







Independent Study of Energy Policy Issues

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Draft Report

June 30, 2011

All photos from New Hampshire, courtesy of Jeffrey H. Taylor & Associates, Inc.




VERMONT ENERGY
INVESTMENT CORPORATION

Meredith A. Hatfield, SCT Co-Chair
Deborah Schachter, SCT Co-Chair
c/o New Hampshire Public Utilities Commission
21 S. Fruit Street, Suite 18
Concord, New Hampshire 03301-2429

June 30, 2011

Dear Ms. Hatfield and Ms. Schachter,

Vermont Energy Investment Corporation is pleased to submit our Draft Report for the **Independent Study of Energy Policy Issues** being prepared as part our contract with the New Hampshire Public Utilities Commission. This report:

- Describes key energy efficiency and sustainable energy programs and initiatives currently underway in New Hampshire, and reviews and assesses them compared to lessons learned, best practices, and benchmarks in other states and jurisdictions;

- Contemplates new approaches to overcoming energy efficiency and sustainable energy market barriers, and optimizing public financing and private investment in the future; and

- Identifies a range of policy changes and program design and implementation enhancements that could maximize effectiveness and increase coordination among current and future programs and initiatives.

This report is provided for purposes of public review and comment, prior to publication of our final report. Once review comments are provided by the Study Coordination Team, we will prepare and submit the final version of our report. That report will be at the same level of detail and in the same presentation style as this draft.

In addition, a concise policy briefing directed at state policy makers, legislators, and agency directors will be prepared that will serve as an Executive Summary. The Executive Summary will be 15 to 20 pages in length, will highlight key findings and policy recommendations from this study, and will include photos and case studies of success stories. The Executive Summary will be developed as a stand-alone document that references the full report.

To help frame our review and assessment in this report, we provide substantial information about current activities. Despite the best efforts by our team to get all the details correct, we are certain to not have captured every nuance in just the way those running the programs would describe their activities. We look forward to this review both for the substantive discussion in response to our findings and recommendations, but also for the opportunity to learn of changes to the program descriptions that those running the programs might suggest as potential edits.

We look forward to working with the Study Coordination Team through the duration of this study.

Sincerely,

Christine Donovan

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

1.1. New Hampshire Legislation "SB 323"

This study was called for in a bill passed by the New Hampshire Legislature in 2010 referred to as "SB 323") which charged 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 study provides an independent, third party assessment of key energy policy issues, programs, and funding mechanisms in New Hampshire. Results of the study can help inform future priorities and activities of the PUC, the Energy Efficiency and Sustainable Energy (EESE) Board, and other state entities and stakeholders working to achieve state energy efficiency, sustainable energy, and greenhouse gas emissions goals in the future.

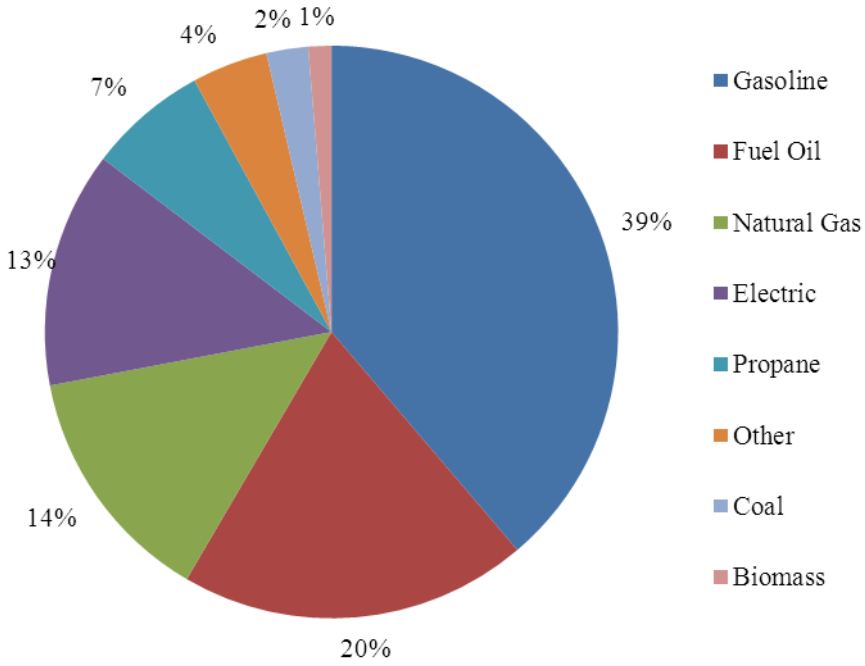
1.2. The Context for this Study

According to the New Hampshire Office of Energy and Planning, New Hampshire citizens, businesses, and industries spent over $6 billion on energy in 2008. Of this, $2.3 billion was for gasoline, $1.2 billion for heating oil and diesel, $818 million for natural gas, $804 million for electricity (not including fossil fuel costs), $406 million for propane, $142 million for coal, and $78 million for biomass.[2] Of this, $4.1 billion left the state immediately, and in many cases left the country, to pay for imported fossil and nuclear fuels.[3] This outflow of energy dollars is a serious drain on the state and national economy, and represents nearly 7% of New Hampshire's annual Gross Domestic Product (GDP).

[1] RSA 323
[2] Energy Information Administration, State Energy Data System 2008, "Table S1b Energy Expenditure Estimates by Source, 2008," http://www.eia.gov/emeu/states/hf.jsp?incfile=sep_sum/plain_html/sum_ex_tot.html.
[3] New Hampshire Office of Energy and Planning, "2007 New Hampshire Energy Facts," http://www.nh.gov/oep/programs/energy/nhenergyfacts/2007/introduction.htm.

New Hampshire residents and business owners could benefit substantially by additional investments in energy efficiency and sustainable energy that reduce (or stabilize) future energy bills, increase comfort, and stimulate the state economy. According to a 2009 study of energy efficiency opportunity in New Hampshire, if all households in the state were improved to the highest level of cost-effective energy

Figure 1.1: 2008 New Hampshire Energy Expenditures[4]



efficiency, residents would save $309 million per year.[5] Efficiency investments in commercial and industrial buildings could keep another $220 million per year in the state. 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. While the investment to achieve such savings could be nearly $2 billion, the savings would offset the investment in less than four years.

1.3. Key Areas of Focus in the Study

Seven key areas of focus are addressed in this study, including:

- The impacts and effectiveness of **energy efficiency and sustainable energy programs offered** in New Hampshire compared to lessons learned, best practices, and benchmarks in other states and jurisdictions;

[4] Energy Information Administration, State Energy Data System 2008, "Table S1b Energy Expenditure Estimates by Source, 2008," http://www.eia.gov/emeu/states/hf.jsp?incfile=sep_sum/plain_html/sum_ex_tot.html.
[5] 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

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

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

- Opportunities for **increasing the efficiency of thermal energy use** by incorporating a "fuel neutral" approach into energy program design and delivery;

- **Community planning and development** approaches that leverage the momentum of Local Energy Committees through the integration of "smart growth" planning principles and community-scale energy project development strategies;

- Ensuring **sustainable funding and increased private investment** to soften the impact of anticipated decreases in federal funding while increasing the potential for stimulating economic growth opportunities and jobs in New Hampshire; and

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

1.4. Draft and Final Reports

This report:

- Describes key energy efficiency and sustainable energy programs and initiatives currently underway in New Hampshire and assesses them compared to lessons learned, best practices, and benchmarks in other states and jurisdictions;

- Contemplates new approaches to overcoming market barriers and optimizing financing and investment; and

- Identifies a range of policy changes and program design and implementation enhancements that could maximize effectiveness, increase coordination, and result in sustainable funding and increased private investment.

This version of the report is the study team's first draft, provided for purposes of initial review and comment, before the team completes its work. Once review comments are provided by the Study Coordination Team (SCT) appointed by the EESE Board Chair to oversee the team's work, the final version of this report will be prepared at the same level of detail and presentation style as this draft. In addition, a concise policy briefing directed at state policy makers, legislators, and agency directors will be prepared that serves as an Executive Summary. The Executive Summary will be 15 to 20 pages in length, will highlight key findings and policy recommendations from this study, and will include photos and case studies of success stories. The Executive Summary will be developed as a stand-alone document that references the full report but does not provide the level of detail presented in the full report.

Once completed, both documents will serve as resources for public policy makers, regulatory and planning staff, and stakeholders in New Hampshire. They will also provide the basis for several public

presentations by the study team before the EESE Board and other public entities in New Hampshire later in 2011 and 2012.

1.5. Stakeholder Outreach and Engagement

This study involved extensive stakeholder outreach and engagement throughout the study period. A wide variety of stakeholders were engaged in some way during the study including:

- Electric and gas energy efficiency, demand response, and/or sustainable energy program managers and administrators;
- State personnel, non-profit organization leaders and staff, and others involved in the design and delivery of efficiency and /or sustainable energy programs and initiatives;
- Efficiency and sustainable energy trade allies involved in the delivery of utility "core programs" and the state's low income weatherization programs;
- Energy Service Company (ESCO) representatives, sustainable energy project developers, bankers involved in energy loan programs, energy investors, and venture capitalists;
- Key policy makers and legislators with particular interest in (or concern about) key energy policy and regulatory issues; and
- Ratepayers and the general citizenry (through use of an electronic survey tool).

Overall, personal interviews were completed with more than 50 stakeholders throughout the state, more than 750 citizens responded to an online survey about energy issues, and more than 25 state, regional, and local agencies and organizations were contacted during the study. Insights and perspectives from this outreach informed both the research and analysis done for the study, and the range of ideas and policy options contemplated or recommended by the study team.

1.6. The Philosophy and Ideology of Market Development

The concepts of "market barriers" and "market failures" have been discussed for more than thirty years among energy efficiency and sustainable energy leaders in the nation. Experience indicates that the most successful energy efficiency and sustainable energy programs and initiatives are those designed to address such barriers and failures. Examples of key barriers include:

- Lack of trusted information;
- Transactional complexity;
- Lack of capital to address high first costs; and
- Split incentives, among others.

Thought leaders in energy efficiency and sustainable energy program design and implementation have noted for decades that many of these are market failures that warrant public intervention to help markets work more efficiently. After the first round of EE program implementation in the early- to mid-1990s,

the underlying concept that limited implementation of energy efficiency measures and strategies indicates there are clear failures in the markets.

> *"Challenges to the existence of market barriers have, for the most part, failed to provide a testable alternative explanation for the evidence, which suggests that there is a substantial "efficiency gap" between a consumer's actual investments in energy efficiency and those that appear to be in the consumer's own interest."*[6]

It is the identification of and strategic action to overcome those barriers and correct those market failures that should continually inform the design of energy efficiency and sustainable energy services and strategies, including both utility services and governmental actions.

If one accepts the proposition that the justification for energy efficiency programs and services is that they are intended to address market barriers and overcome market failures, then the question *"How do we get to market development?"* should in significant measure inform all aspects of program design, implementation, and evaluation. However, such rigor and discipline often does not inform the approach to energy efficiency implementation. There can be two unfortunate results of this failure. On the one hand, skeptics of energy efficiency and sustainable energy investment strategies can employ a definition of "market development" that emphasizes a perceived contrast to programs that rely primarily on financial incentives to secure gains. The underlying assumption, sometimes stated as a clear assertion in this approach, is that market intervention strategies equate to "subsidies" while efforts that rely on education, exhortation, and the independent operation of the market should be considered "market developing."

Given the character of many of the early programs (and indeed, many current ones) the perceived contrast is not completely unreasonable. Many utility programs focus on going out and "buying" a certain amount of resource from customers, relying almost exclusively on incentives, without aggressively understanding the market and developing integrated strategies that address real market failures and respond to market dynamics. It could well be that should such programs be terminated, markets would quite promptly revert to lower levels of performance.

While such programs may be cost-effective and yield real 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. In effect, in these programs there is a limited intervention to overcome barriers for a defined period of time…not to shift the market itself.

In the late 1990s and early 2000s there was a significant divergence in regulatory approaches to program implementation. In some jurisdictions those early programs moved toward aggressive and systematic intervention, focused on identifying and overcoming market failures and securing deep levels of savings. In those jurisdictions, the market development strategies were most often identified, articulated and implemented.

In other jurisdictions an interesting paradox has developed in which an underlying policy and regulatory skepticism about energy efficiency and sustainable energy investment results in very limited commitment to funding, while the rhetoric of letting the market behave on its own continues to be repeated. It is in these jurisdictions that program implementation is the least likely to transform markets in the long run.

1.7. Keys to Successful Market Development

[6] 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

In order to understand the nature of market development barriers and what it takes to overcome them there are several critical points that must be kept in mind:

- **There is not a single market, there are thousands**. There is a tendency to talk about market development as though "once it is done it's done." New learning, new technologies, changes in prices products and markets all keep altering the pool of opportunities.[7] While the market for screw-in bulbs might be transforming to CFLs, there is a new range of opportunities with LED lighting. Refrigerators have more than tripled in efficiency while declining in cost, due in large part to coordinated EE and regulatory strategies; but TV set top boxes (for instance) have a long way to go in improvement and a very different market structure. Often opportunities are changes in practices as well as "products." Building commissioning, air sealing, improved system and building design are all in this category. These changes in practice are likely to require different approaches than discrete physical products.

- **There are a variety of ways to develop markets.** Direct investment strategies should lead to deeper levels of product acceptance. Work on the "market channels" such as the wholesale and manufacturer level can help move markets to lower cost, new products and wide acceptance. Certification processes, labeling, and training can all help move markets. Codes and standards can institutionalize and formalize advances as well..

- **Overcoming failures and transforming markets requires intelligence, responsiveness, innovation and persistence.** Each product or practice needs to be understood for its own version of how the market may be failing, and just what interventions can help address that failure.

Jurisdictions in which there is a strong commitment to market development tend to have the following characteristics:

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

- **Building the market infrastructure**. Well-run strategies create new business opportunities for designers, installers, builders, vendors. Often training and certification help create, differentiate, and grow these new businesses.

- **The focus should be on performance and implementation flexibility to achieve performance goals.** Incentives should be designed to reward implementers for innovation, responsiveness to shifting markets, and not be focused on regulatory micromanagement. Implementers should be free to change strategy, to alter incentives, to make special offers as long as they are held to demanding savings goals. Regulatory proceedings are perhaps the least effective means imaginable for responding effectively to market changes.

[7] This dynamic is not exclusive to EE. 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.

- **Sustained commitments and challenging targets are crucial.** It is a common failure of program design that energy efficiency targets, sustainable energy goals, and implementation budgets are arbitrarily limited. 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 all vital components of effective performance. On the other hand market development is not likely to succeed if resources do not allow for reaching significant portions of the market. A common feature of non-market-development –focuses programs is that they tend to "manage to goals" and if those goals are low, they will be as concerned about the regulatory risks of over-spending as they are about "meeting the targets." It is difficult to pretend that a program is helping develop markets if it has to shut down half way through the year because it is running out of funds.

- **Long term planning should be supported.** Performance goals should not just be year-to year, but allow for ramp-up and innovation over at least a 3-year period.

- **Market development should be 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 actually develops markets, and helps promote and support high-efficiency codes and standards.[8]

- **Regulation should remove disincentives for energy efficiency investments and reward strong performance.** This system should be carefully designed to ensure that consumers retain most of the benefit of the investment, and implementing entities are held to strict performance levels.

- **There must be a consistent and ongoing system of independent evaluation, verification, and feedback.** Something in the range of 3-7% of energy efficiency program budgets should be dedicated to evaluation, monitoring, and verification (EM&V) that continues to understand markets, assess program effectiveness, and inform and improve performance.

1.8. How the Study Results Will Be Used

This study demonstrates the savings levels in New Hampshire, and discusses in detail the energy efficiency programs currently operating to acquire those savings. The extent of sustainable energy market development is also assessed and the policies and programs directed at developing that market are described. This report serves as a resource for public policy makers, regulatory and planning staff and stakeholders interested in energy efficiency and sustainable energy market development in New Hampshire. The report represents the thoughts, opinions, and recommendations of the study team.

[8] An interesting feature of well-run EE 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 those measures are 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.

Section 2: The Current Energy Policy, Regulatory, and Funding Framework in New Hampshire

New Hampshire is a state characterized by its:

- Independent and "can do" spirit;
- Respect for individual freedom;
- Appreciation for private sector solutions to societal needs;
- Belief in local control and emphasis on community-scale approaches to problems and opportunities;
- Commitment to the environment and conservation of natural resources; and
- Economic development based on indigenous and sustainable resources.

Given this, it is not surprising that New Hampshire has a long history of policy, legislative, and regulatory initiatives that seek to increase energy efficiency, promote energy conservation, stimulate sustainable energy use, create jobs, and stimulate economic development.

2.1. Current Energy Policies

The current New Hampshire policy and regulatory framework has a number of impressive policy goals, legislation, and regulation that articulate New Hampshire's intention to move toward greater energy efficiency and sustainable energy development and use. Examples of major initiatives include (among others) the:

- **Least Cost Energy Planning Act** which established least cost energy planning as the energy policy of the state[1].

- **Electric Utility Restructuring Act** which created 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; etc[2].

- **Renewable Portfolio Standard** requiring each supplier of electricity in NH to obtain 25% of their electricity from renewable energy resources by 2025.[3]

- **Net Metering Statute** providing standard tariffs for customer-sited renewable energy.[4]

- **Distributed Energy Resources Statute** intended to stimulate utility investments in distributed generation.[5]

- **Greenhouse Gas (GHG) Emissions Reduction Fund** providing financial support for energy efficiency, conservation, and demand response programs that reduce greenhouse gas emissions.[6]

[1] RSA 378:37, New Hampshire Energy Policy, 1990.
[2] RSA 374-F: Electric Utility Restructuring, 1996.
[3] RSA 362-F: Electric Renewable Portfolio Standard, 2007.
[4] RSA 362-A: Limited Electrical Energy Producers Act, Net Energy Metering, 1998, 2007.
[5] 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[7].

- **Energy Commissions Statute** enabling local Selectboards to create or endorse existing groups to serve as Local Energy Commissions.[8]

A result of these numerous policies and regulations is an impressive portfolio of energy efficiency (EE), conservation, demand response (DR), and sustainable energy (SE) loan, grant, rebate, and incentive programs offered by state government, electric utilities, banks, and municipalities throughout the state. The programs have resulted in millions of dollars of investment in efficiency and sustainable energy in both the public and private sectors, reductions in electricity use due to efficiency improvements, and production of thermal and electrical energy using sustainable, renewable resources.

That said, New Hampshire has a long way to go to achieve the 25 x '25 Initiative endorsed by Governor John Lynch, that seeks to produce 25% of the energy consumed in the state from clean, renewable resources, as well as the goal established in the New Hampshire Climate Action Plan reduce GHG emissions to 80% below 1990 levels by 2050. Simply pursuing business as usual, with the type and scale of energy efficiency, conservation, demand response, and sustainable energy programs and initiatives already underway in New Hampshire is clearly not going to lead to the type of market development needed to achieve these important and aggressive state goals.

2.2. Current Regulatory Framework

In New Hampshire, energy efficiency and sustainable energy initiatives and programs are administered by several agencies, commissions, and boards. The major state agencies focused on energy issues are described below. In general, the Public Utilities Commission handles efficiency programs related to the regulated electric and gas utilities as well as sustainable energy initiatives related to regulatory decisions. The Office of Energy and Planning handles the State Energy Plan, State buildings efficiency, alternative fuels, industrial efficiency, sustainable energy, heating oil and propane, and additional energy-related education projects. The Office of Consumer Advocate provides advocacy on behalf of residential utility rate-payers.

New Hampshire Public Utilities Commission

The New Hampshire PUC's role has evolved since its creation in 1911. The PUC is responsible for ensuring that utility rates are just and that service is reliable and safe. The Governor appoints three Commissioners to the PUC for staggered six year terms, as the appointment is confirmed by the Executive Council. The PUC has a staff of 70 employees. The Commission is funded by a charge on the utilities revenue. Some funds from the Regional Greenhouse Gas Initiative (RGGI), an auction of carbon emission allowances (plus interest on investments) fund a Greenhouse Gas Emissions Reduction Fund (GHGERF). This fund supports energy efficiency, conservation, and demand response programs; at least 10% of the funds support low income initiatives. The Commission manages the Renewable Energy Fund (REF) funded by alternative compliance payments (ACPs) from energy suppliers. The Commission reports on its programs in biennial reports; the latest report available at the time of this report was

[6] RSA 125-O: Regional Greenhouse Gas Initiative; Greenhouse Gas Emissions Reduction Fund, 2008.
[7] RSA 9-B: State Economic Growth, Resource Protection, and Planning Policy, 2000.
[8] RSA 38-D: Energy Commissions, 2009.

published in 2009[9]. The PUC consists of several divisions: Legal, Administration, Consumer Affairs, Safety, Electric, Telecommunications, Gas and Steam, Water and Sewer, Audit, and Sustainable Energy, as noted below.

Electric: The Electric Division oversees electric utilities and energy efficiency programs offered by the utilities, including demand response/ smart metering and the Forward Capacity Market (FCM), as well as transmission issues.

Gas and Steam: The Gas and Steam Division oversee gas utilities and the only regulated steam utility (Concord Steam). Oversight includes rates, distribution, and energy efficiency programs (including low-income assistance programs).

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

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 (RSA 125-O:5-a). 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 potential in New Hampshire.[10] The board is currently responsible for providing recommendations to the New Hampshire Public Utilities Commission on the administration of energy efficiency and renewable energy funds (RSA 125-O:5, I(d)). The EESE board also serves as a platform for voluntary civic engagement. The board's duties, as listed in RSA 125-O:5-a, include but are not be limited to:

- 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.

[9] New Hampshire, Public Utilities Commission, Biennial Report, July 1, 2007 – June 30, 2009.
[10] Energy Efficiency and Sustainable Energy Board RSA 125-O:5-a, First Annual Report, December 1, 2008.

- 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.

- 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.

Some legislative bodies have overlapping duties with the EESE board. Until December 2008 the Energy Policy Commission (EPC) investigated energy issues including energy efficiency and renewable energy (HB 1146 of 2006 and SB140 of 2007). This commission is no longer active. The Energy Planning Advisory Board (EPAB) monitors and assists with the implementation of the 2002 State Energy Plan (SB 443, Chapter 164:2). The EPAB reports are located on the Office of Energy and Planning website. The Energy and Climate Collaborative was created in 2009 to track implementation of the Climate Action Plan. The EESE board and the Energy and Climate Collaborative collaborate closely through their common members.

The EESE board's work plan is designed to meet goals and recommendations in the New Hampshire Climate Action Plan. The work plan focuses on enhanced delivery system for energy efficiency and sustainable energy, coordinated municipal assistance, outreach and public education, "Beacon" communities, clean energy job training, and workforce development. Since 2008, the EESE Board has had working groups focusing on topics that mirror the EESE board's work plan: financing/funding, outreach and public education, public sector (especially municipalities), "Beacon" communities, comprehensive energy study (SB323), and workforce development and job training. Four working groups were active both in 2008 and in 2009.

Members of the EESE Board include representatives from state agencies, non-profit organizations and associations, legislators, non-voting members from the electric and natural gas utilities, and businesses in the energy efficiency and sustainable energy sectors. The PUC provides administrative support to the EESE Board. The Sustainable Energy Division keeps the EESE Board informed of its work.

Office of Consumer Advocate (OCA)

The Office of Consumer Advocate (OCA) is an independent state agency administratively attached to the PUC. Until the 1980s, the Office of the Consumer Advocate was included in the PUC. Amendments to RSA 363 made it independent, except for shared use of business office and support functions. OCA's statute was amended in 2001 and 2007 to include promoting customer participation and education. OCA

staff consists of a consumer advocate, appointed by the governor and council for a four year term, and four additional staff selected by the consumer advocate. OCA is partly funded by a charge on the utilities revenue. OCA receives advice from a Residential Ratepayers Advisory Board (RSA 363:28-a) whose board members are appointed by the Speaker of the House, the Senate President, and by the Governor and Executive Council.

While the role of the PUC is to balance the interests of ratepayers and utility shareholders, the role of OCA is to advocate for residential rate payers. OCA focuses on Dockets susceptible to have an economic or quality impact on residential rate payers. Unlike the Consumer Affairs Division of the NH PUC, OCA is not authorized to represent individuals in complaints with utilities. OCA is a member of the EESE and EPAB boards.

