in each category goes from "threshold," to "design", to "exemplary"

Massachusetts utilities can earn up to 5.5% after tax (8% pretax) of program costs in a shareholder incentive. Performance metrics vary from program to program, but are generally based on three metrics: Savings, Value, and Performance. The weighting of each metric varies by sector; for C&I and Res programs, savings is weighted at 45%, Value at 35%, and Performance at 20%. Performance metrics vary by program, and include creating a comprehensive approach for duct sealing or creating an average reduction of 28% below code for lighting projects. The threshold for the incentive is set at 75% of goals, and the total incentive earned is increased at 100% of goals, and again at 110% of goals.

Table 5 – Weighting of Incentives

Metric Weighting		
Savings	Value	Performance
45%	35%	20%

Thresholds for Increased Incentive Amounts		
Threshold	**Design**	**Exemplary**
75%	100%	110%

Key differences from the New Hampshire approach include:

- **Performance targets based on net savings:** Basing goals on net savings, rather than gross as in New Hampshire, encourages utilities to de-emphasize technologies that already have high market penetration.

- **Multivariate:** The Massachusetts mechanism awards 80% of the incentive to savings and cost-effectiveness, but reserves the remaining 20% to various metrics promoting depth of savings and market transformation efforts that may be in tension with the goal to maximize savings while minimizing cost. For example, some of the C&I performance metrics designed to create deep savings in projects include reaching an average lighting power density reduction of 28% below code, or including comprehensive measures in at least 11% of Small Business customers. These types of incentives are designed to discourage cream skimming – comprehensive measures may not be quite as easy to achieve or as cost-effective as common measures, but are still important to pursue in order to achieve efficiency's full potential. Some MA performance metrics meant to encourage market transformation include training at least 50% of regional HVAC contractors, and ensuring that at least 75% make improvements in their duct leakage rates, or to ensure that at least 30% of active builders sign at least one agreement to participate in the new construction program. Although actions such as these do not necessarily produce measurable energy savings, they help transform the market so that regional private actors are more aware of efficiency, and begin to implement best practices, even in the absence of the program.

- **Incentive level:** Like in NH, MA utilities have earned close to the maximum incentive available in recent years. This equates to about 8% of program budget, pre-tax, versus 12% of program budget in New Hampshire.

Table 6 - New York Shareholder Incentives

Financial Level	Performance Based?	Multivariate?	Scalable?
$38.85 per incremental MWh saved or about 12% of program costs maximum.	Yes. Incentive based on ability to reach savings goals set by legislature.	No.	Yes. The award scales linearly from 80% of targets to 100% of targets.

In 2008, the New York Department of Public Service created a shareholder incentive mechanism. New York utilities earn $38.85 per MWh saved between 80% and 100% of the savings goals. This number was derived from the assumption that the maximum incentive earned should be no more than 20 basis points on the return on equity for New York's investor owned utilities. This also equates to about 12% of the efficiency program budget. At the same time, a penalty of the same amount was created for every MWh below 70% of the goals. There is a deadband between 70% and 80% of the goals in which neither penalty nor reward is received. This structure is depicted in the figure below.

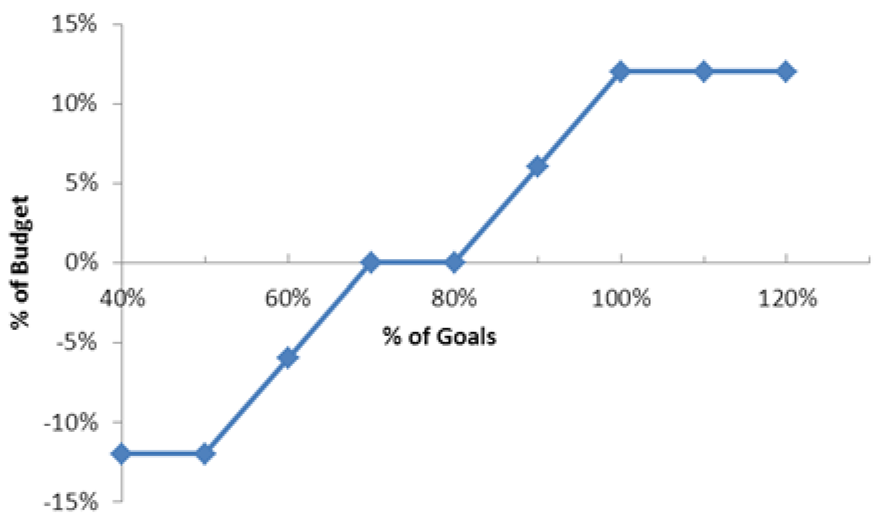


Figure 2 - New York Incentive Structure[6]

The Department of Public Service (DPS) originally intended to set yearly goals, along with yearly incentives and penalties. However, due to delays in approving and ramping up efficiency programs, utilities have been struggling to meet goals (before this decision, most statewide efficiency programs were run by the New York State Energy Research and Development Authority (NYSERDA), not utilities. As a

[6]NY DPS, Case 07-M-0548. Order Issued August 22, 2008.

result, the DPS first combined the 2009 targets with the 2010 targets, and then with the 2011 targets, to create a three-year 2008-2011 target. The DPS hopes to return to calendar year targets for 2012 and beyond.