New Hampshire Office of Energy and Planning

The New Hampshire Office of Energy and Planning is included in the Executive branch of New Hampshire's state government, within the Office of the Governor. The director of the OEP is appointed by the Governor. The OEP administers energy-related programs and initiatives pertaining to a variety of issues including:

- Development of the 25 x '25 Plan in collaboration with the Department of Environmental Services;
- Clean transportation / alternative fuel programs;
- State building efficiency, including Building Energy Conservation Initiative (BECI), and hosting the State's Annual Energy Conference in collaboration with the Department of Environmental Services;
- Industrial energy efficiency;
- Renewable energy;
- State heating oil and propane; and
- Energy-related education, including collaboration with the University of New Hampshire.

Financial support for these programs comes from federal grants and the State's General Fund. OEP also coordinates programs funded by the American Recovery and Reinvestment Act (ARRA). OEP is responsible for the statewide administration of the Low Income Home Energy Assistance Block Grant (LIHEAP), also referred to as the Fuel Assistance Program. OEP contracts with six local Community Action Agencies (CAAs) to provide services to eligible households. This program is funded through the US Department of Health and Human Services.

Both the OEP and PUC are involved in the State's Energy Facility Siting Evaluation Committee (SEC). This committee includes eight state agencies who review proposed energy projects in the state as a committee (RSA 162-H). This approach provides a single forum for an applicant to present an application, simplifying the application process.

2.3. Funding Sources for Energy Efficiency and Sustainable Energy in New Hampshire

Funding for energy efficiency and sustainable energy programs currently comes from a diversity of sources (Table 2.1, 2.2. and 2.3). Some funding sources, such as the System Benefits Charge (SBC), allow for relatively stable funding, which is necessary for the success of programs that support the development of the energy efficiency and renewable energy industry. Other sources are temporary (e.g. ARRA) or are in jeopardy at the time of this writing (e.g. RGGI). More details on each funding source are provided in the appropriate section of this report; a list of ARRA and RGGI funding broken down by

project is provided in Tables 2.2 and 2.3. Other incentives such as federal tax credits provided under ARRA (e.g. Advanced Energy Manufacturing Tax Credit - 48C), or state tax credits (e.g. Renewable Energy Property Tax Exemption, NH RSA 72:61-72) are not listed. ARRA funds currently dominate the landscape with close to $70 million invested between 2009 and 2012. This funding will not be available going forward. RGGI funds provided $30 million in 2009 and 2010. In comparison, the System Benefits Charge provides $19 million annually for the electric efficiency programs, and $7 million for gas programs. REF funds are declining.

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

	State, County, Municipal	C&I	Residential[11]	Low-income	Communi-ties/ Non-profit	Building Code	Other	Total [12]
SBC - Electric	$30,000 - PSNH Smart Start	$9,000,000	$6,200,000	$2,600,000 - CORE	***	$40,000 - CORE		**$19,000,000 (2011)**
EE Charge - Gas	***	$3,600,000	$2,800,000	$800,000	***			**$7,000,000 (2011)**
ACP funded REF		$1,000,000	$3,300,000					**$4,500,000-$1,300,000 (2009-2010)**
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			$1,000,000		$200,000	**$31,000,000 (2009-2010)**
Federal				$2,500,000– WAP, 2009				**$1,300,000-2,500,000 (WAP 2007-2009)**

******* Included in other categories

[11] Does not include low-income programs.
[12] Totals may not add up due to rounding.

Table 2.2. Programs Receiving ARRA Funds

Program[13]	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	$ 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	$ 23,200,000
Base Grant Weatherization	Low-income residential customers	$ 1,600,000
Sustainable Energy Resources for Consumers (SERC)	Low-income residential customers	$ 2,565,000
Total		**$ 27,365,000**
Non-profit Organizations and Other		
EECBG Beacon Communities – BetterBuildings	Competitively selected communities	$ 10,000,000
Total		**$ 10,000,000**
Building Code		
SEP Building Code Compliance	Workshops	$ 600,000
Total		**$ 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	Innovative initiatives from the public, private, and non-profit sectors	$ 1,500,000
Energy Assurance	Risk and vulnerability assessment of the energy infrastructure	$ 320,729
Total		**$ 2,620,729**
ARRA Grand Total		**$ 72,397,729**

[13] Some projects have multiple objectives and may fit in multiple categories.

Table 2.3. Programs Receiving RGGI funds

Program[14]	Funding Recipient	Amount
State, County, and Municipal Programs		
CDFA RLF for building upgrades, 2009-2010	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
RMANH, 2009, expanded in 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)		
CINH for education and National Green Building Standard certification, 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
NHHFA 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		
HBRANH, Training, 2009-2010	Workforce training	$200,000
RGGI 2009-2010 Grand Total		**$31,291,335**

[14] Some projects have multiple objectives and may fit in multiple categories.

The systems benefit charge has been fixed for a decade and was established at the time of partial transition to retail choice in New Hampshire. The portion of the charge dedicated to the "low income assistance program" for low income customers has varied overtime, as has the balance available for energy efficiency programs. While Forward Capacity Market funds are put into energy efficiency program funding, those revenues are limited and not likely to increase in a New England market that is surplus on capacity. RGGI funds have been directed to competitive grant funding efforts directly to customers and other programs for both efficiency and sustainable energy initiatives. In addition, utility administered CORE efficiency programs were awarded a portion of RGGI funds previously, but it is unclear in the current legislative context whether those funds will be available and just how they might be used should they remain available. Federal support for LIHEAP and Weatherization Assistance Programs continue, and vary somewhat from year to year. The Renewable Energy Fund supported by RPS-driven Alternative Compliance Payments seems to be in a period of decline. The huge ARRA funded investment in energy efficiency and sustainable energy initiatives throughout the state will be depleted in 2013.

Looking to the future, New Hampshire faces a huge challenge in finding long-term sustainable funding to stimulate and develop energy efficiency and sustainable energy markets in the state. This is addressed in detail in Section 13: Finance Programs Review and Assessment.

Section 3: Community Planning and Engagement as Cornerstones of Sound Energy Policy

3.1. 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 unprecedented federal support (through ARRA) for state and local energy initiatives, a buzz 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 can foster more energy efficient and sustainable energy use, but also on how municipal government and citizens can take action at the community level to reduce dependence on imported energy and help meet the goals of New Hampshire's Climate Change Action Plan. In the bill's final language, these broader concerns fall generally under the need to increase energy conservation and 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. Add green buildings and fuel efficient vehicles to the mix, and the numbers drop even more. Such savings not only have broad energy implications for the environment, 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 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 C: Bibliography are a variety of planning and smart growth references and resources.

3.2. Community Energy Consumption

Energy is the lifeblood of the economy, and all citizens in New Hampshire rely on energy to carry out their work and conduct their lives. 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

[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

heating of municipal buildings and the fueling of snow plows and fire trucks. Many public policies established at the municipal level relate to land use and development patterns. The development patterns that result from state and municipal regulations have a significant impact on how individuals, businesses, and institutions consume energy. For a long time, when planners and others promoted the benefits of mixed use developments on a denser scale, the response from builders and developers was that 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.

3.3. Concord, New Hampshire: A View of Development over the Years

Concord, is a place holder (or marker) indicative of development patterns throughout New Hampshire. Concord's development trends and situation are replicated in community after community across the state, across New England, and across much of the United States. New Hampshire has 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 neighbors, from Epsom to Bow to Salisbury to Canterbury and Loudon, initially a collection of ten near abutters, then eleven after the Town of Webster came into being in 1860. It 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 locally. Towns were small and decentralized. Concord became the permanent State capital in 1808. Within its region, it 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

[2] *On Common Ground, National Association of Realtors,* Summer 20011, p. 5. http://www.realtor.org/government_affairs/smart_growth/on_common_ground

Table 3.1 New Hampshire Census Statistics

Date	Pop. of Region, Including Concord	Concord Pop.	% of Pop. in Concord	Comments/Observations
1820	17,198	2,838	17%	Agrarian economy. Most towns about the same size: 1,500 to 2,500. Concord new State capital as of 1808.
1880	27,600	13,843	50%	Post Civil War era. Hill/farming towns losing population. Mills in Concord and Suncook. Railroad has come to area.
1930	36,676	25,228	69%	Pre-Depression Era. Small towns still losing population. Railroads at peak. Mills still operational.
1960	44,820	28,991	65%	Small towns starting to grow. Mills starting to fail. Interstate 93 connected to Concord. Other roads improving.
Today	90,024	42,175	47%	Majority of growth in surrounding areas. Concord gaining some population, but losing majority share.
2020	120,000	53,500	45%	Likely unsustainable with current road system. Major road improvements unlikely. Commuting times likely to double.

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 improvements to NH Routes 3, 4, 101, and many others. 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. With the possible exception of an additional lane on Interstate 93, the road system that is in place now is likely the one that will be available to

Case Study: Leading the way with Local Planning and Zoning
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 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

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.

3.4. Guiding Growth for a Sound Energy Future in New Hampshire

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 starting 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 does not presently have a formal energy policy in place. It does, however, have a legislative placeholder where one 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

[3] http://www.gencourt.state.nh.us/rsa/html/I/9-A/9-A-mrg.htm

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.

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 an Energy Policy, resources should be provided to the Office of Energy and Planning to assist it in assisting 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 an office park is an excellent example. The relocation of some Employment Security Offices (and others) out of downtowns, such as out of downtown Claremont, show why this is an important principal.

- **By its rule-making** – State agencies are charged with certain missions, and are generally very good at serving those. They are frequently given rule-making authority to achieve those missions. On more than one occasion, the focus on serving an assigned mission has seemingly blinded agencies to broader issues. The difficulty in siting new school buildings on anything but "greenfield" locations is an example of this. Agencies need to be true to their missions, but 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.

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. It would appear that that is not always the case at present. A recommendation would be that the language be updated to reflect the current sensitivity to Sustainable

[4] http://www.gencourt.state.nh.us/rsa/html/I/9-B/9-B-mrg.htm

Energy and Resource Conservation, and then 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.

At the Community Level in New Hampshire

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 about Climate Change at public meetings then and urged their communities to take action. Over half of those have now formed local energy committees. These new committees 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 committees 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.[5]

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.[6]

Bicycle / Pedestrian Facilities
Keene, New Hampshire

Temple – In 2008 Clean Air Cool Planet, a New Hampshire-based non-profit, and the Town of Temple developed an Energy and Land Use Audit. The audit was a departure from a traditional smart growth audit that looks at the master plan and land use regulations for inconsistencies. In Temple this effort looked at the energy implications of the master plan and land use regulations, and assisted the Energy Committee and Planning Board in building a working relationship that is leading to change locally[7].

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 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. The project is funded with ARRA funds through the State's EECBG Program[8].

[5] http://www.ci.epping.nh.us/art%2022%20Energy%20Efficiency%20&%20SD%2010.pdf
[6] http://www.ci.keene.nh.us/sites/default/files/DOC111010_0.pdf
[7] http://www.nhenergy.org/images/6/61/Temple_Case_Study.pdf
[8] http://www.leenh.org/Pages/LeeNH_BComm/Energy/index

Peterborough – Through a series of zoning changes made to implement the community's Master Plan, Peterborough triggered two positive development examples. 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[9].

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[10].

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 US Dept. 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[11].

Municipal Energy Assistance Program – This effort was made possible through the New Hampshire Public Utilities Commission and the Greenhouse Gas Emissions Reductions Fund. The purpose of the program was to provide a guided (and staffed) step-by-step process to help a number of New Hampshire communities become ready for energy conservation efforts. This also set the ground work for future technical assistance through the Regional Planning Commissions and other agencies, and for gaining 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.[12]

At the Regional Level

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.

Since organizing, PAREI has grown from informal meetings to an organization of over 400 families and businesses. The services offered include discounts on solar collectors, Professional Home Energy Audits,

[9] http://www.nh.gov/oep/programs/SmartGrowth/westpeterborough.htm
[10] http://www.plainfieldnh.org/energy.html
[11] http://www.betterbuildingsnh.com/BetterBuildingsNH/Home.html
[12] http://nhenergy.org/index.php?title=New_Hampshire_Municipal_Energy_Assistance_Program

Energy Saving House Walk Throughs, Solar Site Visits and Solar Analysis Reports, Volunteer Solar Energy Raisers and Housewarmings, membership meetings, an Energy Advisor Network partnering members with volunteers, professional solar water and solar electric installations, as well as Do It Yourself support for installing Solar. To advance this model throughout the 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).

The question has been raised as how best to foster and support these regional initiatives. One, perhaps mildly reactionary, response is that they are happening on their own, so don't interfere. Let them continue to find their way. There is perhaps some merit in that. Stay away from what is working. But technical assistance and support, whether it is from the New Hampshire Office of Energy and Planning, or New Hampshire Cooperative Extension, or others would seem to be a logical adjunct to these home grown initiatives.

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 would seem to be important as well. And learning from PAREI and others who have already gone down this road would be 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 benefited 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 REIs. 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

3.5. Summary and Recommendations

As noted, New Hampshire is not alone in having evolved into 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 be difficult to reverse immediately. But we can, and should, start, for both economic and environmental reasons.

Mixed Use Development Downtown Exeter, New Hampshire

On the hopeful side, there is a useful frame-work for moving in that direction at the State level in New Hampshire, and good examples of how to do it at both the regional and community level. Specifically, in order to reverse the past patterns of development, it is recommended that:

- The NH Office of Energy and Planning (OEP) re-draft RSAs 9-A and 9-B so as to convert their language from "Smart Growth" to Sustainability and Energy Efficiency, including establishing a State Energy Policy within the framework of the State Development Plan.

- OEP and the Governor's Office complete efforts to finalize and publish the State Development Plan called for in RSA 9-A.

- State Agencies regularly use the sustainability and energy efficiency principles outlined in RSA 9-B when making real estate decisions, when making granting decisions, and when undertaking rule-making. Further, that these principles be abided by all Executive and Legislative Branch parties when preparing, reviewing, and adopting the biennial Capital Budget.

- OEP offer regular training and guidance to municipalities to assist them in promoting compact, nodal development whether by the use of Form Based Codes or other means. The education regarding the linkage between sound planning and energy efficiency needs to be a key component of this effort.

- If the funds from the Regional Greenhouse Gas Initiative remain available, that the Energy Efficiency-Sustainable Energy Board should join in this educational effort as well.

- Mixed use development in central places (whether they be village cross roads, town centers, or urban downtowns) be a goal of all State Agencies. 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.

- OEP establish a networking opportunity on its web site, where individuals interested in forming a PAREI-type regional effort in their part of New Hampshire could connect with like-minded individuals in their region.

Village Center
Washington, New Hampshire

These actions are all achievable, and they 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. They 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 residual landscape that accommodates these new trends. We were a community of central places. We were a landscape where at least some people walked to school and to work. We don't need to create this development pattern anew out of whole cloth. We simply need to re-invigorate what is already here. The actions recommended above will allow us to begin to do that.

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 Coop 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 at Work
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

Section 4: Building Energy Codes

Buildings accounted for 50 percent of New Hampshire energy expenditures in 2009[1], 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. Major renovations are also rare opportunities to increase the performance and efficiency of existing buildings. Analysis of the costs of energy code compliance (including both government and private inputs) has shown that for each dollar invested, six dollars of energy savings are realized.[2] Many of the savings last the life of the building and are difficult and more expensive to add after construction.

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 DOE that state's receiving federal ARRA monies adopt the 2009 International Energy Conservation Code (IECC) and that at least 90 percent 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.

To date, 24 states and territories have adopted the 2009 IECC for residential buildings, and 29 states and territories have adopted the equivalent for commercial buildings. 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 health of buildings. Furthermore, the dollars spent on efficient building are more likely to be reused in the local community by the tradespeople who earned them, than the dollars spent on higher fuel use, most of which leave the state and/or country.

4.1. New Hampshire's Energy Code, and Beyond

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, the General Court must concur with the Board's decision or the code reverts to the previous one.

The New Hampshire State Building Code Review Board has adopted the 2009 IECC for residential buildings as well as the equivalent for commercial buildings. As such, the Energy Code is considered to be in effect, although it has not yet been ratified by the General Court. 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

[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)."

zone 5 (where most New Hampshire residents live) compared to buildings constructed in compliance with the previous building energy code (the 2006 IECC.)[4] Recognizing the State Board's adoption of the 2009 IECC and increasing attention to the Energy Code outreach and education efforts, the national Building Code Assistance Project (BCAP) named New Hampshire as one of the "Top Ten Places to Watch in 2010." BCAP notes that by 2030 and assuming 100% code compliance, the state will save an estimated 3 trillion Btu of primary energy, $31 million dollars, and more than 200,000 metric tons of carbon dioxide emissions annually.[5]

State of the art green building techniques can achieve efficiency levels well beyond the 2009 IECC. Standards and rating systems such as Home Performance with ENERGY STAR, Leadership in Energy and Environmental Design (LEED), Passive House, and the upcoming International Green Construction Code by the ICC recognize homes and other buildings that require significantly less energy than buildings built to code. Ways to encourage owners and builders to build to this higher standard include:

- Allowing municipalities to adopt more stringent codes than the State;
- Offering incentives for meeting one of the green building rating system; and
- Offering a higher standard statewide, referred to as reach or stretch code, or above-code.

Several states including California and Massachusetts have adopted optional stretch codes, which are then sometimes adopted as minimum energy codes by municipalities.

The State of New Hampshire does allow 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.[6] The code awards points for orienting a building for passive solar gain, use of local and recycled materials, tight building envelopes, and 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.

4.2. Energy Code Outreach, Education, and Training in New Hampshire

As part of the state's commitment to improving building efficiency through codes, there are two timely projects related to building codes in New Hampshire. One is a recent report published by the Building Code Assistance Project. The other is the exciting Energy Code Challenge initiated by the New Hampshire Office of Energy and Planning.

Building Code Assistance Project

The Building Code Assistance Project (BCAP) published its "New Hampshire Gap Analysis" in February of 2011. The document highlights strengths and weaknesses of current building code adoption and implementation policies and includes 28 recommended actions for the State, local governments, and others to increase code compliance. The report provides important guidance to state and local officials interested in increasing Energy Code awareness and compliance around the state.

[4] ICF International, "ICF's Analysis of the Energy Savings achieved by the 2009 IECC," 2008. http://www.thirtypercentsolution.org/solution/ICF-data.pdf

[5] Building Code Assistance Project, "New Hampshire Code Overview," http://bcap-ocean.org/state-country/new-hampshire.

[6] 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

New Hampshire Energy Code Challenge

In 2010, the Office of Energy and Planning hired GDS Associates 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 ARRA). Referred to as the Energy Code Challenge, OEP allocated $600,000 in federal stimulus money for this program. (This is in addition to ongoing code education work being carried out by utilities in the state.) GDS completed a code compliance survey previously in 2006, and has updated the survey for the challenge. Sixteen training workshops were held in 2010 and sixteen more are underway in 2011 to educate designers, builders, code officials, realtors, and appraisers about the new Energy Code. The daylong workshops are being held at various locations throughout the state. Over 1,000 people have attended thus far, 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 being used to educate the public about energy codes. Sustained consumer awareness programs can create demand for code compliant construction and renovations and for builders and code officials who are certified and who follow continuing education programs. The challenge addresses many of the issues raised in the BCAP report and aligns New Hampshire with some of the best known methods to improve the performance and quality of new construction.

4.3. Conclusion and Recommendations

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 including good policies for adoption, enforcement, and measurement of building performance and leads to optimal savings from efficient building practices.

The Energy Code Challenge currently underway should result in a significant increase in understanding of the Energy Code. Newly invigorated implementation efforts including the 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 to bring them up to speed could potentially be raised, or at least offset, through permit 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.

Key recommendations from the BACP New Hampshire Gap Analysis include the following:

- Ensure that the New Hampshire State Building Code is ratified by the General Court, and ensure that the New Hampshire Building Code Review Board retains its authority to update the State Building Code in the future.

- Clarify roles and responsibilities for Energy Code enforcement between the state and municipalities, and establish Energy Code compliance verification methods.

- Encourage local jurisdictions to adopt more stringent energy codes for public and private buildings.

- Continue to support and expand energy code outreach at the state and local levels, including raising awareness among new stakeholders.

- Find ways to provide more resources for Energy Code enforcement in unincorporated areas and jurisdictions without code officials or develop creative solutions, such as regional inspection departments.

- Provide inspection departments with training, tools, DOE materials, and other resources to improve energy code enforcement.

- Establish minimum certification and licensing requirements for code officials and contractors.

- Encourage partnerships between the state, trade associations, the utilities, and other stakeholders that result in continued outreach, education, training, etc. once the current Energy Code Challenge program is completed.

- Encourage design and construction professionals to construct and market energy-efficient buildings to distinguish themselves in a competitive marketplace.

Section 5: State Government Leading by Example

5.1. 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.

New Hampshire State Government has demonstrated a strong commitment to energy efficiency and sustainable energy. In Executive Order Number 2011-1, issued in April 2011, Governor Lynch reiterates 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 (25 x '25). In addition, a variety of ambitious goals and policies are established to continue an already impressive record of energy savings by State Government. These include, for example:

- An order for all agencies to work with the State Energy Manager to implement energy efficiency and cost savings measures.
- Agencies and Departments are required to track energy and water usage in order to benchmark their facilities' usage, and to develop a plan to reduce use.
- New equipment purchases must be ENERGY STAR® rated, and new construction must meet or exceed a yet to be determined high energy standard.
- New construction projects are required to consider installing renewable energy generation, where practical.

5.2. 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% already[1]. 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 dollars 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.

[1] Energy Management Annual Report, November 2010, http://admin.state.nh.us/EnergyManagement/index.asp

Table 5.1. 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 5.2. 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. 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.

5.3. The Economic Impact of 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.[2] 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 South Fruit Street.

5.4. Recommendations and Conclusions

As noted in the goals of the Office of Energy and Planning (OEP): "OEP's intent is to demonstrate the State's progress in reaching energy efficiency goals, and doing so with measures that are duplicable by

[2] Nashua Telegraph: http://www.nashuatelegraph.com/news/742706-196/report-psnhs-use-of-coal-drains-green.html

other public and private entities."[3] 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, and an extensive outreach and education effort focused on telling the state's story. In the future, the 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 might seek to hold open houses to show off their projects and to develop case studies sharing their lessons learned. Some state governments have negotiated group discounted pricing for items such as low wattage fluorescent lamps and high performance ballasts. An RFP is put out to bid and the low bidder wins the contract 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 efficient equipment.

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. Partnering with the utilities to promote residential efficiency programs could benefit all parties. New Hampshire has over 25,000 full and part time State employees. 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.

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 throughout the state.

[3] Office of Energy and Planning website: http://www.nh.gov/oep/recovery/sep_programs/state_building_eerep.htm

Section 6: Electric and Gas Utility Energy Efficiency Programs – Portfolio-Level Review and Assessment

6.1. Overview of Electric and Gas Utilities Providing Energy Efficiency Programs

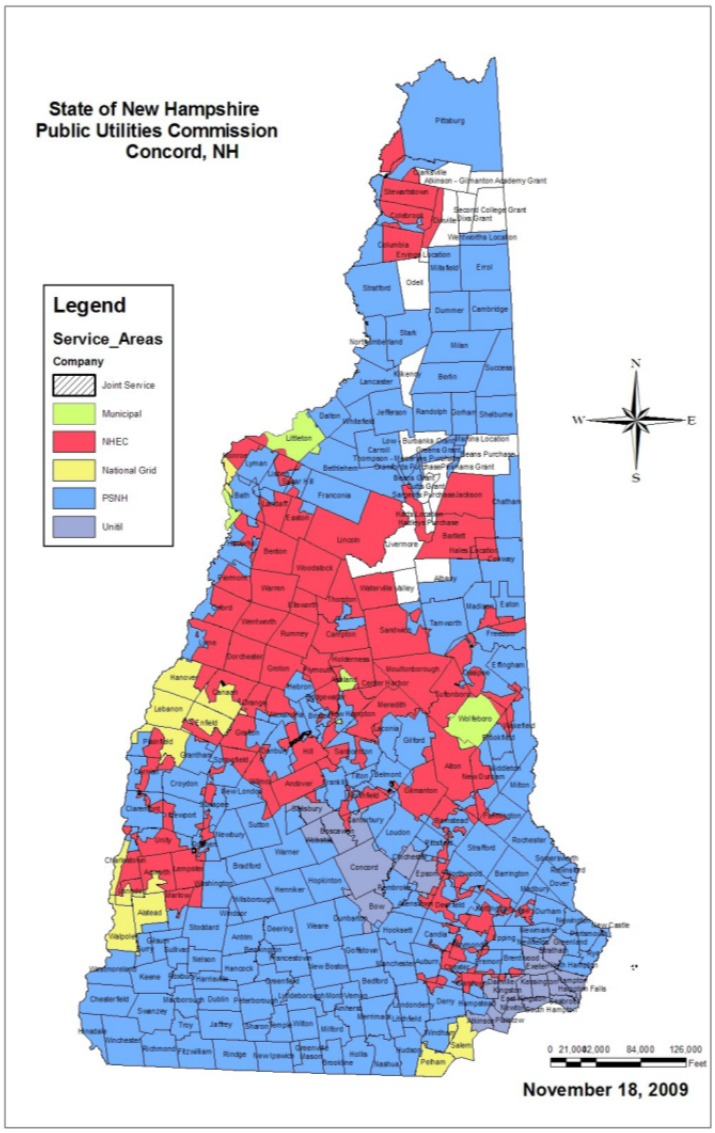


Figure 6.1. Electric Utility Territories in New Hampshire

New Hampshire electric utilities serve approximately 687,000 customers. Three investor-owned utilities (PSNH, Unitil, and National Grid) and one electric cooperative (NHEC) serve 86% of the electric customers[1]. These utilities are regulated by the PUC and are required to offer energy efficiency programs to their customers. The remaining 14% are served by five municipal utilities that are not regulated by the NHPUC and are not required to offer energy efficiency programs.

The electric utilities' territories are complex and fragmented (Figure 6.1[2]). The number of customers and retail sales of the major utilities for residential and commercial customers is presented in Table 6.1. The actual peak demand in New Hampshire in 2010 was estimated at 2,389 MW[3]. Overall, the system has a net summer capability of 4,165 MW (nameplate capacity of 4,513)[4].

[1] EIA Electric Power Annual 2009
[2] NHEC website
[3] ISO New England Briefing to the NH Senate Energy & Natural Resources Committee, February 10, 2011 http://www.iso-ne.com/pubs/pubcomm/pres_spchs/2011/nh_senate_final_feb_2011.pdf
[4] New Hampshire Energy Fact Sheet; EIA State Historical Tables for 2009 Released: November 23, 2010, Report Revised: January 4, 2011 http://www.eia.gov/state/state-energy-profiles-print.cfm?sid=NH

Table 6.1. Electric Sales by Utility[5]

		Public Service of NH	Unitil Energy Services	NH Electric Coop	Granite State Electric	Municipal Utilities, Other	Total
Total	Electric Revenue (1,000$)	1,033,260	148,096	131,956	84,887	220,969	1,619,168
	Electric Sales (MWh)	7,749,877	1,177,554	712,462	869,299	189,301	10,698,493
	Consumers	478,686	76,086	78,320	41,805	12,090	686,987
Residential	Electric Revenue (1,000$)	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

In 2002, a variety of energy efficiency programs started being offered by the four regulated utilities, as requested by the PUC. Referred to collectively as the CORE programs, the programs target a mix of residential, commercial and industrial (C&I), and income-eligible customers in New Hampshire.[6] The CORE programs are funded by a system benefits charge (SBC)[7], and by forward capacity market (FCM) payments provided by the Independent System Operator-New England (ISO-NE).

The SBC charge assessed to all electric customers in New Hampshire is $0.0033 per kilowatt-hour (kWh) and is divided between energy efficiency and the Energy Assistance Program (or EAP), which helps income eligible customers pay their electric bills. 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

[5] EIA Electric Power Annual Report 2009.
[6] Each of the programs is discussed in more detail in subsequent sections of the report.
[7] Pursuant to RSA 374-F:4 VIII(c).

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 expires on June 30, 2011 and will revert to the prior rates on July 1, 20118.

There are two main gas companies in New Hampshire (Northern Utility d/b/a Unitil, and EnergyNorth Natural Gas, Inc. d/b/a National Grid) serving approximately 114,000 gas customers[9]. New Hampshire Gas/Iberdrola serves about 1,000 customers. Due to the nature of natural gas distribution, gas utility territories are generally more contiguous than those of the electric utilities' (Figure 6.2.[10]).

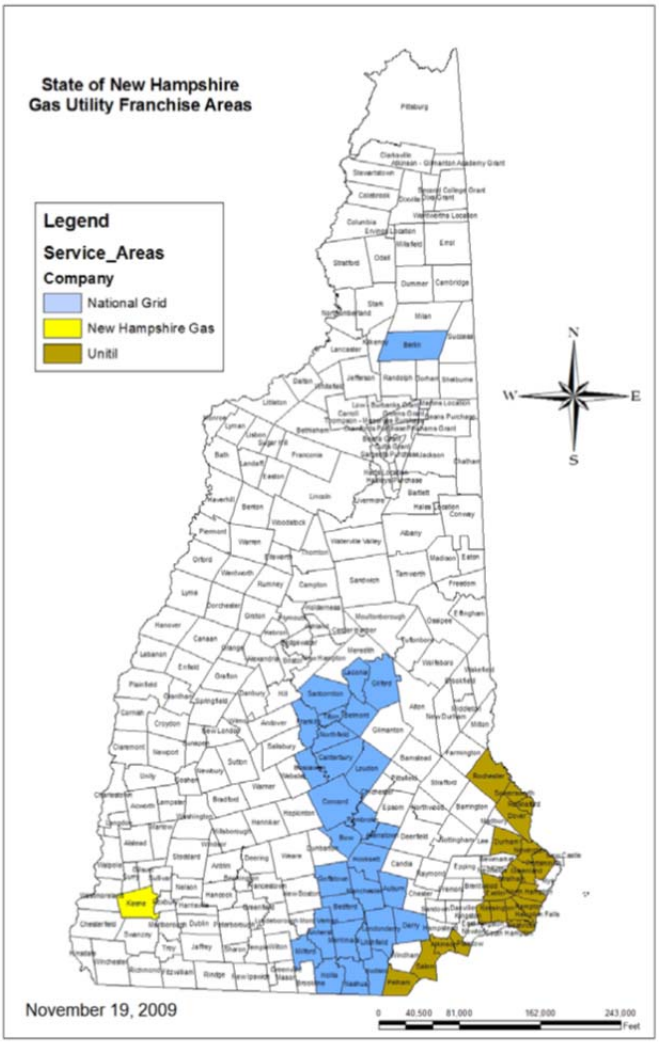


Figure 6.2. Natural Gas Utility Territories in New Hampshire

Funding for gas efficiency programs is collected through an energy efficiency charge that is included in the Local Distribution Adjustment. This charge is adjusted annually in the Cost of Gas proceedings and accounts for any reconciliation of prior year program expenses, and for the rate necessary to fund the following year program budget.

Funding for energy efficiency programs has varied over the last few years (Figure 6.3.), with the shift in SBC allocation, the influx of federal American Recovery and Reinvestment Act (ARRA) funds into New Hampshire, and funds produced by New Hampshire's participation in the Regional Greenhouse Gas Initiative (RGGI). Future funding will vary as well, as ARRA funds are depleted and as the state's participation in RGGI continues to evolve, in accordance with various legislative initiatives under consideration in the New Hampshire House and Senate[11].

[8] RSA 374-F:4, VIII(c)

[9] Natural/Propane Gas and Steam Utilities Summary Data: Natural Gas, Propane Gas and Steam Utility Companies Operating in New Hampshire, Calendar Year 2008 http://www.puc.nh.gov/Gas-Steam/Statistics/2008biennialrptstats.pdf

[10] NH PUC http://www.puc.nh.gov/Gas-Steam/Statistics/2008biennialrptstats.pdf

[11] House Bill 519 is currently under review by a conference committee of the New Hampshire Legislature.

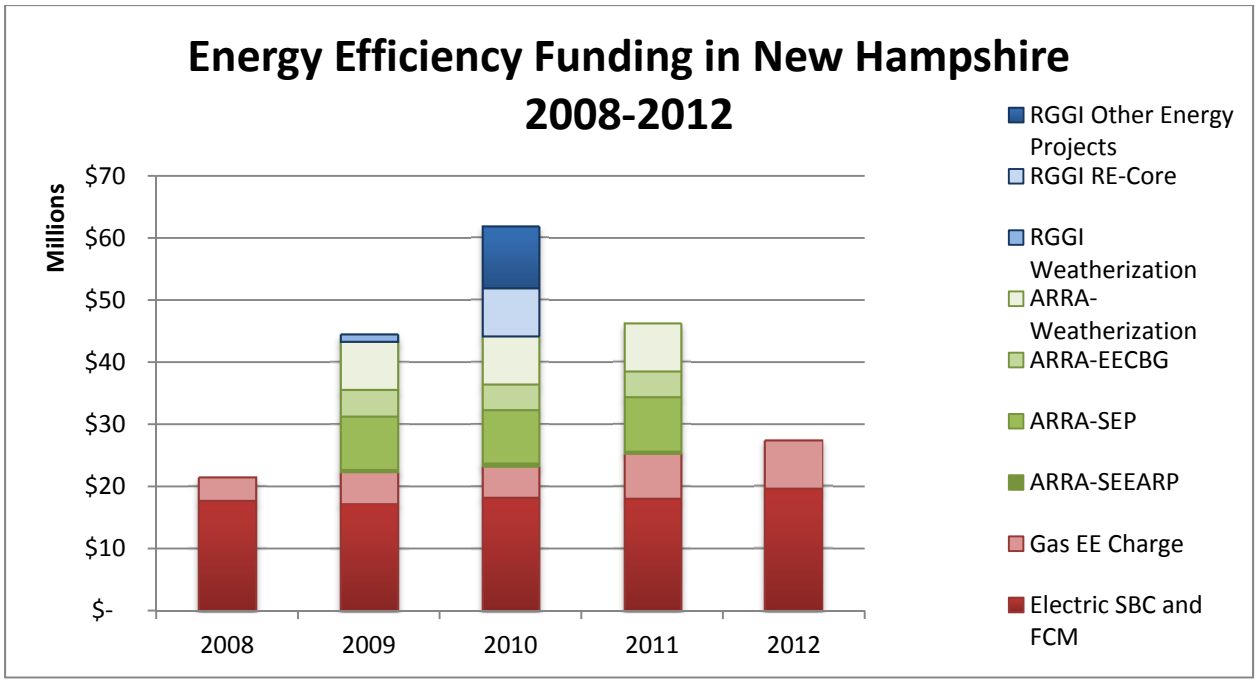


Figure 6.3 Funding Allocation to Energy Efficiency Programs in New Hampshire

6.2. Portfolio-Level Review and Assessment

When reviewing energy efficiency programs as a portfolio, the following key components were assessed to determine how well the portfolio is serving customers in New Hampshire and how they could be further improved.

Review of Energy Efficiency Goals and Investment:

- What are the overall goals for energy efficiency (at the state or utility level)?
- What are the funding mechanisms and what are the funding trends?
- What are the annual savings being achieved?
- Will the annual savings lead to achievement of the goals?
- If not, what ramp up is needed to achieve the goals?

Review of Evaluation, Measurement and Verification:

- How is the portfolio evaluated, and by whom?
- How are savings measured and verified, and by whom?
- Are the same measure characterizations and saving calculations used by all the regulated utilities? If not, why not?
- Are the savings assumptions updated frequently as technologies advance and baselines shift?
- Are freerider, spillover and in-service rates considered?

6.3. Portfolio Goals Spending and Achievements

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, 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 sections, based on the specific market segment the programs address. Programs directed at the residential market segment are reviewed and assessed in Section 7, followed by the C&I market segment in Section 8, and the low income market segment in Section 9.

Energy efficiency is increasingly being recognized as a key investment for the future, and states in New England have significantly increased spending for electric and gas efficiency programs between 2006 and 2010. Reviewing the energy efficiency budget and spending at the portfolio level (i.e. the umbrella consisting of residential, low-income, commercial, industrial, and educational programs) is important in assessing how well energy efficiency programs and policies are funding programs in order to reach their intended goals. Figure 6.4 show the energy efficiency spending trends for the states in New England.

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, saving 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 plant would be in that sense
- 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 reduces the need for new transmission lines

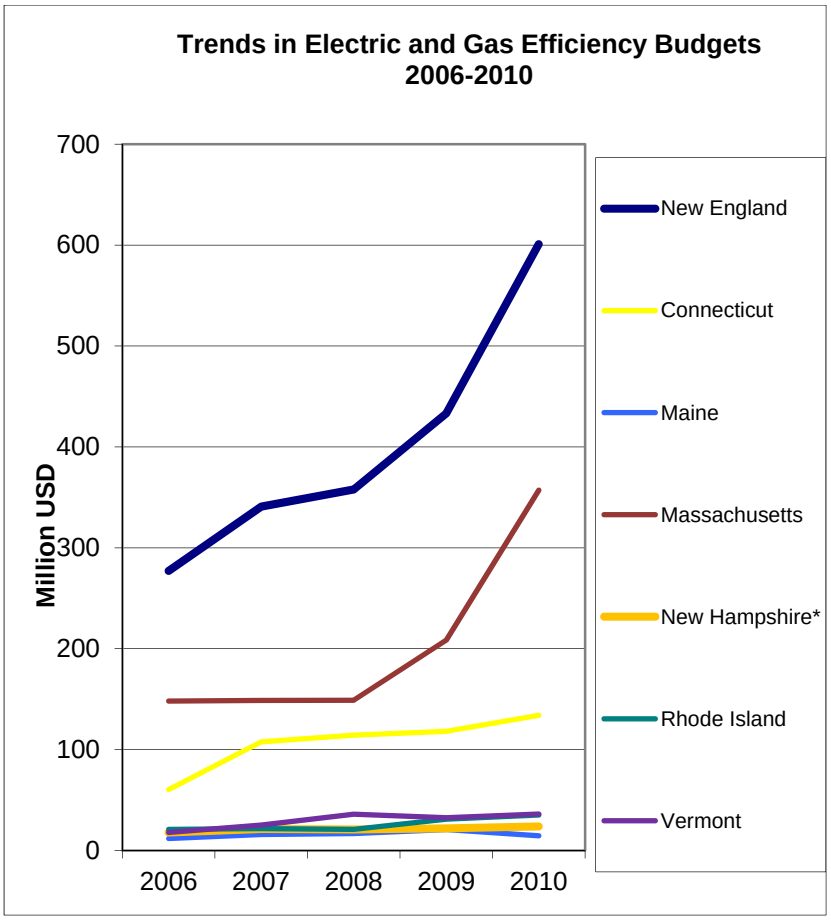


Figure 6.4. Trends in Electric and Gas Efficiency Budgets

Spending per capita varies by state, with Vermont having the greatest energy efficiency budget per capita for electric programs and Maine having the smallest budget per capita. New Hampshire has the fifth electric energy efficiency budget per capita out of the six New England states and the second gas energy efficiency budget per capita in the region as shown in Table 6.2.[12]

Table 6.2: 2009 and 2010 Efficiency Budgets in New England States[13]

State	Electric Efficiency Budgets (million USD)[14]		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

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

[13] Budget per capita reported for 2009 and 2010 in CEE report were different than reported in filings, values for NH reflect 2009 and 2010 budgets reported in the utilities filings excluding Load Management)

Massachusetts	179.3	281.2	$42.65	44.1	75.9	$11.50
New Hampshire[15]	**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 the allocation for efficiency programs are different throughout the Northeast. New England states all participate in the ISO New England Forward capacity market, whose funding levels fluctuate depending on market prices. FCM funds are also vulnerable to reallocation away from efficiency programs toward general state funds, depending on specific state policies. RGGI fund allocation toward efficiency programs is regulated by fixed percentages in all New England states except New Hampshire.

Table 6.3 Comparison of Efficiency Program Funding[16]

State	SBC – Electric & Gas	RGGI	FCM
CT	Electric SBC - 3 mills/kWh	Regulations set at 69.5%	ISO-New England
MA	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 (DOER commits 100%)	ISO-New England
ME	Electric SBC - .03 cents/kWh for most utilities) but cannot exceed .15 cents/kWh. Gas SBC – ≥ 3% of each gas utility's delivery revenues	Statute sets 100%	ISO-New England
NH	Electric SBC- As of July 1, 2011 - 1.8 mills/kWh for energy efficiency, 1.5 mills/kWh for low income bill payment assistance	Competitive bidding process	ISO-New England
RI	Electric SBC - 2 mill/kWh non-bypassable public benefits fee specifically for energy efficiency programs	Regulation set at 100%	ISO-New England
VT	Efficiency Utility 3 yr budget process referred to as Demand Resource Plan	Statutes set at 100%	ISO-New England

6.4. Portfolio Level Program Achievements

Annual energy saved by energy 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 Therm). This represents 0.5-0.8% of the electricity and natural gas volume sold in New Hampshire (1-2% of the revenue generated, see Tables 6.4 and 6.5).

[16] Information from ACEEE State Energy Efficiency Scorecard and NEEP Update on Efficiency Policy: Progress, Innovation and Challenges. Presented to EESE Board Nov 12,2010

The metrics for first year and lifetime $/kWh and $/therm savings are simple metrics that give a high level snapshot of the program yields. They should not be confused with "levelized cost of energy" which compares electric or gas efficiency energy savings with electric or gas energy production costs. 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 6.4. Electric Energy Efficiency Program Achievements in 2008-2010

	Actual[17]			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 6.5 Gas Energy Efficiency Program Achievements in 2008 -2010

	Actual[18]			Predicted	
	2007-2008	2008-2009	06/2009-12/2010	2011	2012
$/therm saved, first year (gas)[19]	$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 spending/total retail revenue (gas) [20]	1.07%	1.52%	2.29%	2.98%	3.23%
First year savings/total state retail therm sales (gas) (predicted for 2011-2012)[21]	0.75%	0.45%	0.69%	0.60%	0.66%

Comparing program yield results of $/kWh, $/kW or $/therm, efficiency savings, and spending as a percent of retail sales is one way to assess programs. However, results need to be interpreted carefully due to varying consistency among the available data.. Electric efficiency program results can be reported at meter or at generation source and as gross savings or net savings that have been adjusted by free riders or spillover effects. Efficiency program budgets have a wide variation and can include (or not) all program administrative costs, IT support, as well as evaluation, measurement and verification activities.

[17] Approximation, some annual savings were estimated using lifetime savings and average measure life
[18] Approximation, some annual savings were estimated using lifetime savings and average measure life
[19] Gas EE savings data set incomplete
[20] Total spending as a percent of total retail revenue uses 2008 retail sales data http://www.puc.nh.gov/Gas-Steam/Statistics/2008biennialrptstats.pdf
[21] 05/2009-12/2010: adjusted for 18 month timeframe

Also important to understand when interpreting data is the maturity of the program (an early start up program may appear to have higher costs), and the depth at which goals are set (comprehensive and deep savings often cost more). An industry standard for examining efficiency program yields does not existf.

That said, below is a comparison of the $/kWh and percent of retail sales in New Hampshire compared to other programs reviewed as part of a benchmarking study comparing Efficiency Vermont and Burlington Electric Department to 27 mature electric efficiency programs across the country. The study analyzed first year $/kWh, efficiency spending as a percent of electric revenue, and energy savings as a percent of retail sales. The analysis used data from 2008 as reported by program annual results. Baseline data was collected from the Energy Information Administration (EIA). In Table 6.6 overall median results from Navigant are compared to the New Hampshire CORE programs. As shown in the table, as of 2008, the New Hampshire CORE Electric Programs spent less, saved less, and cost more per unit of savings compared to other mature programs. Much has changed since 2008 in the efficiency industry as well as nationwide with higher goals and more focus on efficiency programs occurring in multiple states since then. The study team is not aware of a comparable benchmarking study being done more recently.

Table 6.6 Navigant Median Results Compared to New Hampshire CORE programs (2008)

	Spending as a Percent of Revenue	Electric Savings as a Percent of Sales	Cost of First Year Savings ($/kWh)
Overall Navigant Results[22]	1.9%	1.0%	$0.18
NH CORE programs	1.3%	0.8%	$0.26

A national review of costs savings by utility energy efficiency programs provides performance metrics for six states with gas programs.[23] The range of performance includes Connecticut at a high of $0.55/therm saved to a low of Iowa at $0.27/therm saved. Other states in the sample include 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 and the mean for the sample is $0.37/therm saved. The time frame for each state's sample includes at least three years, with the exception of California which is a two year sample, and Connecticut, which is a single year sample. The New Hampshire utilities average for the three years including 2006-2009 is $0.16/therm saved for all programs (Residential and C&I) for both utilities.

Goals are determined by utilities according to past program success, funding availability, and changes to qualifying criteria (e.g. ENERGY STAR criteria). Utilities manage the energy efficiency programs day to day and therefore know what parameters are likely influence future program achievements and have easy access to detailed program data when establishing goals. Figure 6.5 shows goals compared to achieved savings for the electric CORE programs.

[22] Benchmarking of Vermont's 2008 Electric Energy Efficiency Programs: A Comparative Review of Efficiency Vermont and Burlington Electric Department. Navigant Consulting. May 21, 2010

[23] Saving Energy Cost Effectively, Page 7 Table 2

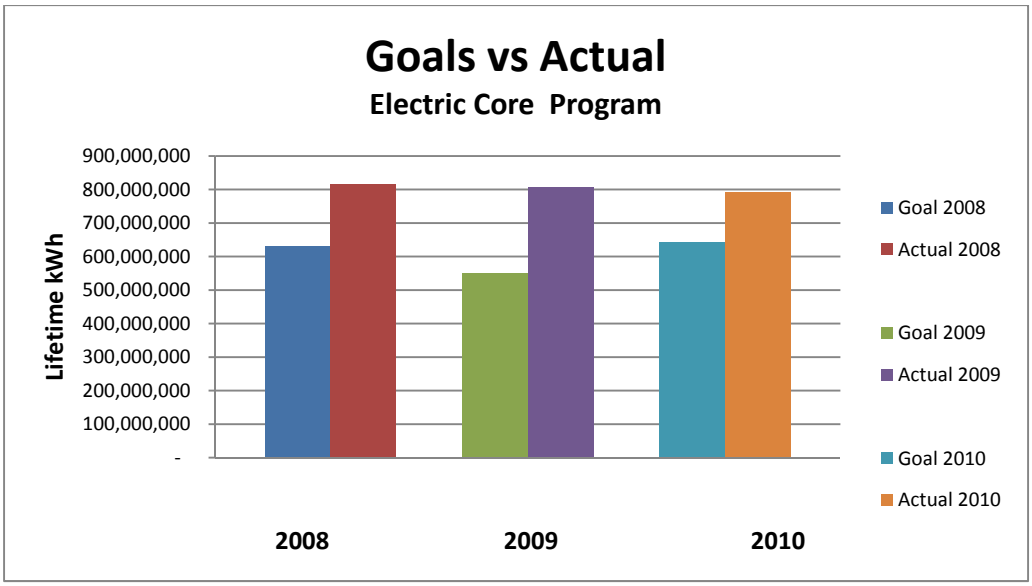


Figure 6.5: Electric Core Program Goals vs. Actual

Comparing future goals to historical achievements shows that both the residential and commercial industrial sectors have exceeded goals in the past and goals for 2011 and 2012 are set below previous performance.

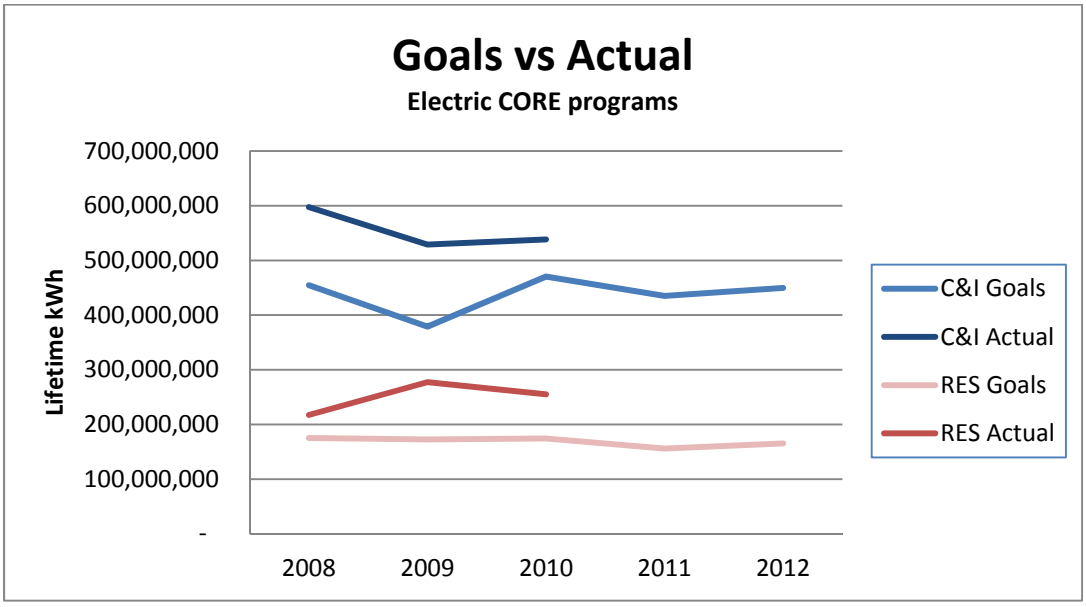


Figure 6.6. Goal Setting Trends

A goal setting procedure referred to as an Energy Efficiency Resource Standard (EERS) has been adopted by 26 states nationwide, including four states in New England. 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. Figure 6.7 shows EERS electric targets and Figure 6.8 shows natural gas targets currently in effect in New England.