Key differences from the New Hampshire approach include:

- **Penalty:** The main difference between the New York and New Hampshire incentive mechanism is the existence of a penalty in New York if a utility fails to achieve at least 70% of the goals. The DPS and other stakeholders believe that the incentive mechanism combining penalties and incentives have been successful in achieving the buy-in of a wide range of stakeholders, and capturing the attention of utility senior management. For comparison, if New York utilities achieve only 65% of the goal, a penalty is incurred, while New Hampshire utilities achieving 65% of goal are still eligible for an incentive of about 5% of program spending.

- **Higher marginal incentive rate:** As seen in Figure 5, although the maximum incentive is the same in New Hampshire and New York, the New York incentive starts rising later, but rises much steeper than the New Hampshire mechanism. This higher marginal incentive rate provides a greater motivation for New York to achieve the next marginal MWh of savings once it is already achieving some incentive. This is significant because in economic terms, people are motivated by the marginal return on investment, not the total award. Thus a utility manager is more likely to pursue the next MWh of savings in the New York model than in the New Hampshire model due to the higher incentive per incremental MWh saved, despite the fact that the overall incentive size is quite similar in both states. Thus, the penalty motivates utilities to achieve a minimum performance, and the steep incentive curve provides significant motivation to achieve full goals. The negative aspect of the New York mechanism compared to the New Hampshire mechanism is that the New York incentive does not grow beyond 100% of goals.

- **No scaling above 100% of goals:** A negative aspect of the New York mechanism is that the incentive stops growing once 100% of goals are reached. This provides no motivation for utilities to display exemplary performance. New Hampshire's PI, by contrast, increases until 150% percent of the goals are achieved.

- **Utility Performance:** Although NH utilities regularly earn near the full incentive available, New York utilities are struggling to achieve enough savings to avoid a penalty. Indeed, the DPS has combined the goals of 2009-2011 so that, in 2011, the utilities can try and make up for low performance in 2009 and 2010 and avoid penalties for those years. Even so, it will be a struggle for utilities to meet the combined goals. While neither the New York nor the New Hampshire situation is ideal – goals should be aggressive yet achievable – the New York situation shows that the incentive/penalty mechanism has had success in getting the utilities to invest significant time and effort in ramping up their efficiency efforts and achieving savings.

Table 7 - Vermont Shareholder Incentives

Financial Level	Performance Based?	Multivariate?	Scalable?
Maximum incentive of about 2.7% of program spending. However, EE programs are not run by the utilities, so there is less of a need to eliminate disincentives.	Yes. There are multiple measurable targets involved in determining the incentive amount	Yes. There are seven scalable performance metrics and five performance targets which must be achieved before any incentive becomes available.	Yes. The award for each performance metric scales up from a threshold to a maximum. The threshold and the scaling vary by metric.

Vermont's efficiency programs are not run by the electric and gas utilities, but rather by a third party efficiency provider, Efficiency Vermont. Efficiency Vermont is currently run by the non-profit Vermont Energy Investment Corporation (VEIC)[7], which contracts with the VT Public Service Board for three year terms in order to run Efficiency Vermont. A multivariate performance target incentive that amounts to about 2.7% of program spending is built into the contract between VEIC and PSB. The incentive is dependent on 7 different performance metrics, each with different threshold levels and scaling methods. These metrics include energy and demand savings, demand savings in capacity constrained areas, and increasing the share of savings coming from non-lighting measures. There are also five different performance requirements that don't carry an explicit financial award, but can reduce or eliminate the total incentive. These requirements include a minimum benefit-cost ration (BCR) of 1.2, minimum amounts of residential and low income spending, and geographic equity.[8]

Key differences from the New Hampshire approach include:

- **Performance targets based on net savings:** Basing goals on net savings, rather than gross as in NH, encourages utilities to de-emphasize technologies that already have high market penetration.
- **Multivariate:** The Vermont mechanism explicitly rewards performance for specific policy goals, and looks a 12 different metrics. New Hampshire only considers savings and cost-effectiveness, two goals which are closely related.
- **Incentive level:** Vermont's maximum performance incentive of 2.2% is the lowest of any state. This is appropriate because it is a performance-based contract with a non-profit entity, rather than the utility. Therefore, the program administrator has no disincentives to perform as well as possible, and its non-profit structure also lessens the need for large rewards. Still, New Hampshire's maximum incentive is over 5 times larger than Vermont's maximum incentive. There is partial decoupling in Vermont, to limit utility risk from Efficiency Vermont's activities.

[7] The VEIC staff that implements Efficiency Vermont is separate from the consulting team that is responsible for this report.
[8] For more detail about the Vermont incentive, see the PSB Contract: http://psb.vermont.gov/docketsandprojects/eeu/rfpsandcontracts/2009-2011/eeucontract

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The views expressed in this report are those of the study authors, consistent with the commissioning of this work as an independent study. This report is posted on the website of the New Hampshire Energy Efficiency and Sustainable Energy Board (EESE Board) website http://www.puc.nh.gov/eese.htm

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