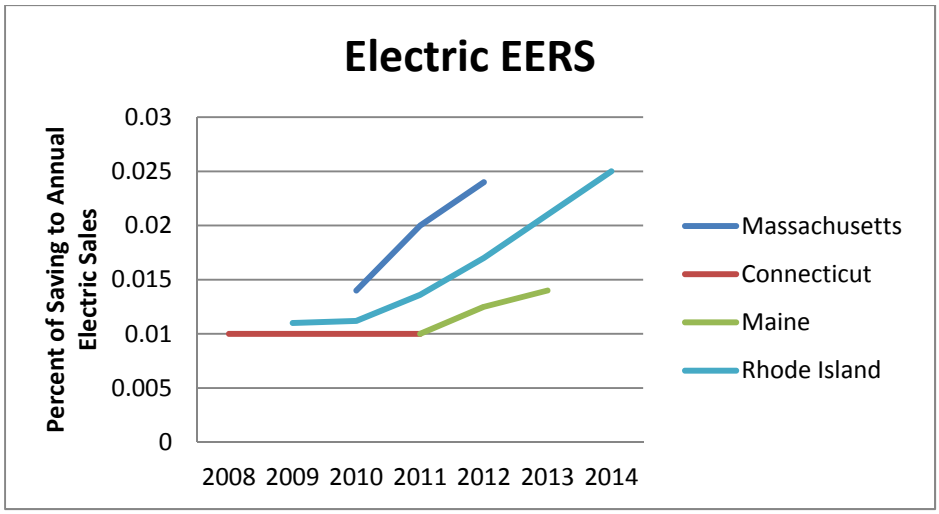


Figure 6.7. Electric EERS in New England[24][25][26]

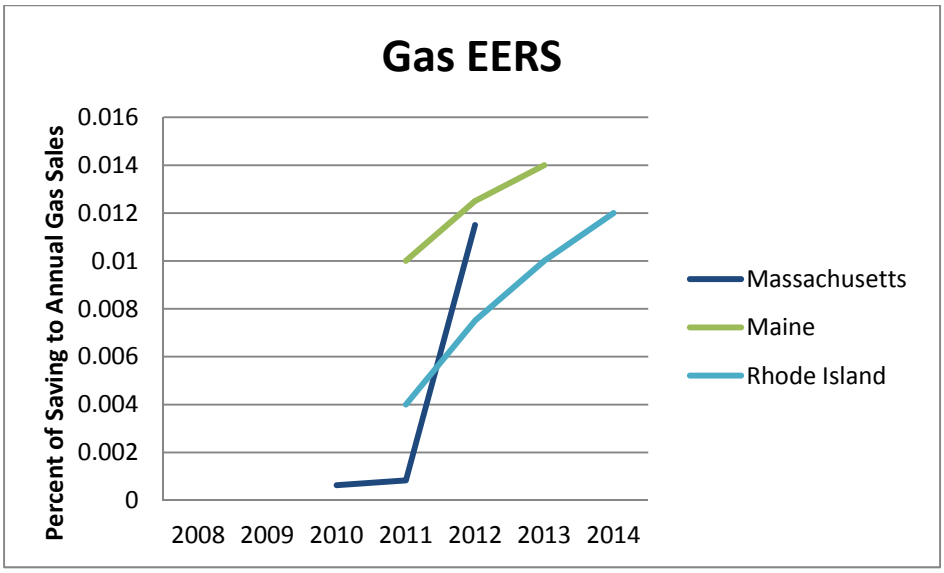


Figure 6.8. Gas EERS in New England[27]

As discussed at length in other sections, overarching policies that provide guidance for CORE Program funding levels and goal setting should be further developed in New Hampshire. CORE Program goals have consistently been met in the past. Trends looking forward in 2011 and 2012 do not indicate that the current goals will challenge the programs to do better, or foster innovation.

[24] http://www.aceee.org/files/pdf/fact-sheet/State%20EERS%20Summary%20June%202011_1.pdf

[25] Vermont does not have a typical EERS goal setting process so not on graph. A contractual agreement committed Vermont to achieve ~6.75% cumulative form 2009 to 2011. For 2012 and beyond Vermont enters into a 20 year planning process called the Demand Resource Plan

[26] Rhode Island 2012-2014 proposed but not adopted for both gas and electric

[27] http://www.aceee.org/files/pdf/fact-sheet/State%20EERS%20Summary%20June%202011_1.pdf

6.5. Evaluation, Measurement, and Verification

Evaluation, measurement, and verification (EM&V) are important activities for all efficiency programs. In basic terms, program EM&V establishes a process to document, review, and assess program assumptions and effectiveness on a continuous basis as well as incorporate the lessons learned to improve the program. Best practice includes independent, third party review of program effectiveness including savings claims, administrative structures, market effects and impacts on baseline. Another important component of EM&V is assessing the gross energy saved at the meter with the given energy conservation measure compared to net energy savings (which includes factors of baseline, free rider, spillover, 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. In this high level overview, we group EM&V activities into three categories (1) Evaluation in the form of periodic market studies, program reviews and baseline assessments (2) Measurement in the form of a Deemed Savings Database (3) Verification through an annual third party audit of savings claimed

Evaluation

This report refers to evaluation activities as periodic market studies, program reviews and baseline assessments. The California PUC and its Advisory group commissioned a report titled "California Evaluation Framework"[28] which is a comprehensive guide to all aspects of measurement and evaluation and is targeted for California program administrators, regulators and other stakeholders. It also serves as a useful reference for other efficiency programs. In this report they describe several types of evaluation studies:

- **Impact Evaluations**: 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 investigation.
- **Market Transformation Evaluations**: review the effect the programs have on long term market transformation.
- **Information and Education Evaluations**: assess the impact of educational outreach and information sharing on program success.
- **Process Evaluations**: examine the way programs are implemented and identify improvement to increase the effectiveness of program operations.

Information from evaluations is provided to program administrators, regulators, and stakeholders to 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.

Measurement

It is critical that a program have the ability to accurately measure the savings achieved by the program's efforts. An important tool to manage measure level savings claims, the assumptions used to develop savings and cost effectiveness including loadshapes, baselines, operating hours, free rider, spillover and in service rates is a "Deemed Savings Database" (also referred to as Technical Resource Manual (TRM)"). A Deemed Savings Database serves a wide range of users and functions, including for:

[28] 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.

- **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
- **Independent Program Evaluator** – for evaluating utilities performance relative to statutory goals, and facilitating planning and portfolio review
- **Forward Capacity and Carbon Markets** – for valuing efficiency resources

A Deemed Savings Database is intended to serve as an important tool both for planning and assessment of success in meeting goals and 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 program, 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.

Prescriptive measures found in the database are typically for measures installed in large numbers each year and for which it would be impractical to attempt to separately estimate or measure the impacts of each installation. These are usually measures installed in residential and small commercial buildings. The assumptions are derived from a variety of sources including independent evaluation studies both for the particular jurisdiction and regionally, engineering estimates, building simulation modeling and federal ENERGY STAR market data.

Also found in a deemed savings database are protocols (algorithms and data collection priorities) to calculate custom savings from measure 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). The database 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

In order to ensure savings claims are accurate, annual third party review and auditing of savings claims is recommended. This includes not only an examination of annual savings claim report, but also a review of the tracking system, calculation protocols, underlying key assumptions, and site visits, as necessary. The data selected for review should be chosen to support verification that goals are 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 process – special reviews and systems that have been established to ensure all data are accurate for reporting

Oversight and Roles of EM&V Activities

Across the nation, efficiency programs have a variety of implementation structures, regulatory oversight and legislative requirements which results in many possible configurations for EM&V roles and responsibilities. A report by Lawrence Berkley Lab[29] summarizes three generalized approaches between regulators and program administrators and as shown in the table below.

Table 6.7 – Examples of Decision Making Roles

	EM&V Budget and Contractor Selection	Objectives and Goals Developed	Evaluation Method Developed	Public Input/Stakeholder Collaboration
1	EE Program Administrator	EE Program Administrator	Independent Evaluation Contractor	No
2	EE Program Administrator	EE Program Administrator	Independent Evaluation Contractor	Yes
3	PUC or Advisory Board	PUC or Advisory Board	Independent Evaluation Contractor	Yes

These three categories are somewhat over simplifications but provides an overview of the types of roles and responsibilities that can be held for all of the components of EM&V. For example, an program administrator can initiate a study because they are responsible for prioritizing topics and funding and can follow through to completion without any public input. On the other hand, an EM&V process can be chosen and initiated by a PUC with stakeholder and public input to study design. Roles and responsibilities in EM&V are often dictated by the regulatory structure in place for the state or jurisdiction as well as the incentive structure for achieving goals and the consequences for non-performance.

A detailed example of M&V protocol types and oversight roles is provided in a California PUC M&V report. The diagram bellows shows the various protocols and how they are related, as well as whether they are implemented by the program administrators alone or jointly with the PUC.

[29] Review of Evaluation, Measurement and Verification Approaches Used to Estimate the Load Impacts and Effectiveness of Energy Efficiency Programs. April 2010

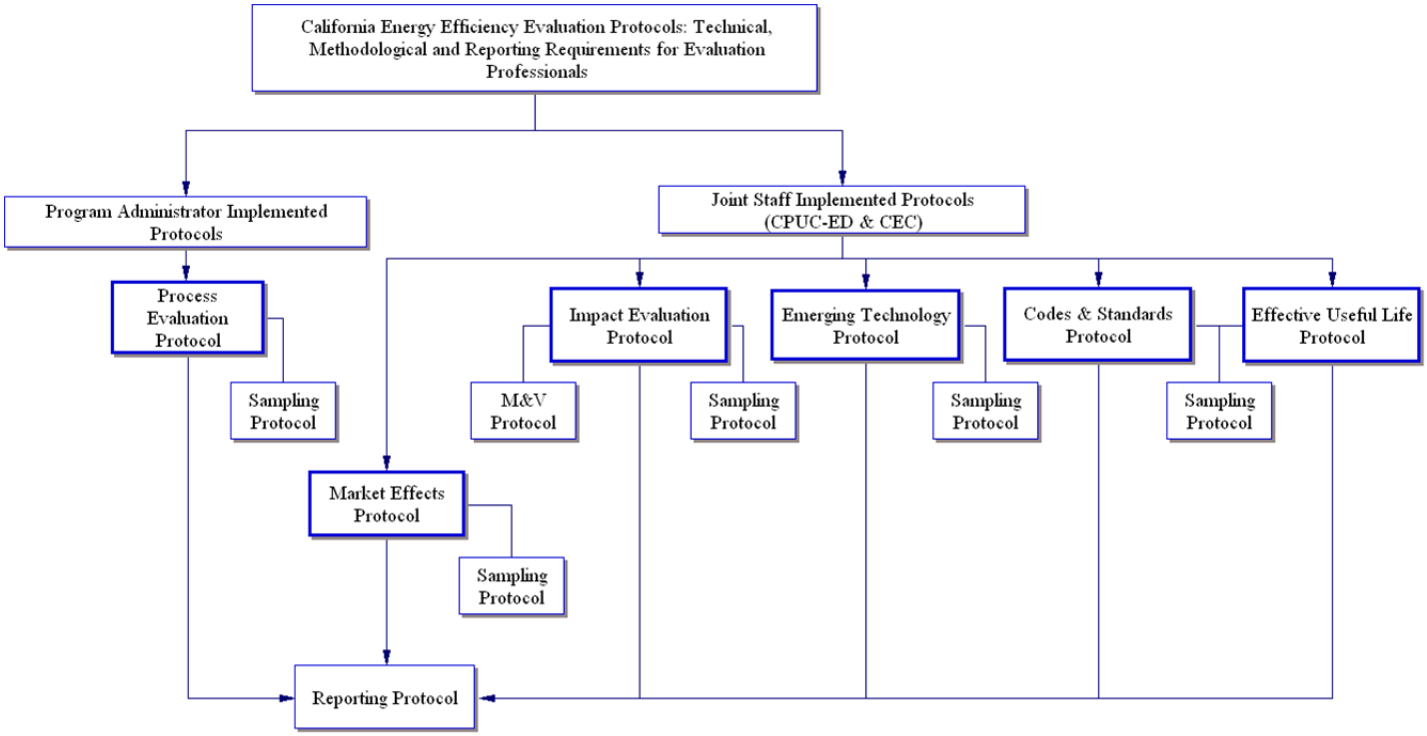


Figure 6.9. The Energy Efficiency Program M&V Protocol Used in California [30]

EM&V Spending Levels

The Consortium for Energy Efficiency reports that in 2010, on average electric programs spent 3.9 % of program budget on EM&V and gas programs spent 3.8%t[31]. EM&V spending as a percent of overall portfolio spending varies nationwide. Many issues specific to the program factor into the decision on how much to spend, including whether the program is new with high levels of uncertainty and market acceptance, or well established with deep understand 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 relative to bids into regional markets like FCM and RGGI.

6.6. New Hampshire CORE Programs

The CORE programs in New Hampshire use the terms "Monitoring and Evaluation" when referring to budgets and activities to assess and verify efficient program impacts. The responsibility for Monitoring

[30] 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

[31] 2010 State of the Efficiency Program Industry, CEE. December 10, 2010.

and Evaluation of the Electric CORE programs was transferred from utilities to PUC staff pursuant to an agreement from March 2007[32] in order to provide more independent oversight. Since that time, the PUC has worked collaboratively 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. The CORE programs budget approximately 5% of total budget for monitoring and evaluation.

In the 2011-2012 CORE Program Plans, the PUC in conjunction with 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 can re-allocate funding to support other areas of the CORE Program.

Over 100 evaluation reports have been completed since 2000 on the CORE programs in New Hampshire. The most recent evaluation report is both a process and impact evaluation of the HPwES program and was released in June 2011. The next more recent series of reports were completed and released in 2008 that cover a wide range of topics including custom commercial and industrial retrofits, industrial lighting, and residential lighting. As reported in the CORE Program Plans for 2011-2012, several studies will be commissioned in 2011. The majority of the funding will be spent to continue to receive ISO NE FCM payments.

Prescriptive measure development and updates are managed by the CORE Program Committees. Many prescriptive measure characterization algorithms and assumptions used to calculate annual savings claim (e.g. savings, costs, incentives, and measure life) are uniform between utilities and are maintained by the program committees. If the committee learns of new technologies or developments, they will reexamine the data and assumptions on hand to modify the measure. In practice, if there is better information available for the specific project that is preferred over the prescriptive assumptions that input is used. A good example of this situation would be lighting for a facility that runs three shifts. The operating hours would be much higher than an average facility and an efficiency measure would have higher net benefits with higher use.

Some measure characterizations are not the same across utilities. One example is the prescriptive commercial gas rebates which have different incentives values between Unitil and National Grid. Another example is the Home Performance with ENERGY STAR Programs that use different modeling software to calculate savings from thermal measures. Savings are reported by utilities to the PUC on a quarterly basis and also annually. Some utilities involve 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 PUC.

The NH utilities' CORE Efficiency Programs are also all participants in the ISO-NE Forward Capacity Market. In order to qualify for participation in this regional wholesale capacity market, each utility has developed an M&V Plan to describe how program savings and verification activities meet ISO-NE's Measurement and Verification requirements. These plans have been approved by ISO-NE as being in compliance with the requirements.

The CORE programs participate in the regional Evaluation, Measurement and Verification Forum (EM&V Forum) sponsored by Northeast Energy Efficiency Partnerships (NEEP). The forum's goals are

[32] Petition for approval of 2006 Core Energy Efficiency Programs, Order No. 24,599 in Docket No. DE 05-157

to develop EM&V protocols for the Northeast. The protocols cover several specific focus area's of EM&V:

- Protocols to support participation in ISO-NE FCM
- Load shape development
- Common reporting guidelines
- Multi-year evaluation planning

Each utility contributes funding to the regional efforts from their Monitoring and Evaluation budgets.

6.7. Conclusions

Evaluation, Monitoring, and Verification is an important component of efficiency programs and ensures the accuracy of program performance. Processes, roles, and responsibilities should be transparent and consistent across all utility programs. Since the New Hampshire CORE programs are part of the ISO- NE FCM, there are systems and plans in place to verify savings that ensure rigorous savings claims. Measure level savings, algorithms, and all inputs should be uniform between utilities. The process should be managed centrally and should systematically update measures and assumptions in a technically rigorous way. Annual savings verification should be done by an independent third party and at all utilities. Ideally, the contractor should have wide ranging experience in EM&V and would review all New Hampshire savings claims. The contract could be managed centrally to reduce administrative costs and burdens.

Section 7: Residential Energy Efficiency CORE Programs Review and Assessment

7.1. Introduction

Residential buildings account for nearly 41% of electricity use in New Hampshire, 45% of fuel oil 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) are multi-family homes greater than four units and 6% are mobile homes (35,759 units)[4]. Approximately 73% of occupied housing units are owner-occupied and 27 percent 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.

In New Hampshire, as in many states, utilities supplying electricity and natural gas to customers are regulated by the state Public Utilities Commission, and various state policies are in effect that result in the utilities offering a range of energy efficiency programs and services to their customers. Referred to as the CORE programs by Commission staff and others, these programs are designed to provide important energy savings to both the utilities and their customers.

Presented below is a description of the CORE efficiency programs currently offered to residential consumers in New Hampshire, as well as a review and assessment of the programs conducted for purposes of this study. The program review and 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 residential sector that various CORE programs are designed to serve. Those market segments include:

- Existing homes;
- Residential new construction (RNC);
- Residential retail products;
- Residential heating, ventilation, and air conditioning (HVAC) equipment; and
- Education and outreach.

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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 Bureau http://www.nh.gov/nhes/elmi/pdfzip/econanalys/vitalsigns/vs2011/vs-2011-11-construction.pdf

Single-family homes and multi-family homes are often treated separately by energy efficiency programs. The discussion below primarily addresses efficiency programs targeting single-family homes. Efficiency programs directed at multi-family homes are discussed in Section 8 as part of the commercial and industrial section. Energy efficiency and weatherization programs for low income residential customers are discussed in Section 9.

7.2. Overview of CORE Programs for Existing Homes

Energy efficiency services and programs have been offered to residential utility customers in New Hampshire through the CORE programs since 2002. Current 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 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 programs offered by the gas utilities.[6] Overall this indicates that approximately 4% of existing homes in New Hampshire have participated in an energy efficiency program offered through CORE during the past 10 years[7]. There is a large potential for improving efficiency and reducing energy consumption in the remaining homes in the future.

Market Barriers to Increasing Energy Efficiency in Existing Homes

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

- **Lack of customer interest 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 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 mistrust products that look and/or operate differently from those traditionally used in the home remodeling trade.

- **High initial cost:** Although cost effective over the life of the measures installed, a comprehensive, whole house energy efficiency retrofit has a relatively high initial cost which can limit customer interest and investment.

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

[6] Some of these customers may have participate in both programs, if they are served by both an electric and a gas utility.
[7] Since 2002, approximately 11,000 houses participated in Home Energy Solution/ NH Home Performance with ENERGY STAR Programs and 8,600 in Home Energy Assistance Programs. A approximately 5,000 gas customers also participated in weatherization programs. Some may have participated in both gas and electric programs

- **Split incentives:** In rental housing, many 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 born by the tenant. This creates a situation referred to as "split incentives."

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:** Emphasizing the increased comfort, reduced energy bills, and health and safety benefits from increased energy efficiency in existing homes.

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

- **Financial incentives for contractors**: Including: incentives to encourage contractors to pursue trainings and BPI certification, and to purchase diagnostic equipment; incentives that may be split (or shared) between the contractor and the customer; financial assistance through cooperative advertising; incentives for commissioning; and/or incentives for bundled ENERGY STAR qualified lighting, appliances, and building products such as insulation and windows.

- **Quality assurance and savings verification:** To ensure both 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:** To ensure 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.

Research conducted by various energy efficiency program design experts around the nation indicates that the most effective energy efficiency programs in the nation feature an integrated package of services which 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[8].

[8] 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;

Existing Homes Programs for Electric Utility Customers

New Hampshire residents seeking to retrofit 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 only address one component of a home, whereas a whole-house approach considers the interaction between 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 7.1. and Table 7.2., residential electric customers living in 1-4 unit homes and interested in whole-house energy efficiency improvements can participate in the Home Performance with ENERGY STAR (HPwES) program. Multi-family facilities larger than 4 units can also receive home performance services under a fuel-neutral, RGGI-funded program (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 PSNH and Unitil are run as fuel neutral pilots. If a gas or electric HPwES program runs out of money due to oversubscription, there is a collaborative process in place by which their customer's retrofit can be funded by another's utilities' HPwES budget if there is available funding[9].

Table 7.1. 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, but thermal imaging is not included customers could chose to pay extra for this service **Health and Safety Measures**	• Existing home or 1-4 unit apartment building • Home heating index (HHI) used to qualify homes (except NGrid)	• 50 % of cost up to $4,000 per customer – co-payment required • $100 audit fee (a $450 value); until 2010 NGrid offered free audit but this changed to $100 in 2011. • Air sealing is free for NGrid customers • PSNH and Unitil offer a fuel neutral pilot; NHEC and NGrid serve electrically heated homes • Interest-free revolving loan program is available (max. loan is $7,500). On-bill financing offered by PSNH and Unitil since 2010. NGrid is looking into pursuing increased financing.

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

[9] Tom Palma, Personal Communication, 5/31/11

To partner with utilities in the HPwES/gas weatherization programs, contractors have the option to apply to receive an RFP when the utilities go to bid for home performance contractors (currently once a year[10]). 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 may provide contractors with a percentage of reimbursement incentives for training and the purchase of required diagnostic tools.

Table 7.2. Re-CORE Expanded Home Performance with ENERGY STAR Programs for Electric Utility Customers

Measures Offered	Eligibility	Key Program Characteristics
Expansion of CORE residential programs	• 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 multi-family facilities larger than 4 units. • NHEC: Revolving loan fund for weatherization and heating system replacements in the HPwES program. • Certifies homes as meeting the American National Standard Institute (ANSI) approved National Green Building Standard. Funds pay for the NH Build Green verification and provide an incentive for builders.

Customers have the choice of selecting their own BPI-certified contractor or having a BPI-certified contractor assigned directly by the utility. Prices that contractors charge for various measures are set by the utilities. An independent third-party contractor will spot-check at least 10% of the work. Outreach for the HPwES program includes referrals, marketing of the program through a brochure, and bill inserts.

In addition, NHEC offers a load management program to customers who have (or seek) electric baseboard heat and/or electric water heating, as noted in Table 7.3.

Table 7.3. 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

Budgets allocated to the residential existing homes market segment across all four utilities are summarized in Table 7.4. The share of the total core budget spent on the electric Home Performance with ENERGY STAR program varied between 8% and 13% between 2008 and 2010. The share of the total electricity savings for the HPwES program varied between 2% and 6% of total electricity savings for

[10] The procedure is being reconsidered as stated in NH PUC Order No. 25,189.

2008-2010. The yield for the HPwES program over the last 3 years was on average $0.08 per lifetime kWh saved.

Table 7.4. Electric Utility Home Performance with ENERGY STAR and Home Energy Star 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

Residential natural gas customers can receive home performance services at two levels in New Hampshire: an educational home audit and a more in-depth weatherization program performed by a certified contractor. The home audit program is available to customers living in 1- to 4-unit homes and in individually metered multifamily dwellings with 5 or more units (offered by NGrid only). All insulation measures for properties with greater than 20 units are put out to competitive bid and coordinated with the New Hampshire electric utilities' multifamily building programs. The audit program is referred to as the Energy Audit Program for NGrid customers, and as the Residential Home Energy Assessment Program (formerly the Residential Conservation Services) for Unitil customers. The audit is an educational program that provides an assessment of a customer's energy usage and recommendations for ways to improve the home's energy efficiency. No savings are associated with this program. Gas customers who receive a home audit and go ahead with improvements can participate in a weatherization program. The weatherization program is referred to as the Home Performance with ENERGY STAR Program (formerly the Residential Custom Measures) for Unitil customers, and the Weatherization Program for NGrid customers.

The two programs are summarized in Table 7.5. and 7.6. The programs are based on a similar design, and they aim 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 that may explore: solar thermal or combined heat and power (CHP) equipment, insulation and building envelope techniques, and new home construction practices.

Table 7.5. Home Energy Audit Programs for Gas Utility Customers

Measures Offered	Eligibility	Key Characteristics
Audit and detailed report that: • Identifies energy savings improvements • Estimates costs of the improvements • Prioritizes the improvements based on a simple payback analysis • Identifies health, moisture, and safety issues	All gas utility customers	NGrid: Over-the-phone assistance and education ("Tier 1") that may results in a referral for a home audit ("Tier 2"). Tier 2 services may include two free audits, 2nd audit is valued around $650: 1. Home energy assessment; includes the free installation of low-cost energy efficiency Instant Savings Measures 2. Weatherization program Unitil: $215 incentive towards the cost of the audit

Table 7.6. Home Performance with ENERGY STAR and Weatherization Programs for Gas Utility Customers

Measures Offered	Eligibility	Key Characteristics
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	50% of project costs up to a cap of $4,000 Incentive for cost effective opportunities to upgrade gas HVAC equipment a-is via the Residential GasNetworks program NGrid also serves multifamily buildings: incentive is up to $4,000 for 1-4 unit homes, $750 per dwelling unit for multifamily buildings.

Gas program budgets and savings are presented in Table 7.7. Comparison of gas program budgets and energy savings between years is difficult because programs have changed names between 2008 and 2009, and program description and names varied between the two utilities. The yield for existing homes programs appears to be highly variable; it averaged $0.29 per lifetime Therm saved ($0.15-$0.42 between 2006 and 2008 depending on the program, the utility, and the year).

Table7.7. Gas Budgets, Goals, and Savings from Energy Audit, Weatherization, and Home Performance with ENERGY STAR Programs[11][12]

Year	Planned Budget[13]	Lifetime Goal[14] (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
05/2009-12/2010	$ 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

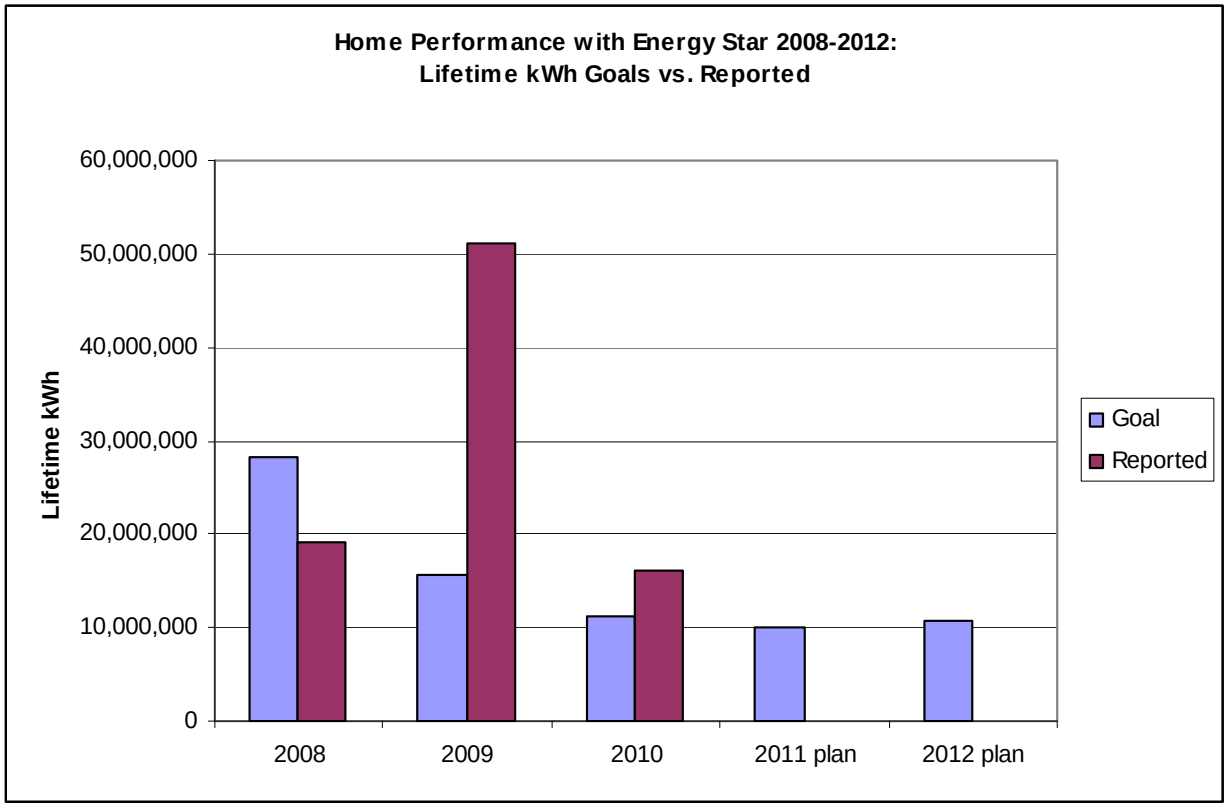
Existing Homes Program Results and Market Development

Home Performance with ENERGY STAR is the primary program addressing the residential existing homes market through the CORE programs and is therefore the focus in the discussion below. In addition, the discussion below focuses on HPwES offered to electric customers.[15]

Savings Goals: The savings goals for HPwES program offered by the electric utilities declined between 2008 and 2010, and remain level going forward into 2011 and 2012 (Figure 7.1.). Compared to achievements in prior years, the residential HPwES program goals are set lower than historical savings achievements for 2011 and 2012 (Figure 7.2.). Thus.there appears to be a downward trend in savings expectations for this program. Changes in the federal ENERGY STAR criteria may be a factor in the lower goal setting.

[11] Includes savings reported for the gas programs by NGrid and Unitil.
[12] 2006-2009 includes budgets previously included in Residential Conservation Services/ Measures; Self-Install Rebate; and Internet Audit Guide.
[13] "Planned Budgets" do not match exactly between 2009-2010 planning documents and 2009-2010 shareholder incentive reports. Used values from 2009-2010 Shareholder incentive reports in this table
[14] 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
[15] With the gas programs filings changing during the last few years, and with reported savings becoming available after research was completed for this draft report, it has not been possible yet to assess how well the gas HPwES programs are achieving the stated goals. This research will be completed prior to publication of the final report.

Figure 7.1. Electric Utility HPwES Lifetime Savings Projected and Achieved 2008-2012



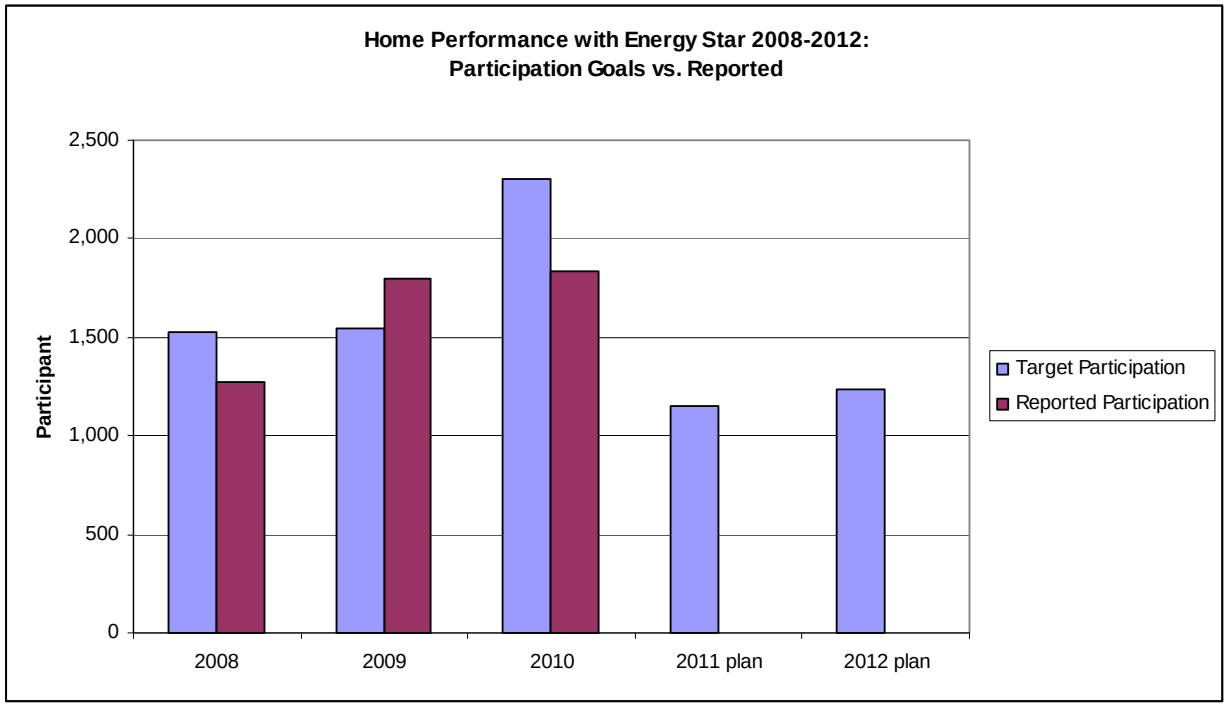
Two measures of success for this program are to attain the savings goal and the participation goal set for the program. Between 2008 and 2010, New Hampshire electric utilities achieved 180% of the savings goals, reached their participation goal one year out of the last three, and spent on average 90% of the budget allocated to Home Performance with ENERGY STAR. Participation goals established for 2011-2012 are lower than those achieved previously and the budget established for the program remains the same (Figure 7.2.).

Financial Incentives and Private Investment: Offering modest incentives for installation of efficiency measures through a HPwES program are 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. The incentive offered to New Hampshire customers participating in HPwES appears to be very effective in providing a limited number of 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 compared to what other states in the region offer. For example:

- The HPwES incentive in Massachusetts is up to $2,000;[16]
- In Vermont, the incentive is up to $2,500[17]; and
- In New York, the incentive is 10% of the total job cost, up to $3,000.[18]

[16] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MA119F&re=1&ee=1
[17] www.efficiencyvermont.org
[18] http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/best_practices_case_study_new_york.pdf

Figure 7.2. Electric Utility HPwES Program Participation Projected and Achieved 2008-2012



Research indicates that HPwES incentive levels in New Hampshire are higher than nearby states with well-developed and successful HPwES programs. New Hampshire utilities do not currently plan to further reduce the incentive, unless recommended by the HPwES evaluation that is currently underway.

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 NGrid was around 40%, which may be due to the offering of the audit for free and the fact that the audit does not require the use of the Home Heating Index (HHI) to screen homes. In comparison, Maine has a conversion rate of around 33%, using a different program model[19].

While 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 there is not enough profit-margin when work is subcontracted.[20] 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.

Marketing and Outreach: About one half of the households surveyed for the *Additional Opportunities for Energy Efficiency in New Hampshire* report indicated they were aware of their utility offering energy efficiency programs, and 30% had participated in them in some way[21]. Marketing for the HPwES program consists of a brochure:

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

[20] 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

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

- Provided upon request;
- Distributed at trade shows;
- Included as a bill stuffer; and
- Distributed with information about financing.

Currently, minimal or no mass marketing is done for the program and word of mouth and the outreach noted above is sufficient for generating enough market interest to use up the program budget[22]. When utilities exhaust their budget, they have the flexibility to stop marketing and to avoid adding to their customer waiting list. Whatever marketing budget is not spent at that point rolls into the program incentive, allowing more projects to be incented. 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.

That said, additional marketing opportunities exist for stimulating further market development for increasing energy efficiency in existing homes. This could be achieved 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 current contractor recruitment structure in New Hampshire may not be a supportive design for extensive cooperative advertisement. Program evaluation recommends that marketing materials more strongly emphasize the benefits of improving home comfort and reduced energy bills, by including customer testimonial.

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 trainings that increase contractor knowledge and skills. This helps create a private market infrastructure capable of accurately and comprehensively diagnosing and addressing energy problems in homes. By partnering with BPI-certified contractors, New Hampshire utilities could take an active step in developing the home performance market in the state. BPI certification provides qualified contractors a marketing tool that they can use to differentiate themselves in the market, and gives consumers a tool they can use to identify knowledgeable contractors. Other tools can also be used to develop the market, such as sales training that enables contractors to more effectively educate consumers on efficiency improvements, or incentives for purchasing diagnostic equipment.

The New Hampshire strategy to further develop the supply/installation side of the home energy retrofit market is not defined in utility filings[23] and the market development strategy for the supply chain/contractor segment of the market seems unclear. In the 2011-2012 plan, the "program intervention" suggested at the "supply infrastructure" level involves financial incentives, but no program to develop contractors' performance. Current issues with contractor recruitment (i.e. contractors not having the ability to be added to the approved list at any time of the year[24]) are indicators that market development is not being achieved effectively on the contractor side of the market. A 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. However, 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.

[22] Palma, Thomas, Manager Distributed Energy Resources, Unitil, *Personal Communication,* May 31, 2011
[23] 2011-2012 Core Programs Plan (p. 26)
[24] NH PUC Order No. 25,189

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.[25] Implementation of the HPwES program is similar across the state except that utilities contractors use different audit software. (Unitil contractors use Surveyor® for the HPwES modeling, others use Treat®[26], 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 NGrid).[27] PSNH and Unitil have similar program approaches; NGrid has its own approach with a lead vendor conducting free air sealing and arranging contractor for customers.

Customer Satisfaction: Overall, among participants, satisfaction with the HPwES program in New Hampshire seems extremely high.[28]. Notes one customer, "The New Hampshire process is good; customers don't have to do anything."[29] Eighty percent of participants indicate an increase in comfort level in their homes[30].

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 HPwES 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 between utilities (from 36-98%). Each utility uses a different technique to estimate savings. Combining engineering and bill engineering results in realization rates that were 92% for gas and 52% for electric utilities. In comparison, realization rates for other states presented in the Cadmus draft report ranged from 58-117%[31].

Conclusions and Recommendations

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[32].

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

[25] The fuel neutral pilot currently being offered by two of the utilities is not offered consistently statewide.
[26] Tom Palma, Person Communication, 5/31/11.
[27] 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.
[28] GDS Associates Inc., *Additional Opportunities for Energy Efficiency in New Hampshire*, Final Report to the New Hampshire Public Utilities Commission, January 2009,
[29] Joseph Bates, Personal Communication, 4/28/2011
[30] 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
[31] 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
[32] 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

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.

7.3. 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% between 2006 and 2009[33], indicating that over the last few years, single family home construction declined more than multi-family home construction.

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. With an annual incremental electricity use by residence statewide of just under 16,600 MWh, residential new construction in 2009 added approximately 0.4% to New Hampshire's residential electrical use.[34] While the electric energy use is not as large as other sectors, there are significant opportunities to reduce consumption and work to 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:

[33] 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

[34] 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

- **Lack of contractor and customer interest 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, and thus may not be convinced that the investment made to build energy efficient housing will be prudent 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;
- 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 increase the energy efficiency of new homes as well as 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 utility staff member 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 NEHC also offer efficient heat pumps programs. Incentives offered through CORE and utility specific programs are

presented in Table 7.8, 7.9, and 7.10. Additional programs offered through RGGI funding are summarized in Table 7.11.

Table 7.8. 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 (PSNH)	Fossil fuel heating systems: $2,500; electrical systems: up to $7,500 (PSNH< with geothermal heat pump)

Table 7.9. Utility-Specific Residential New Construction Programs[35]

Measures Offered	Eligibility	Key Characteristics
PSNH: Incentive for geothermal heat pump (until 2009), geothermal and air source heat pumps (2010). **NHEC:** Third party mechanical engineer designs ductwork – all ductwork designed, installed, replaced, 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:** Offers two "tracks" for the ENERGY STAR Homes Program: Traditional track - Available for conventional fossil-fuel based heating system, and a Geothermal track - PSNH offers higher incentives for the installation of geothermal heat pumps in new home construction, incentives up to $7,500 are available **NHEC:** New energy efficient air source heat pump: $2,000 + $800 per ton, + $500 for ductwork, maximum of $4,500; A charge of $350 for plans evaluation and site inspections deducted from the rebate

[35] ENERGY STAR Homes Program Enhancements. For PSNH customers: Geothermal Option (2008-2009) and Air Source Heat Pump Option (2010). For NHEC customers: High Efficiency Heat Pump.

Table 7.10. 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.	Customers selecting a geothermal heat pump system.	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 7.11. Re-CORE Expansion of Residential New Construction Program

Measures Offered	Eligibility	Key Characteristics
	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.

New construction programs for natural gas customers are offered by both gas utilities (National Grid and Unitil). The programs are referred to as New Home Construction with ENERGY STAR by NGrid, and ENERGY STAR Homes by Unitil (not offered in 2011). Prescriptive rebates are also offered for programmable thermostats. 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 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. In certain cases, the gas utility may pay the entire cost of an ENERGY STAR home's participation fee, if the home is constructed in a community served by a municipal electric utility.

Utility staff recruit new projects, work to educate builders on the benefits of energy efficiency, and work with HERS consultants to insure that national program standards are met or exceeded. There are approximately 17 HERS-raters statewide (including both individuals and about 10 companies)[36]. Conservation Services Group, Inc. (CSG) is NGrid's sole rater for the 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

[36] Ben Stephenson, Unitil, Personal Communication, 2011

about $0.11/lifetime kWh. 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 7.12 and 7.13.

Table 7.12. 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 Attained
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	$,522,600	NA	13,575,800	NA	510	NA

Table 7.13. Budgets, Goals, and Savings for Gas Residential New Construction CORE Program

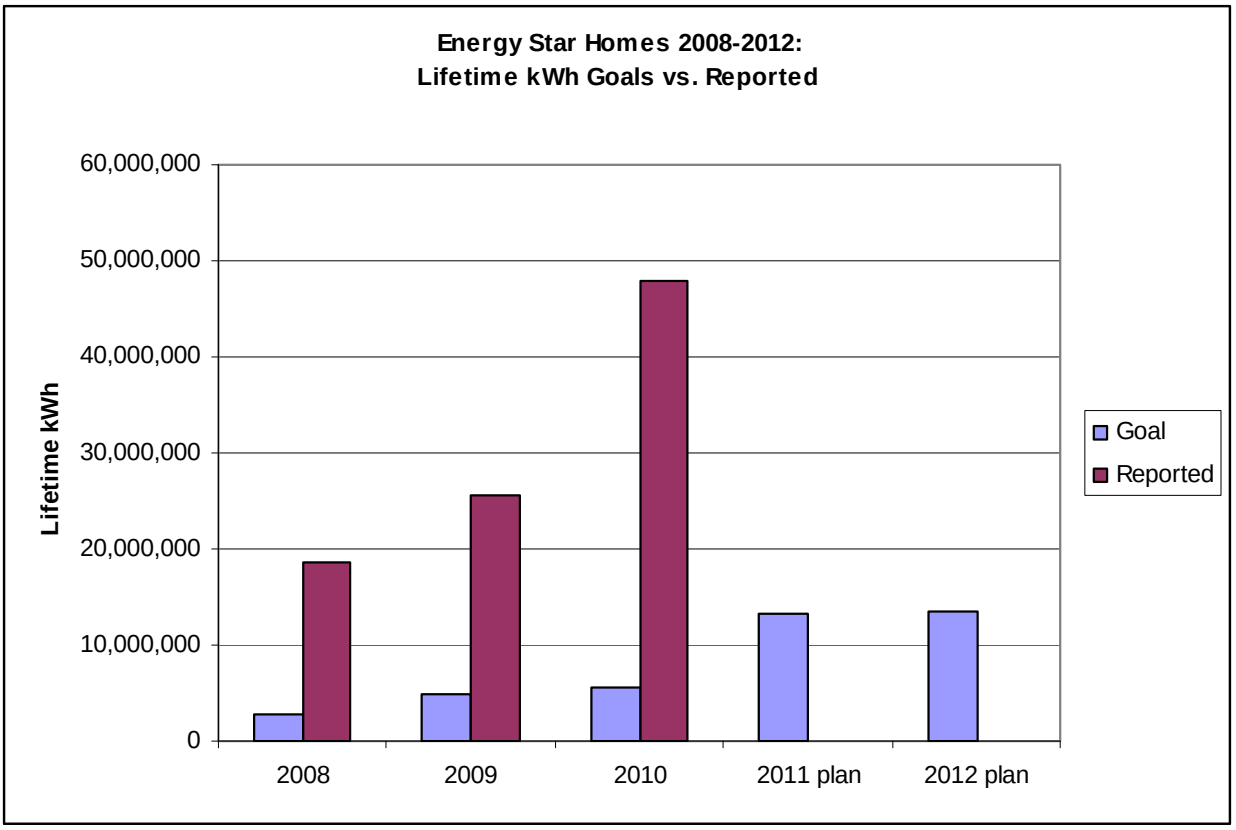
Year	Budget	Lifetime Savings Goal	Reported Savings (Therms)	Participation Goal (# of homes)
2006-2007	$ 57,625	866,200	359,700	122
2007-2008	$ 52,267	648,300	340,000	89
2008-2009	$ 74,375	180,750	-	296
May 2009-Dec 2010	$ 118,072	53,950	211,480*	75
2011	$79,355	204,000	NA	30
2012	$89,769	231,200	NA	34

*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, but still lower than prior years' achievements (Figure 7.3). While the transition to the new ENERGY STAR 3.0 criteria may initially reduce the number of qualifying houses, the goals going forward are lower than historical achievements.

Figure 7.3. Home Performance with ENERGY STAR Savings - Projected and Achieved



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 and home inspectors "throughout the state's most active building regions" as stated by the National Grid 2011-2012 program filing. It would provide a better understanding 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.

While the ENERGY STAR Homes program appears to be overall the same 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. 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. 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.

Conclusions and Recommendations

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.

7.4. CORE Programs for Residential Retail Products[37]

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.

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 interest and investment in energy efficient retail products. These include, for example:

[37] 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.

- **Lack of customer understanding and demand:** New Hampshire consumer's 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 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 therefore has limited integration 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 7.13. to 7.16.

Table 7.13. CORE ENERGY STAR Lighting Program

Measures Offered	Eligibility	Key Characteristics
CFLs Indoor fixtures Outdoor fixtures LEDs (catalog only)	All electric utility customers	Rebate is a point of purchase instant rebate Catalog price reflects rebate

Table 7.14. 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 5.15. 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 COREe programs

Table 5.16. 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 recycled more than 700 units and sold out the program in four weeks

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 7.4.). 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 7.5.). 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.

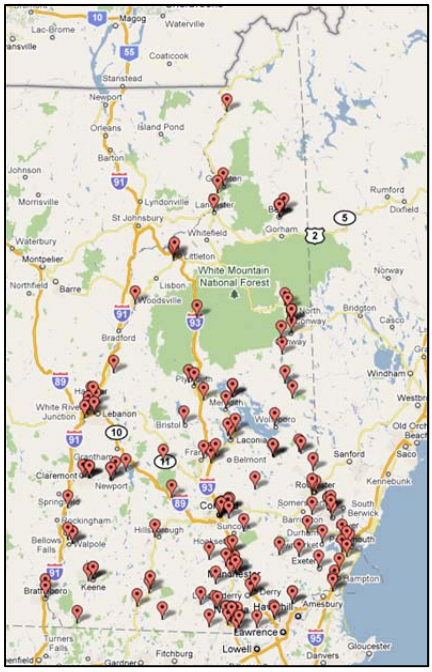


Figure 7.4. Map of New Hampshire Lighting Retailers Partnering with Utilities

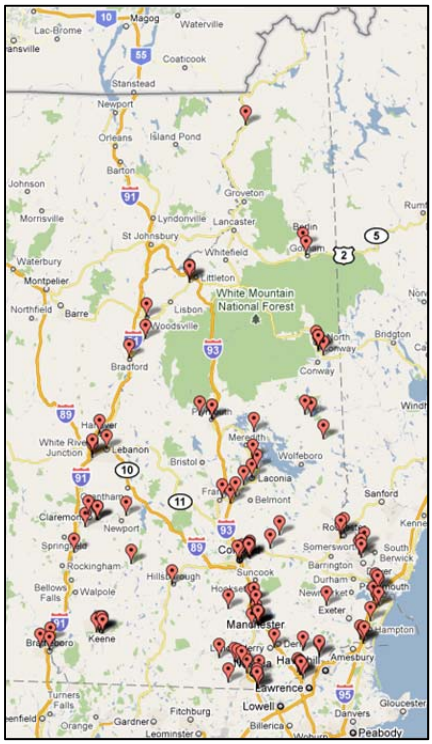


Figure 7.5.: Map of New Hampshire Appliance Retailers Partnering with Utilities

The NHSaves catalog and the associated Energy Federation Inc. web site 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 already reduced by the rebate and a variety of technologies and products are available including LED screw in bulbs and recessed cans. Natural gas customers can purchase reduced cost thermostats through the catalog. The remaining 10% of the purchases are catalog sales.

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 fund to provide additional funding for the ENERGY STAR lighting program.

The State Energy Efficient Appliance Rebate Program (SEEARP) was created under the 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 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 of 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 program to offset the incremental cost of more efficient technologies. Detailed program funding can be found in Tables 7.17. and 7.18.

Table 7.17. 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 7.18. 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 programs account for about 25% of spending on residential programs and about 85% of savings of the residential portfolio for first year savings[38].

- In 2010 the combined yield of the programs were $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 achieved:

- 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 New Hampshire Public Utilities Commission, in 2010 the ENERGY STAR appliance program had about 78% of program budgets going to rebates/services and ENERGYSTAR lighting had about 55% of budget going to rebates/ services.

Conclusions and Recommendations

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

[38] Three year average

the nation as a whole (Table 5.19). This high penetration is consistent across all appliance types and shows that the program has set the foundation for adoption of new and emerging technologies.

Table 7.19. ENERGY STAR 2009 Market Share[39]

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 incandescents 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 over looked in New Hampshire. 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. However, that approach to the market does not increase availability in stores, a key aspect of developing a wide array of technologies stocked in New Hampshire retail stores.

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%. As shown by Table 7.19. the saturation 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 but also realize more savings per unit therefor increase 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

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 installed base of consumer electronics 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

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

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[40].

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. The 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.

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

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 efficient product pricing for the consumer would be an important next step for the CORE programs. The incentive is paid directly to the manufacturer or retailer who then reduces the mark-up on the product. This should result in lower retail prices and also reduces the administrative costs to the program and the retailer. 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 won't be coupons requiring address and utility company data which is now used to attribute savings to individual utilities. Lighting and appliance rebate data have been collected for several years and could provide a useful database on which to build a model for savings distribution and allocation between utilities.

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.

7.5. 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[41]. If the useful life of heating equipment is 15+ years that means about 30,000 units

[40] Efficiency Trends in Consumer Electronics. Presentation at Automated Home Management Experts Meeting by TIAX. October 1, 2009.

of heating equipment are replaced each year in the state. The choices made when replacing heating equipment are long lasting as HVAC equipment can operate for over a decade (or more) before the next replacement. 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 understand 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 "sold" by the contractor, rather than "bought" by a homeowner.

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;

- 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 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 less equipment manufacturers than contractors so reaching the upstream players to increase high efficiency market share of equipment to New Hampshire is a key issue of HVAC program design.

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

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, gas, 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** – in providing incentives, require both a higher AFUE than ENERGY STAR and an efficient furnace fan (electric commutated motor).
- **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. This will provide savings over electric resistant heat.
- **Electric hot water heat pumps** – for homes with electric domestic hot water.
- **Wood and 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 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 program names and technologies offered. 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 7.20.

Table 7.20. 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 ENERGY STAR windows and doors (Discontinued in 2010)	All gas utility customers	Mail in rebate

The program is administered by GasNetworks which is a collaborative of natural gas companies serving customers in New Hampshire, Maine, and Massachusetts. 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 and GasNetworks serves as the rebate administrator. 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 other 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 7.21.

Table 7.21. Natural Gas Heating and Hot Water Equipment Rebate Program Budgets, Goals, and Savings[42]

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

[42] Derived from incomplete data set. Will update for final report incorporating most recent filings with the PUC.

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. Information on administrative costs does not appear to be available.

Conclusions and Recommendations

The program should expand to offer services throughout the state and across all fuels, including oil and wood for heating. Central air conditioning, mini-splits, and duct sealing should be included in an expanded program. Training on proper sizing and quality installations for the additional technologies should be launched at the same time. An important strategy to continue is regional coordination (similar to GasNetworks) to cultivate industry partnerships throughout the supply chain for the new technologies promoted.

7.6. CORE Educational Programs

The general goal of education programs is to engage a range of market actors 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.

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 minimum energy 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 achive state energy and climate change mitigation goals.

CORE Education Programs Offered by Electric Utilities in New Hampshire

Educational programs offered by electric utilities as part of their CORE programs include:

- **Energy Code Training Classes** - For builders, architects, engineers, designers, contractors, building science students, and code officials; workshops are free.

- **Collaborative Seminars** (2008 and 2009): partnerships with trade allies to encourage and sponsor energy efficiency seminars and presentations for NH businesses

- **Commercial Energy Auditing Class** (2010 only)

- **C&I Customer Education**

- **Energy Education for Students in Grades K-12**

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 (Table7.22.), however the actual budget spent has declined from 2008 to 2010 (Figure 7.6.). 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 7.23.). Collaborative Seminars 2008-09 and Commercial Energy Auditing Class 2010 are not offered under this program for 2011 and 2012. 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.

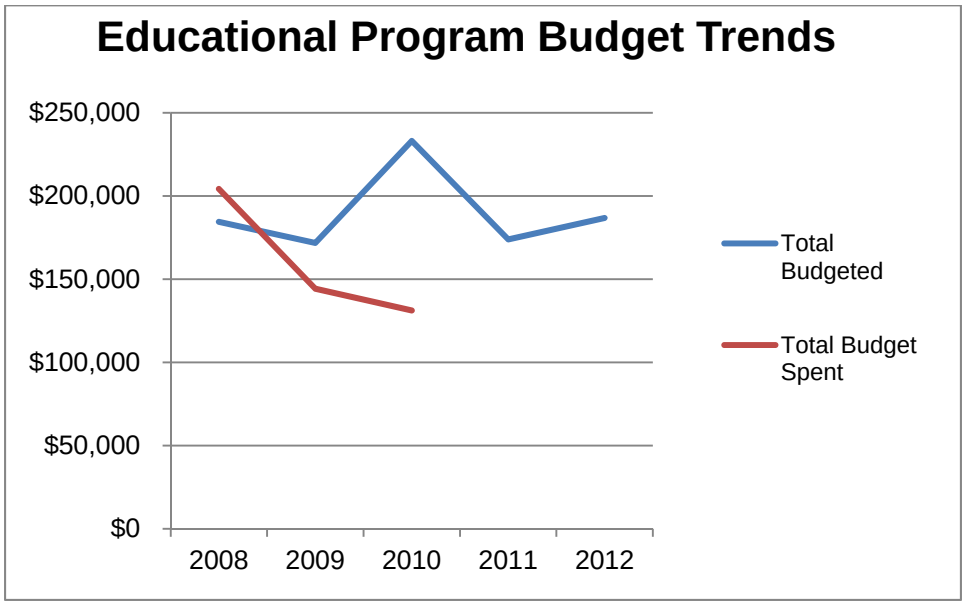
Table 7.22. Budget Allocated to Educational Programs

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 7.23. 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 7.6. 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[43]
- Seminars and home shows
- Outreach to energy service companies (ESCOs) and third party service providers
- 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 i(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

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

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). Three participants per year have participated.

CORE Education Programs Offered by Electric Utilities in New Hampshire

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, PSNH sponsors a Building Operator Certification (BOC) class that meets for eight sessions. This BOC class has been offered four times 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[44].

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.

Several of the residential programs reached their targeted participation and programs seem to be advertised sufficiently to reach that goal. 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.

In the C&I sector, the active efforts to train and outreach to service providers and energy services companies appear largely aimed at serving larger customers. Outreach to large businesses through direct contact by the Account Executives and through training seminars seems to be effective, as awareness of the programs and participation are high. Most of the C&I training seminars and programs are designed around technologies that are process-oriented, such as motors, compressed air, and pumping. These technologies are generally targeted at large C&I customers. More educational opportunities focused on lighting, HVAC, and commercial kitchen equipment would help small businesses. There is a lack of awareness of program offerings among some small customers in general and for some types of large customers. This lack of awareness of efficiency programs is a barrier to their participation in the programs and their implementation of efficiency projects. Overall, only 60% of small C&I were aware of the programs[45]. Least aware small businesses (by business type) are retail (43% aware of utility programs), grocery (46%), and health (46%). Least aware large business types were large retail (75%)[46]. A

[44] Gil Gelineau of PSNH, May 11, 2011
[45] 2009 GDS report Additional Opportunities for Energy Efficiency in New Hampshire, , p. 53-54, tables 37 and 38
[46] 2009 GDS report Additional Opportunities for Energy Efficiency in New Hampshire, Table 71, page 130

marketing campaign targeted at these customers could be an effective way to increase program awareness in these market segments.

Adding more Account Executives to the utilities' roster would help reduce the workload, allow for increased focus and outreach for customers who are not as actively involved with the programs, and encourage Account Executives to engage customers who have not participated yet at all. PSNH has seven Account Executives focused on large C&I customers, and two Energy Service representatives working with the small customers. Because Unitil and National Grid have a small part of the electric market share in New Hampshire, their investment in efficiency in New Hampshire is lmore imited. They do not have the customer base and outreach that PSNH does, for example. While the 2011-2012 plan outlines a number of way to reach out to customers, it is unclear if the utilities have sufficient staff to execute the proposed activities. Increased 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 is another way that could be considered.

Conclusions and Recommendations

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.

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.

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.

The residential market would benefit from additional education on energy efficiency and programs offered by the utilities. The C&I market would benefit from additional staff resources to provide dedicated outreach to more customers.

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.

4.6. CORE Programs Residential Sector Summary of Recommendations

§7.2. CORE Programs for Existing Homes - HPwES
• Consider reducing incentive levels to make program dollars extend further through the year and to prevent "stop and start" market effects
• Transition to open market for contractor recruitment

§7.3. CORE Programs for Residential New Construction – ENERGY STAR Homes
• Continue coordination between gas and electric utilities
• Prepare contractor market for ENERGY STAR Homes Version 3

§7.4 - Retail Products Program
• Transition to upstream incentives
• Encourage specialty and LED bulbs and fixtures to be carried in retail locations
• Promote CEE appliance tiers
• Expand technologies promoted to include consumer electronics and pool pumps

§7.5 - Heating Ventilation Air-Conditioning (HVAC)
• Expand heating technologies promoted across all fuel types including oil and wood
• Expand program to include cooling technologies and include contractor training on proper sizing and quality installations
• Continue regional coordination to cultivate industry partnerships

§7.6 - Education
• Develop clearly defined short and long term goals for each education program
• Initiate collaboration with community-based energy projects and local energy committees
• Invest in energy code outreach and education
• Develop more thorough reporting for Education programs

Section 8: Commercial & Industrial Energy Efficiency CORE Programs Review and Assessment

8.1. 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 customer with > 100 kW demand (> 200 kW for Unitil). 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 < 100 kW demand (< 200 kW for Unitil).

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 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 in New Hampshire administer and deliver efficiency programs to businesses and industries in the state, and the electric programs are well aligned among the utilities, with only minor differences in program design between utilities. For this assessment, the electric programs are discussed as a group unless there is a reason for discussing one program from a specific utility. The two gas utilities serving C&I customers also offer efficiency programs, but their programs have been quite

[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

different from each other and from the C&I programs offered by the electric utilities. For 2011 and 2012, state regulators requested a move towards better 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. Several gas filings[3] were submitted to the New Hampshire Public Utilities Commission after research and analysis was completed for this Draft Report, and there was not sufficient time to review those filings prior to the June 30 Draft Report deadline. Unitil recently reported results for May 1, 2009 through Dec 21, 2010 which makes it hard to compare the 20 month period contained in the report to other annual reports[4]. Previous gas filings were reviewed by the study team, but the information presented in the filings did not lend itself well to the type of review and assessment done for this study. The new gas filings will be reviewed in July, and any subsequent findings and suggestions relative to the gas energy efficiency programs will be presented in our next report.

8.2. Energy Efficiency Opportunities in the C&I Sector

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. A New Hampshire bottle manufacturing plant provides a good example. In 2002, before the CORE programs were in place, a New Hampshire bottling plant was the least cost effective plant of 10 owned by the company throughout the United States (with cost effectiveness measured 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. The story of this New Hampshire bottle manufacturing plant is a great example of how efficiency programs can contribute to a state's economic vitality by making business stronger and more profitable.

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. Designing and delivering effective energy efficiency programs to this sector provides both challenges and opportunities. A manufacturer, in addition to typical electrical usage with lighting and HVAC, usually has specialized equipment used as part of the manufacturing process. The manufacturer probably also has very different patterns and hours of usage than a general store, office building, school, wastewater plant, or ski area, which 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 the customers while meeting savings goals cost effectively.

In general, the trend in C&I energy efficiency programs is to design programs around specific technologies and business types, to 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) and to 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). Because the energy savings potential is often quite significant among the largest C&I customers, experience with the most successful energy efficiency programs indicates the importance of assigning an Account Executive (or Key Account Manager) to each customer. This enables a personalized and customized approach and can lead to significant energy savings for both the utility and the customer.

[3] NATIONAL GRID Energy Efficiency 2010 Year-End Report, N.H.P.U.C. Docket No. DE 09-170
[4] 2009-10 Unitil Gas report

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
- Decision makers must be informed and convinced that the opportunity makes sense for their business

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 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 continue to 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.

8.3. 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. These 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.

8.4. 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 a walk-through 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); and
- Electric hot water (for Unitil customers only).

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;
- An unspecified rebate for Unitil customers.

Custom projects identified through the audit are eligible for rebates by PSNH and Unitil. PSNH offers 35% or 1 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. Other leads come from the utility websites, referrals from calls to customer service at the utilities, some direct mailing (primarily to past customers), and training sessions. 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 been the only utility to consistently meet or exceed their goal over the last three years. National Grid reduced their goals from 2008 to 2010 by 38%, and still only achieved one half their goal in 2010. Presented below is a statewide summary of past performance as well as the goals for 2011 and 2012.

Table 8.1. Small Business Program Budgets, Goals, and Savings

Year	Budget	Budget Spent	Lifetime 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 8.1. savings and goals for this market segment have remained fairly consistent and flat over time.

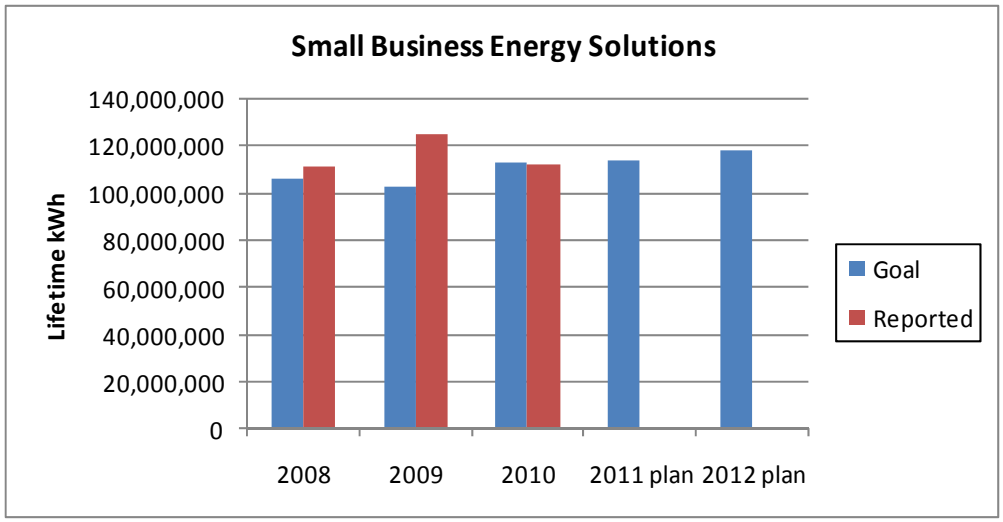


Figure 8.1. Small Business Program Goals and Savings

A survey of small C&I customers conducted in 2008 indicates 60% were aware of the utility energy efficiency programs, and 30% had participated.[5] 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.

Conclusions and Recommendations

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

- Offer rebates for a wider range of technologies and products.

- Not requiring pre installation inspections or approval, or post installation inspections for every project. Such inspections and approvals prior to the project can result in delays, scheduling issues, and paperwork that become barriers to customer participate and add cost for the utility. Instead, inspections could be required 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.

Below are examples of cost effective programs offering 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 rebates re offered for air conditioning, food service equipment, refrigeration, agricultural equipment, premium efficiency motors. The utility does random inspections.[6]
- **Efficiency Vermont:** 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.[7]
- **Oregon Energy Trust:** 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. [8]
- **Excel Minnesota:** Rebates are offered for compressed air, cooling, data centers, controls, VFDs, motors, and re-commissioning. Studies and some measures require pre-approval.[9]

In addition, 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. The involvement of a contractor working for the utility complicates the process. New

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

Hampshire State Government is one example of a customer with procurement regulations that do not mesh well with the small business program.[10]

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.[11]

8.5. 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. Rebates for custom applications are the lesser of 35% of the total installed cost or buy down to a 1 year pay-back. National Grid pays up to 50% for custom projects due to market saturation in its territory.[12] Primary outreach to the large customers is provided by Account Executives working for the utilities. 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;
- 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 goals have been 12% to 65% lower than the achieved savings. The goals set for 2011 and 2012 are lower than the 2010 goal by 11% and 9% respectively. The planned budget for this program is reduced from 2010 levels by 9% and 4% for 2011 and 2012, respectively. Although the program has consistently exceeded its goals in the past, goals for 2011 are 26% lower than the actual 2010 savings claim.

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

Table 8.2. Large C&I Retrofit Program Goals, Budgets, and Savings

Year	Budget	Budget Spent	Lifetime 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. [13] The survey also identified those large customer types that were least aware of the utility programs.[14] 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 8.2.

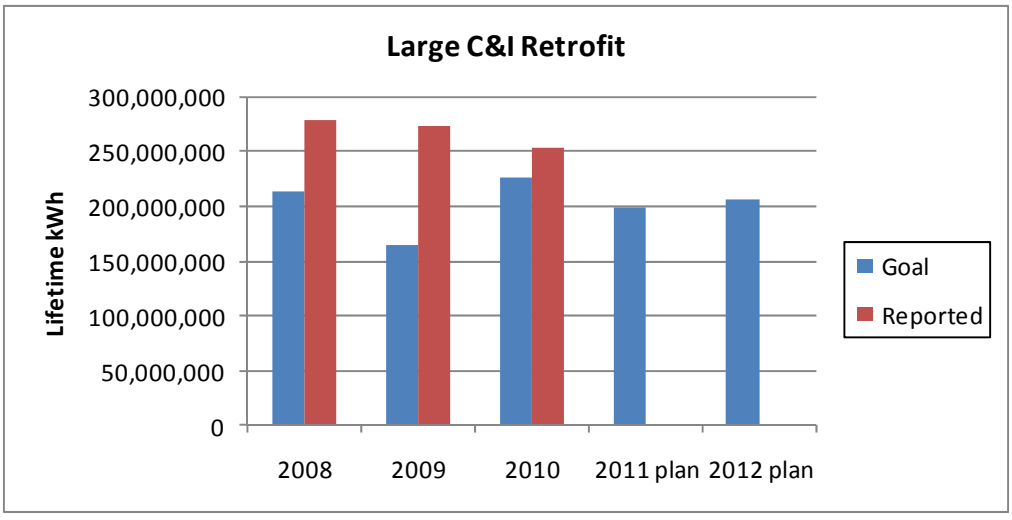


Figure 8.2. Large C&I Retrofit Program Goals and Savings

[13] Additional Opportunities for Energy Efficiency in New Hampshire, p. 53-54, tables 37 and 38.
[14] 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. Incentives currently are designed to provide a one year payback. While this approach is certainly enjoyed by the C&I customers, it is not clear why incentives are being offered for improvements that would pay back in one year (or less). 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). The 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.

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. 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.

Another issue may be the way businesses are defined as Large or Small. For example, the New Hampshire State Government has more than 500 locations or meters and is the largest electricity user in the state. However, the majority of State Government's electric meters draw less than 100 kW each and are categorized as small business accounts. As a result, the State is not assigned an Account Executive the way other large C&I customers are and the State does not receive the kind of attention that a single meter with the same magnitude of power usage would. This is also the case for telecom companies or campuses who are large users in total, but have many small accounts. One solution would be to look at both peak draw and overall aggregate usage to determine which businesses are eligible for the more intensive technical support and guidance that Account Executives can offer. For companies that have locations scattered throughout the state, it would be ideal to have one Account Executive assigned for all of the customer's assets to streamline the service and eliminate redundancy.

Some customers note they have not done efficiency projects as a result of running into the cap on the amount of incentive money provided each year to a single customer. This cap depends on the size of the customer's demand and on the program, and varies from $50,000 to $150,000. The caps are used as a guideline and not as absolute limits. Programs that operate in jurisdictions mandated to pursue all cost effective efficiency measures and rewarded based on verified savings, do not typically operate with such caps.

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. PSNH has seven Account Executives for approximately 1,200 large C&I customers. 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 after large customers who have not participated in the programs yet.

8.6. 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, but is open to businesses in addition to municipalities.

The Smart Start programs run by NHEC and PSNH used 21% of their budgets in 2010. Budget sand participation have declined since 2008. In 2010, no NHEC customers participated in the program, and 32 PSNH customers participated. This may be the result of a 5% fee imposed on the customer to cover the possibility of a default. Because PSNH's program is limited to municipalities and other government entities, which tend to be lower risk, this fee may be an unnecessary barrier. Because the repayment of the loan is through the billing system and is therefore linked to the continuation of electrical service, there is a strong motivation for a municipality not to default on the loan.

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 which projects will provide the most savings for the incentive cost. 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). Companies typically ask for 35-50% of the project cost in incentive money as part of their bid. The program averaged about 5% of the C&I lifetime savings during 2008-2010.

The intent of this program is to enable very large energy efficiency projects and to see what the market will bear for incentives. In other words, the low incentive bid wins the money. Average cost has 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 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 hoped. The typical bids have requested incentives of between 35% and 50% of the cost of the projects. This seems to strongly reflect the standard incentives levels offered by the C&I programs. In other words, the bids are influenced by and are reflecting the programs, instead of the RFP bids informing and perhaps justifying lowering the programs' incentive levels.

One way to continue progress towards the intent of the program 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 more cost effective. By limiting the number of winners, this should drive the participating companies to provide more competitive bids.

8.7. 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 an incentive of 75% of the incremental cost or enough for a 1 year payback. 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 (for NHEC customers only).

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 8.3.

Table 8.3 New Construction and Market Opportunity Program Budgets, Goals, and Savings

Year	Budget	Budget Spent	Lifetime 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

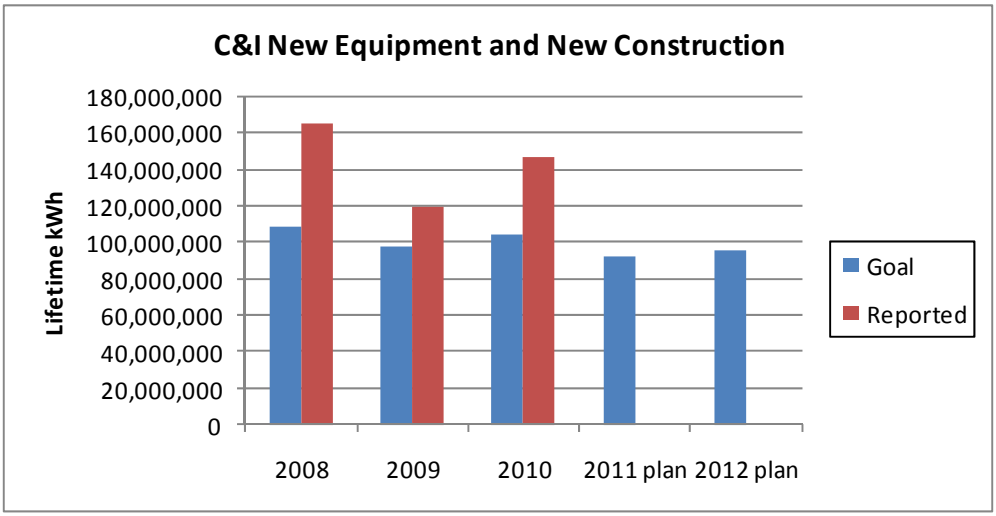


Figure 8.3. C&I New Construction and New Equipment Program Goals and Savings

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 the 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 pre and post inspections and preapprovals for most measures, and involve a fair amount of paperwork as part of the process. Account Executives take care of much of the paperwork for large customers. Small businesses do the paperwork on their own. 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.

It is difficult to assess the impact the program is having on market development overall. Information is not currently available the number of vendors providing equipment, who is attending the various seminars provided, etc. Are there just one or two vendors are participating from year to year, or is the number growing over time? 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.

8.8. 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 collapse. 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[15] This favorable metric may be explained by a focus on cost effective measures implemented in large industrial process projects. Projects involving small businesses, which take more time and effort relative to the savings, seem to be a lower priority.

Market Segments Not 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.

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

[15] Benchmarking of Vermont's 2008 Electric Energy Efficiency Programs, Table 0-4, page 11

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 capitol projects, assuming it passes the boards 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[16]. There may be opportunities for increased coordination between the utilities and thie program, moving forward.

Wisconsin and Oregon supports 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.[17]

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, submetering, expert advice, and support for demonstration projects. They use a 10 step process to guide wastewater projects through to completion.[18] 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.[19] New Hampshire's

[16] http://www.nhschoolbenchmarking.com/Default.aspx
[17] http://www.focusonenergy.com/business/schools-and-government/
http://energytrust.org/public-sector/incentives/Schools/equipment-upgrades/
[18] http://www.nyserda.org/programs/Environment/muniwaterwwt.asp
[19] http://www.focusonenergy.com/Business/Agribusiness/
http://www.efficiencyvermont.com/for_my_business/solutions_for_me/agriculture_and_farms/general_info/overview.aspx

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.[20]

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.

Unitil offers a multifamily gas program for buildings with four or more units. 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[21].

Payback Expectations

Customer concern over payback is the number one barrier for C&I customers for doing efficiency projects.[22] The NH utilities' response to this concern is to reduce the payback for most projects to one year, which is low. 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 a: two years, 2.5 years or a 22% ROI, and three years.

Customer Satisfaction

According to the 2008 survey of New Hampshire energy efficiency programs (Additional Opportunities for Energy Efficiency in New Hampshire, p. 57), 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. The large businesses stated that the programs were easy to access, and their Account Executive was helpful and responsive.

Section 8.9. 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. As of 2009, there were 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, whereas industrial use has been decreasing. Residential use has been flat.

[20] http://www.ensave.com/new-hampshire-farm-energy-audits.html
[21] http://www.efficiencyvermont.com/for_my_business/solutions_for_me/rental_property/general_info/overview.asp
[22] Additional Opportunities for Energy Efficiency in New Hampshire, table 41, p. 57

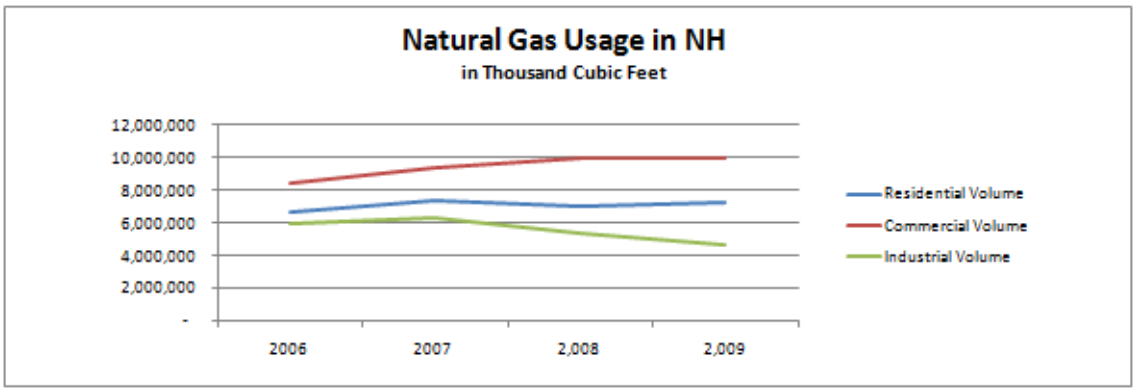


Figure 8.4. Natural Gas Usage in New Hampshire

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 8.5 illustrates the price of natural gas by customer type.

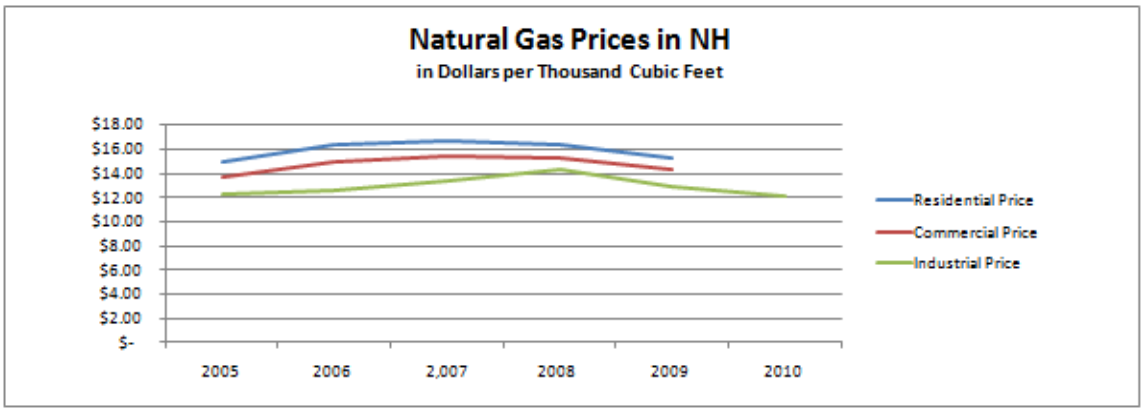


Figure 8.5. Natural Gas Prices in New Hampshire

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:

- 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 uses 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 being increased from $1.9 million for the 2008-09 season to $3.9 million in 2012.

In jurisdictions where gas and electric programs are fully aligned, the alignment begins with sharing a common name, 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).

8.10. Retrofit Programs for Gas C&I Customers

Unitil 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 will share 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.

National Grid Programs

Commercial Energy Efficiency Program: The Commercial Energy Efficiency Program is designed to help multifamily, commercial, industrial, governmental, and institutional customers install energy efficient natural gas equipment. Customers are also eligible for incentives for technical aid such as audits, design work, building controls and process improvements. Equipment eligible for incentives includes:

- Programmable thermostats;
- Boiler reset controls;
- Steam trap replacements;
- Pipe/duct insulation;
- Building shell insulation (i.e., walls, roof, floor, crawlspace);
- High efficiency windows; and
- Commercial kitchen equipment.

Specialty Retrofit Program - Building Practices & Demonstration Program :The intent of this program is to showcase the significant energy savings that can be achieved with new or under-utilized commercially available technologies. 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.

Special Retrofit Program - Economic Redevelopment Program: Customers must be located in an economic zone and improvements must be made to existing buildings. All improvement measures must exceed building codes, and customers must put up at least 50% matching funds.

8.11. New Construction and Market Opportunity Programs for Gas C&I Customers

Unitil 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 website.

National Grid Program

Commercial High Efficiency Heating Program: This program offers rebates for the installation of high-efficiency gas heating and water heating equipment including heaters, furnaces, boilers, and water heating equipment. Incentive amounts are posted on the website.

Program Alignment

Although there is significant overlap in the technologies offered by the two utilities for this program, the incentive amounts for these two programs vary appreciably. As can be seen in the table below, Unitil is offering more than double National Grid's rebates for some equipment. National Grid does offer standard rebates for commercial kitchen equipment, but just for steamers and fryers.

Table 8.4. Comparison of National Grid and Unitil New Equipment Rebates

		National Grid	Unitil	Differential
PRODUCT	**Minimum Rating**	**Rebate**	**Rebate**	
Furnaces (up to 150 MBH)	90% AFUE*	$ 100		
Furnaces with ECM motor	92% AFUE*	$ 400	$ 400	
Furnaces with ECM motor - 300 MBH	94% AFUE*		$ 650	
Condensing unit heaters (151 to 400 MBH)	90% Thermal Efficiency**	$ 500	$ 500	
Direct fired heaters/direct fired makeup air (up to 1500 MBH)		$ 1,000		
Direct fired heaters/direct fired makeup air (1501 to 3000 MBH)		$ 1,500		
Direct fired heaters/direct fired makeup air (over 3000 MBH)		$ 2,000		
Infrared heaters (all sizes)	Low Intensity	$ 500	$ 500	
Steam boilers (up to 300 MBH)	82% AFUE*	$ 200		
Hydronic boilers (up to 300 MBH)	85% AFUE*	$ 500	$ 500	
Hydronic boilers (301 to 499 MBH)	85% Thermal Efficiency**	$ 1,000	$ 2,000	$ 1,000
Hydronic boilers (500 to 999 MMBH)	85% Thermal Efficiency**	$ 2,000	$ 2,500	$ 500
Hydronic boilers (1000 to 1700 MBTU)	85% Thermal Efficiency**	$ 3,000	$ 3,500	$ 500
Hydronic boilers (1701 MBTU and up)	85% Thermal Efficiency**	$ 4,000	$ 5,000	$ 1,000
Condensing boilers (up to 300 Mbtuh)	90% AFUE* or greater	$ 1,000	$ 1,000	
Condensing boilers (301 to 499 Mbtuh)	90% Thermal Efficiency**	$ 1,500	$ 3,000	$ 1,500
Condensing boilers (500 to 999 Mbtuh)	88% Thermal Efficiency**	$ 3,000	$ 5,000	$ 2,000
Condensing boilers (1000 to 1700 Mbtuh)	88% Thermal Efficiency**	$ 4,500	$ 10,000	$ 5,500
Condensing boilers (1701 Mbtuh and larger)	90% Thermal Efficiency**	$ 6,000	$ 15,000	$ 9,000
Indirect fired water heaters (up to 50 gallon storage)		$ 100	$ 500	$ 400
Indirect fired water heaters (over 50 gallon storage)		$ 300	$ 500	$ 200
Integrated water heater/condensing boiler	**.9** Energy Factor and 90% AFUE		$ 1,300	
On-demand tankless water heaters (with electronic ignition)		$ 300	$ 300	
7 Day Programmable Thermostat			$ 25	
ENERGY STAR Storage Water Heater	.67 Energy Factor		$ 100	
Condensing Unit Heaters up to 300 MBH	90% Thermal Eff.		$ 500	

Fryers	ENERGY STAR	$ 1,000	$ 1,000	
High Efficiency Gas Steamer	ENERGY STAR or >38% eff.	$ 1,000	$ 1,000	
High Eff. Gas Convection Oven	40% eff.		$ 1,000	
High Eff. Gas Combination Oven	40% eff.		$ 1,000	
High Eff. Gas Conveyer Oven	40% eff.		$ 1,000	
High Efficiency Gas Rack Oven	50% eff.		$ 1,000	
High Efficiency Gas Griddle	ENERGY STAR		$ 500	

*AFUE= Annual Fuel Utilization Efficiency

**Thermal Efficiency= Efficiency of heat transfer in a boiler minus boiler radiation and convection losses

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. The assessment is based on gas filings submitted to the PUC prior to completion of research for this Draft Report. Filings submitted subsequently will be reviewed in July and the information will be updated, as needed.

Table 8.5. 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 2009	No Data	No Data	No Data	No Data	No Data	No Data
2010	No Data	No Data	No Data	No Data	No Data	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

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 six states with gas programs.[23] The C&I sector achieved savings for $0.12/therm for those years. National Grid accounted for about 88% of the savings, and Unitil saved the remaining 12%. Commercial and industrial projects accounted for 42% of National Grid's savings, and for 48% of Unitil's during the three years for which there is data. National Grid's average cost of savings for C&I programs was $0.10/therm, and Unitil's was $0.29/therm.

This low $0.16/therm average is largely driven by a very good year for the 2007-2008 season, during which the cost of savings was $0.11/therm. In turn, this low year was greatly impacted by National Grid's Commercial Energy Efficiency program that brought in almost 12,000,000 therms of savings at $0.03/therm and accounted for 40% of all savings for that year (both C&I and Residential). It is not known how much of the savings was driven by an increase in participation versus a small number of very large projects.

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. Goals for 2011 and 2012 are more aggressive and the budget is increased. Unitil did not achieve its C&I goals by 19% to 41% for the years between 2006-2009. Unitil's goals for 2011 and 2012 decline from past goals, yet are higher than past actual savings for since 2006-2007. Combined, the two utilities have exceeded the state goals for all years since 2006-2007 (excluding 2009-2010 for lack of data).

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.

[23] Saving Energy Cost Effectively, Page 7 Table 2

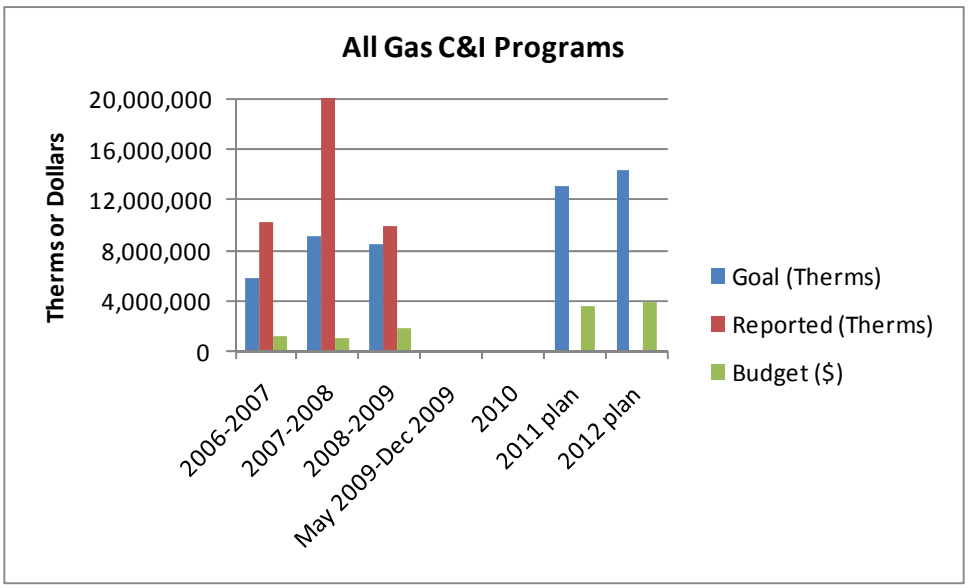


Figure 8.6. Gas Programs Goals, Savings, and Budgets

Conclusions and Recommendations

The gas programs are doing well overall with respect to cost savings. Although Unitil is spending three times as much as National Grid, both programs are cost effective and compare favorably to past benchmarked gas programs. Due to a lack of data, it is less 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.

While the 2011-2012 plan does a great job of outlining a number of way to reach out to the 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.

8.11. Conclusions and Recommendations for both Electric and Gas C&I Efficiency Programs

The table below summarizes the recommendations for the C&I Efficiency programs discussed above.

Table 8.6. Summary of Recommendations for C&I Energy Efficiency Programs in New Hampshire

§8.1. Overall Recommendations for the C&I 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 0.8% for electricity and 0.4% for gas (all programs). As per the GDS study, 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. The maximum achievable cost effective non-electric savings is 9% of 2018 usage in the C&I market.[24]
• 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?
• 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?
• Make better use of marketing and account management/customer service money by reducing redundancy and increasing cooperation, especially between the gas and electric programs. Cross training will likely be necessary to achieve this.
• The electric utility programs are pretty well aligned. The National Grid gas program is very different in format compared to the other programs, and the Unitil prescriptive rebates differ from National Grid's. This may result in unnecessary market confusion.

§8.2. Recommendations for Market Transformation
• Reduce or eliminate the focus on simple payback and emphasize return on investment, cash flow, other resource benefits, process improvements, and other benefits like comfort and productivity.
• Hire or subcontract more people to work on market development through account management, education and direct customer outreach.

[24] Additional opportunities for Energy Efficiency in NH, pages 107 and 108

§8.3. Recommendations for Improved Outreach
• Better engage large customers with dispersed accounts by looking at aggregate usage in addition to demand. New Hampshire State Government is one example.
• Better engage customers with multiple stakeholders such as municipalities and K-12 schools by providing more support. These customers may need extra hand holding to push efficiency projects through their processes.
• Better engage small customers by providing a streamlined process for new construction (market opportunity) projects such as kitchen equipment, VFDs for heated and chilled water circulators, HVAC equipment, and agricultural equipment. Eliminate pre-inspections and require only spot post inspections.
• Provide targeted outreach programs to types of customers to increase participation among small businesses such as retail, restaurants, grocery and delis, K-12 schools, multifamily housing, and farmers.
• Use upstream programs for commonly purchased equipment such as lighting lamps and ballasts, and some HVAC equipment.

Section 9: Low Income and Weatherization Assistance Programs Review and Assessment

9.1. 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 DOE 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 distributors, 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]

9.2. Key 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.

[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

- **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.

9.3. 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 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 (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, OEP maintains technical and administrative manuals, performs administrative/financial and field monitoring visits annually, and performs on-site inspections on a minimum of 10% of the units weatherized. The OEP also develops and carries out annual training and technical assistance activities that 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 Program (HEAP). The HEAP 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]

Low income weatherization jobs are classified as "A" or "B" jobs in New Hampshire, based upon whether or not the job is for are 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 CORE program. If no, the household is considered a B job and is eligible for electric base load measures only (which are essentially CFLs and refrigerator

[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.

replacements). 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 HEAP 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 HEAP 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 HEAP and the gas utilities' low income programs operate under the same income guideline as the state's WAP – 200% of the federal poverty level. 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 that income qualify and do not receive utility bill assistance may still apply for free energy efficiency services through the CAAs.

9.4. Program Results and Market Development

The table below documents the HEAP 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.

Table 9.1. CORE HEAP 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%

[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 9.2. CORE HEAP 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 9.1 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.

9.5. Conclusions and 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.[10]

The state provides a strong framework to help drive the program's success through continued development of administrative policies and procedures as well as a field technical manual. 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.[11] 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

[9] http://www.nh.gov/oep/programs/energy/documents/blasnik_wxn_study.pdf, pg. 11.
[10] http://www.nh.gov/oep/programs/energy/documents/blasnik_wxn_study.pdf, page 4.
[11] Gamble, Nancy, Personal Communication, May 9, 2011.

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.[12]

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 a 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 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 to 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.

Coordination and Administration: 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 PSNH and operational decisions are usually consistent across CAAs. Additionally, the utilities, 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 OEP to raise the performance issue and coordinate efforts to address deficiencies.[13] 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.

- *Recommendation: Coordinate Quality Assurance inspections, share inspection reports, and handle performance issues collaboratively between the State and HEAP.*

[12] http://www.nascsp.org/data/files/weatherization/py_2009_funding_survey.pdf, page 16-17.
[13] Melanson, Frank, Personal Communication, May 12, 2011.

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 New the Hampshire' State WAP Plan).[14] The CORE programs also perform site inspections on at least 10% of the units served by HEAP. 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. Given the fact that more than 90% of the low income homes served in NH are funded with both WAP and CORE funding, it seems that the combined inspection rate may be excessive, and that Quality Assurance could be coordinated through a single entity.

- *Recommendation: Through OEP and HEAP, 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 could also be linked integrally to training and technical assistance plans. 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 OEP, and occasionally cost shared. This is excellent, and it is recommended that this effort continue to be strengthened and informed by the training needs identified through Quality Assurance.

- *Recommendation: Coordinate annual production plans between the WAP and utility programs in order to both meet utility goals and ensure that New Hampshire's low income households are equitably served.*

  As discussed above, the HEAP 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 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.[15] Interviews with state and local agency staff indicate that their waiting lists can extend several years, whereas utility A jobs are expected to be served within eight weeks.

  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. 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

[14] http://www.nh.gov/oep/recovery/documents/wx_plan-master_file_worksheet.pdf, page 12.
[15] Melanson, Frank, Personal Communication, May 12, 2011.

timely fashion if CAAs will not be able to meet production targets and then be able to reallocate resources accordingly.

- *Recommendation: Consider measure level reimbursement on an actual costs incurred basis rather than on a prescriptive rate for the HEAP and gas low income 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 program 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)[16]. The federal WAP rules require that weatherization work performed under the program be reimbursed based on actual costs incurred, and reporting and invoicing of those costs is entered into a spreadsheet that is sent to the OEP and compiled[17]. 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.

IT Resources: 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. 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.

- *Recommendation: Consider ways that the utilities and the state could work together to more effectively share information, including pre- and post-weatherization usage data. 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. 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. The HEAP administrator and the OEP WAP management should discuss whether such a tool could serve both the utilities' and the state's needs to collect and track such information in the future.

[16] 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.
[17] Gamble, Nancy, Personal Communication, May 9, 2011.

Section 10: Sustainable Energy Program Review and Assessment

10.1. Introduction

New Hampshire generates 84% of its electricity from nuclear power (43%), natural gas (23%), and coal (18%), and relies on oil and other fossil fuels for most space heating. 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 16% of current electricity generation, with solar, wind, and methane providing less than 1% [1].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[2]. 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[3], 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[4].

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

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 grid reliability and security, and reduces the need for transmission and distribution (T&D) upgrades
- Take advantage of consumer interest in environmental benefits and lowers 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, 2007; http://www.nh.gov/oep/programs/energy/nhenergyfacts/index.htm
[3] http://www.governor.nh.gov/media/news/2006/082906energy.htm
[4] The New Hampshire Climate Action Plan, New Hampshire Department of Environmental Services, 2009

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.

10.2. New Hampshire Sustainable Energy Policy

10.3. Sources of Funding for Sustainable Energy

10.4. Framework: New Hampshire's Electric Renewable Portfolio Standard

10.5. Framework: Sustainable Energy Permitting and Infrastructure

10.6. Framework: Financial Support Mechanisms for Sustainable Energy Development

10.7. Framework: Customer-sited Sustainable Energy Rebate Programs

10.8. Utility Investment in Distributed Sustainable Energy

10.9. Sustainable Energy Program Administration

10.10. New Hampshire Markets: Solar Photovoltaic and Solar Thermal Energy

10.11. New Hampshire Markets: Wind Energy

10.12. New Hampshire Markets: Biomass Electric and Heat Generation

10.13. New Hampshire Markets: Hydroelectric Generation

10.14. New Hampshire Markets: Methane and Landfill Gas

10.15. New Hampshire Markets: Geothermal and Other Sustainable Energy

10.16. Sustainable Energy: Summary of Recommendations

10.2. 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.

10.3. 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 10.4. 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[5], the REF is currently being used to fund several customer-sited sustainable energy rebate programs and a competitive project solicitation (programs funded to date by the REF are discussed in Section10.7.).

[5] http://www.puc.nh.gov/Regulatory/Rules/Puc2500.pdf

Because it receives funding solely from RPS 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 compliance payment collections has declined steadily:

- $4.5 million in 2009;
- $1.3 million in 2010; and
- Estimated at $0.8 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 authorized to support projects that address sustainable energy development, to date only one such award has been made – the Plymouth Area Renewable Energy Initiative received $99,250, which provided support for community-based solar hot water installations. 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 expanded **Systems Benefit Charge** to the REF
    - **Earmarking portions of the GHGERF**, particularly for thermal generation technology support
    - **Forward Capacity Market** proceeds, either through the utilities' activities or aggregated by state programs
    - Certain cost-effective sustainable technologies (solar hot water, for example) could become **eligible measures under energy efficiency programs**

10.4. 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)[6]. Combined, these RPS requirements now apply to ~ 56% of the total retail electric sales in the US[7]. If achieved, these requirements together are expected to contribute to the attainment of roughly 71-88 GW of new sustainable energy capacity by 2025[8] 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[9]

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:

- **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
- **Class IV:** Existing small hydroelectric (≤ 5 MW)

[6] 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.
[7] The Status of State RPS Efforts-Observations & Trends, Clean Energy States Alliance presentation to NH 2011 RPS Review Meeting, 2/14/2011
[8] The Status of State RPS Efforts-Observations & Trends, Clean Energy States Alliance presentation to NH 2011 RPS Review Meeting, 2/14/2011
[9] Minutes of the 2011 RPS Review Meeting, 4/21/11

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"[10].

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 service providers also banked low-cost RECs toward future compliance. Many sources for the RECs used are not from investment in NH[11]:

- 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.

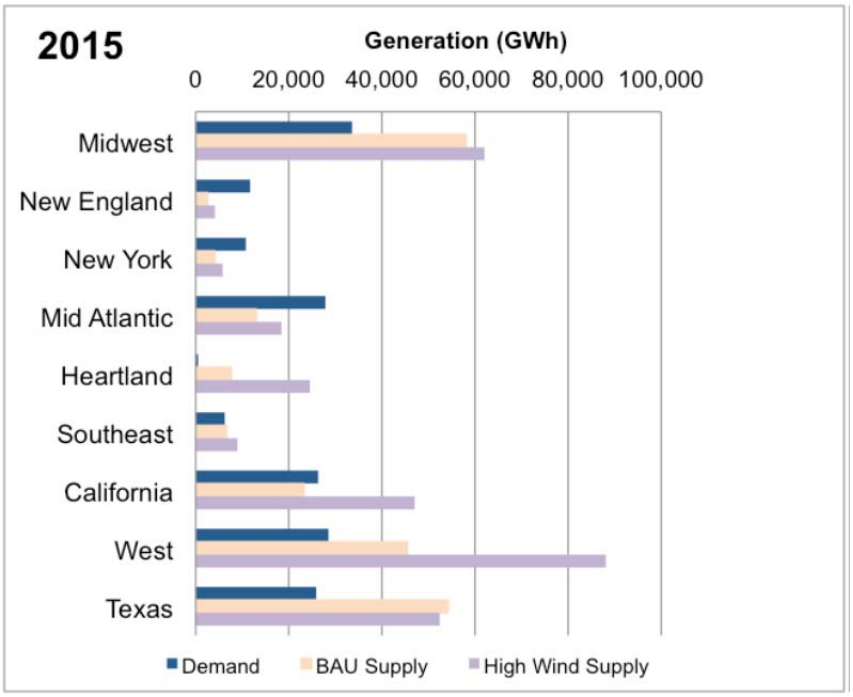
ACP payments decreased from 2009 to 2010 because of greater market supply and, consequently, the lower cost of Class I and Class III RECs. The price of Class I and Class II RECs even fell below the price of Class III and Class IV prices, creating a situation in which RECs produced by existing renewable generation facilities are more valuable than those associated with new renewable power installations. This

[10] RSA 362:F
[11] http://www.puc.nh.gov/Sustainable%20Energy/RPS/2011%20RPS%20Review%20Kick-off%20Presentation%202-13-11.pdf

means that at this point in time, the regional market is oversupplied and new investment is occurring at only low levels.

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 10.1) 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 10.1. Snapshot of Regional Demand and Supply under RPS in 2015[12]



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 review will likely consider many issues, such as:

- Adequacy of RPS class requirements;
- Class requirements based on market conditions;
- The inclusion of requirements for thermal energy and energy efficiency;
- Increasing class requirements for Classes I and II beyond 2025;
- Transition of "new sources" into old sources;

[12] Bird et. al, NREL 2010, Technical Report 6A2-45041

- Purchasing structures and procurement policies;
- Distribution of the Renewable Energy Fund;
- Narrowing geographic eligibility to benefit New Hampshire generators;
- Issues of specific technologies, such as large hydroelectric, and wood-burning concerns;
- Competitive or open procurement of RECs;
- Easier participation for smaller facilities;
- Decreased costs;
- Transition to a distribution-based requirement; and
- Whether to continue with an RPS in place.

This review is required by legislation.[13] 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.[14] 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[15]. 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[16].

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. .

- **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.[17] 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.

[13] 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
[14] HB 1377, Chapter 229:3, Laws of 2010
[15] HB 311-FN: currently in review in the House Science, Technology, and Energy Committee
[16] 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.nhcollaborative.org/Workgroups/WGC/HB%201377%20Small-scale%20renwables.pdf
[17] The Commerce Clause and Implications for State Renewable Portfolio Standard Programs, Clean Energy States Alliance, 2011.

- **Authorize 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.

- **Develop policies to facilitate aggregation of smaller projects** (net-metered) to lessen transaction costs of measurement and participation in REC markets, including streamlined means of aggregating and computing RECs by utilities and other aggregators.

- **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.

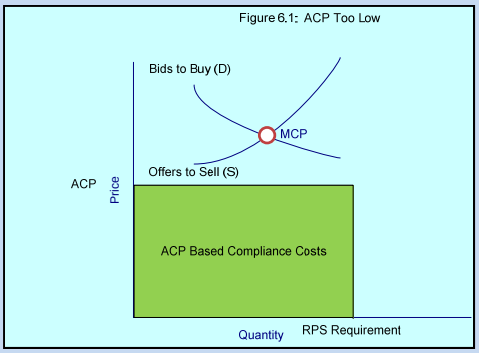
- **Establish new, higher Alternative Compliance Payment levels** for some or all RPS classes, followed by a scheduled ramp-down of ACP levels. The ACP is an important design element for an RPS, serving two major functions:

    - 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.

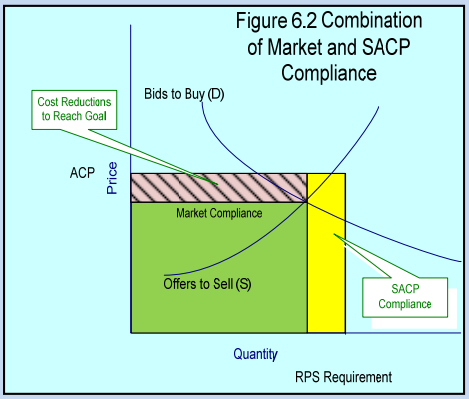
While the ACP can provide a source of funds for investment by the state, which uses collections from ACPs to fund sustainable energy programs, this function is secondary and should not drive the design of effective ACP levels. Using ACP collections as the primary funding source for program-level investment 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 10.3. for recommendations). A review of elements to consider when setting new ACP levels is provided below.

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.

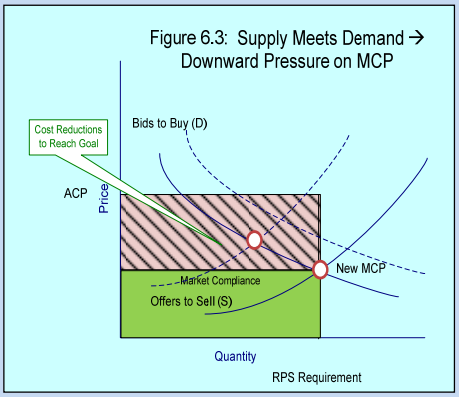


In open markets such as these, at any given price, sustainable energy project developers determine the level of supply they can offer, and buyers (who must meet RPS requirements) have a certain demand for projects at that price. The market competitive price (MCP) is defined at the intersection of the price of supply and demand – Figure 10.2. 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 10.3. 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 10.4.). 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%
- **Design a schedule for subsequent lowering of the ACP** as markets develop and prices fall

10.5. 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.

Table 10.1. Current Regulatory and Permitting Infrastructure in New Hampshire

Strategy	Date Current Authority Effective	Key Characteristics
Interconnection Standards & Net-metering Rules	August 2010[18]	• Standard interconnection application – simplified standards for inverters sized up to 100 kVA • Utilities may not require customer-generators to perform additional tests, or pay for additional interconnection-related charges. Insurance is not required • New project size limits for net-metering: o Small systems: up to 100 kW o Large systems: up to 1 MW • Aggregate capacity: 50 MW state-wide (allocated to utilities as 1% of annual peak demand for each) • Net excess generation rolled over or payment for credit can be requested (rules being finalized) • Allows third parties to own facilities • PUC finalizing net-metering rules (Docket 10-216)
Local Ordinances: Renewable Energy Policy	2000, 2002	• The installation of [RE] shall not be unreasonably limited by use of municipal zoning powers[19] • Zoning ordinances shall be designed to encourage the installation and use of solar, wind, or other renewable energy systems[20]
Solar Easements	1985[21]	• Allows property owners to create solar easements
Small Wind Permitting Standards and Model Ordinance	September 2009[22]	• 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[23]

[18] RSA 362-A; N.H. Admin. Rules, PUC 900
[19] RSA 672:1, III-a
[20] RSA 674:17, I (j)
[21] RSA 477:49 et seq.
[22] RSA 674:62 et seq.
[23] RSA 4C:5a; http://www.nh.gov/oep/resourcelibrary/swes/documents/technical_bulletin.pdf

Strategy	Date Current Authority Effective	Key Characteristics
Local Option Property Tax Exemption	January 1976[24]	• 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
Environmental Disclosure	2010[25]	• Providers of electricity must provide information to customers on the sources of their electricity • PUC finalizing rules (Docket 10-226)
Green Service Option	2009[26]	• Requires electric distribution utilities to offer one or more renewable energy source options • PSNH, Unitil, & Nat'l Grid now offer options
Utility Distributed Energy Resources Rules	September 2008[27]	• Provides an exception to the general rule – that utilities cannot build new generation – for DG of ≤ 5 MW • One Unitil project approved to date[28] • 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

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[29]. 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,

[24] RSA 72:61 et seq.
[25] RSA 378:49
[26] RSA 374-F:3, V(f)
[27] RSA 374-G
[28] PUC Order No. 25,201
[29] NH REF Annual Report for 2009 (Oct. 1, 2010)

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 to come on line.
    - 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.
    - Design net metering policy to allow all customers to choose to **roll-over the net excess generation credits** indefinitely or, at the end of a 12-month period, require the utility to purchase any remaining excess electricity from the customer at the utility's avoided-cost rate.
    - 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.
    - **Allow net metering for electric customers on a time-of-use (TOU) tariff**. 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.
    - 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:** 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[30] 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.
    - 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[31]. 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[32] 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.

[30] The Impact of Local Permitting on the Cost of Solar Power, SunRun, Jan. 2011 www.sunrunhome.com/permitting
[31] Vermont Energy Act of 2011 (H.56)
[32] 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.

- **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. For example, Vermont's first megawatt scale solar facility, the 1MW Ferrisburg Solar Farm, was commissioned in December 2010. In response, the Vermont Department of Taxes has issued guidance to host communities that solar facilities be appraised on the 'income approach'. This guidance is inadvertently creating a significant inequity in the property taxes to be paid by solar facilities, in comparison to the property taxes paid by renewable technologies that have existed in Vermont for many years, namely biomass, hydroelectric, and wind. By using the income approach to valuation, it is estimated that the education tax component of the total property tax for solar facilities will be approximately $.03 per kilowatt hour, which is 10 times that of biomass ($.0298), 6 times that of hydroelectric ($.005), and 10 times that of wind projects($.003). Such inequities should be avoided.

- **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[33].

- **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

[33] 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

- **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 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 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. 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.

10.6. 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 10.3.).

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 10.2. 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 • Because 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. • Often a complement to other financial incentives • Can be very difficult to budget for - commitment is uncertain

Investment Incentive Mechanism	A Good Fit When…	Factors to Consider
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
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 13 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 streamlines 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.

10.7. 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[34] of the fund to establish and administer small-scale 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 10.3. 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		$516,000	
NH PUC	REF	C&I PV/ Solar Thermal	Nov 2010	$1,000,000	• Strong interest • Lower incentive level than RES 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

[34] 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

Provider	Funding	Program Sector / Type	Start Date	Budget to Date	Key Characteristics
NHEC	CORE?	Residential Solar Hot Water	Ongoing		• Program has been on hold but now has funds and is accepting reservations for 2011
PSNH	CORE	Residential Geothermal Heat Pumps	Ongoing	NA	• Part of EE Home Performance and New Construction programs
NHEC	CORE	Residential Geothermal 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. 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 rather than 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 for funding:
  - 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
  - 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**

Competitive 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. 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 initiative35. 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, 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.

[35] Would You Like Efficiency With That? Linking Efficiency and Renewables to Motivate Customer Action, B. Schutten & K. Kuntz, ACEEE 2010.

- **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. Finance program structures are discussed more fully in Section 13 of this report.

10.8. 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[36]. 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 – Unitil's 100 kW PV and 65 kW micro-turbine project recently installed at Exeter High School. Other proposals have been rejected or withdrawn because of cost-benefit or cost-recovery issues. 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 permit process for smaller generation facilities using renewable resources
    - 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

- **Consider the value of different 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

[36] This excludes NHEC and the municipal electric utilities, which are not subject to the restrictions placed on other utilities in the state.

"value" of the generation to the utility, rather than based on estimates of the production cost of the eligible technologies[37]. 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

10.9. 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 listed in statute[38]. This means that new legislation is required for even small changes in program components, such as incentive levels, maximum systems sizes, and maximum rebates levels, as well as allocation of program funding across customer classes. The New Hampshire Office of Energy and Planning is administering the bulk of the ARRA-funded projects for the state.

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 can be reviewed and approved by the Legislature or other stakeholders as a long-term plan, 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:** Such streamlining could take advantage of the economies of scale,

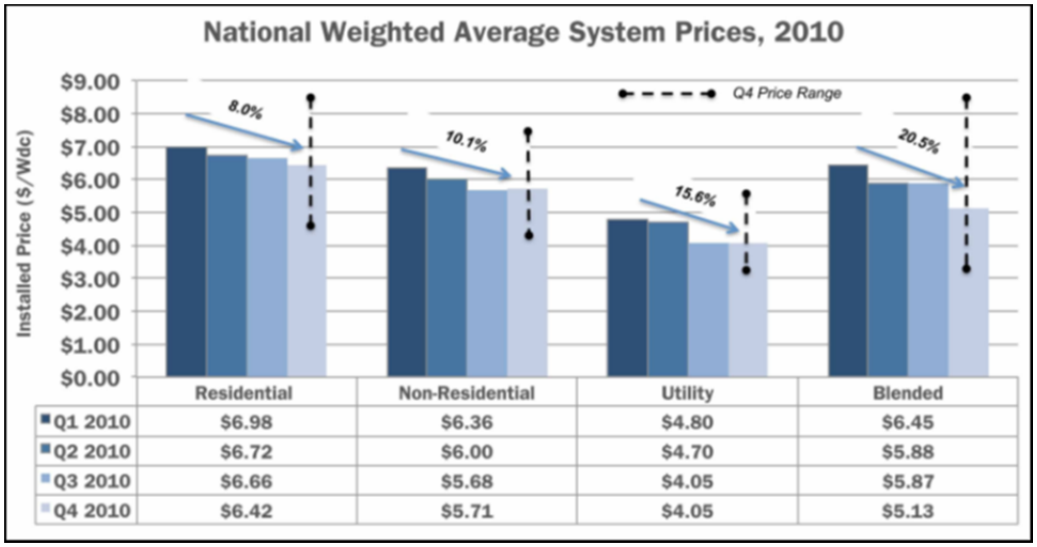
[37] http://www.energy.ca.gov/2011_energypolicy/documents/2011-05-09_workshop/comments/SMUD_Comments_on_May_9_IEPR_Workshop_TN-60815.pdf
[38] RSA 362-F:10

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.

10.10. 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 10.5.)[39].

Figure 10.5. National Weighted Average PV System Prices, 2010[40]



	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 here, potentially drawing customers who are just looking to install solar, away from SHW. Third-party ownership models have also been gaining hold here, particularly in the non-residential market[41].

[39] US Solar Market Insight – 2010 Year in Review, SEIA/GTM Research
[40] SEIA/GTM US Solar Market Insight 2010
[41] US Solar Market Insight – 2010 Year in Review, SEIA/GTM Research

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 reduction 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 to stimulate investment in solar technologies in order to capture these benefits and improve its 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:

- 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
- Stonyfield Farm, Londonderry – 50 kW solar array; the first major solar array in the state. This project was financed "primarily by purchase of expected life-of-project REC output." Owned by Stonyfield Farm.
- Manchester Landfill (proposed) – Up to 5 MW solar array proposed by PSNH atop the closed Manchester landfill. On hold as permitting and project finance details are investigated.

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 10.3.

Table 10.4. Customer-sited Solar Rebate Programs: Program Design and Performance

REF- and ARRA-Funded Solar Rebate Programs – Completed Systems (April 2011)										
Technology	Target Market Sector	Program Start	Incentive Design			Program Performance				
			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 $2,400		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)								
Technology	Target Market Sector		Incentive Design			Under Reservation		
		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 $2,400		na	58		$134,800
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	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. 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 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 authorized to support projects that address sustainable energy development, to date only one such award has been made – the Plymouth Area Renewable Energy Initiative received $99,250. As part of their project, they have provided 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 similarly limited under current plans.

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[42]. 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.

[42] http://www.epa.gov/swerosps/bf/partners/brightfd.htm

- **Reconsider the SHW program incentive design:** The current levels of support for solar hot water are higher than would be necessary if determined solely on a customer economics basis. However, a rich rebate level can be very effective in garnering attention and giving a boost to a new market. It does, though, limit the number of participants the given budget can accommodate. It would be appropriate to reconsider the SHW program design based on the market response for the current program and an analysis of cost and returns to the customers, and set out new rebate levels accordingly.

- **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.

10.11. New Hampshire Markets: Wind Energy

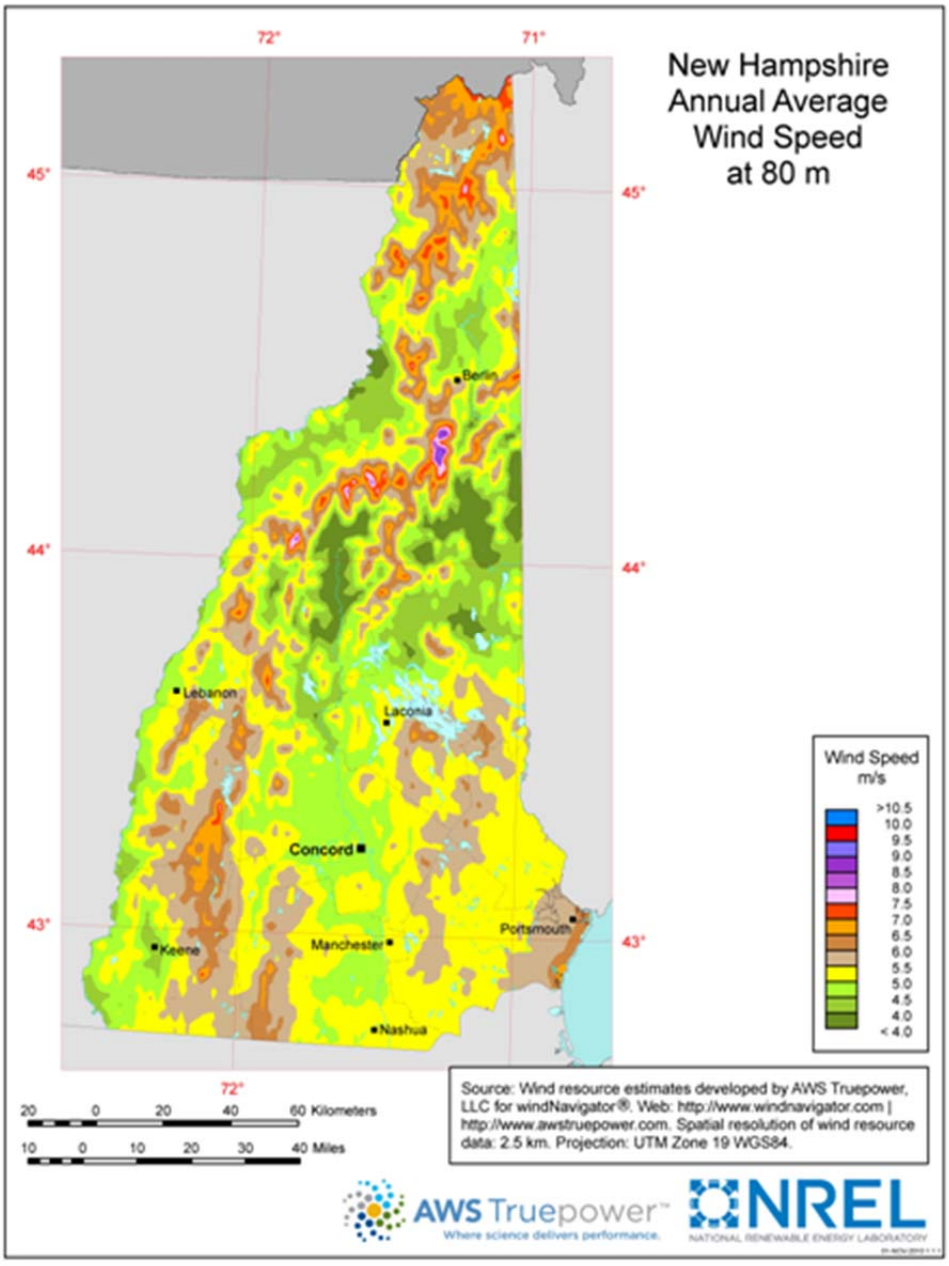
Like other renewable energy sources, wind is inexhaustible, produces no waste or pollution, provides locally sited power and local economic value, and its costs are subject to neither market nor geopolitical volatility. Improvements in wind technology have brought its long-term costs down to a level that is competitive with fossil-fuel energy generation[43], and wind power continues to be the fastest growing energy resource in the US. Markets in many regions do still struggle with siting issues.

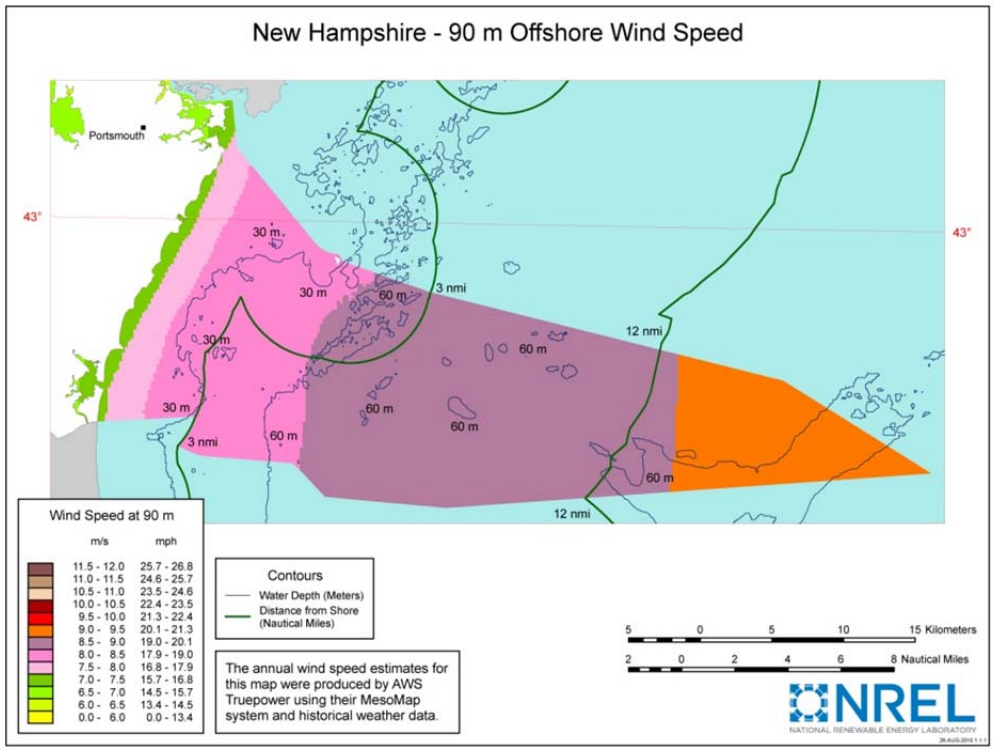
Current New Hampshire Landscape – Wind Projects and Programs

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[44]. 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 10.6.)[45].

[43] http://www.windpoweringamerica.gov/pdfs/2007_annual_wind_market_report.pdf
[44] AWEA Fact Sheet for NH Q1 2011: http://www.awea.org/learnabout/publications/factsheets/factsheets_state.cfm
[45] AWEA Fact Sheet for NH Q1 2011: http://www.awea.org/learnabout/publications/factsheets/factsheets_state.cfm

Figure 10.6. 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 10.5. 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 2011 • 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[46]. 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

[46] 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 10.3.

Table 10.6. 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.

- **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[47]); require turbines to be approved by the Small Wind Certification Corporation[48]; 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.

10.12. 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.

Current New Hampshire Landscape – Biomass Projects and Programs

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[49]. In 2009, 5% of New Hampshire residents used wood as their primary heat; 10% of rural residents heated their

[47] http://www.powernaturally.org/programs/wind/eligible_wind.asp
[48] http://www.smallwindcertification.org/
[49] New Hampshire Energy Facts 2008: Overview based on EIA 2008 Data, NH OEP

home primarily with wood.[50] Given the NH RPS requirements, electricity generation from biomass in the state is projected to increase substantially.

The table below gives representative examples of facilities that generate energy from woody biomass in New Hampshire.

Table 10.7. 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[51] • 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. • Owned by Bridgewater Power Co. of Ashland, NH[52]
Pine Tree Bethlehem	17.5	Bethlehem	Operating	• Owned by Tractabel Power of Concord – Pinetree Power, Inc. operates facility
Pine Tree Tamworth	23.8	Tamworth	Operating	• Owned by Tractabel Power of Concord – Pinetree Power, Inc. operates facility
Hemphill	16	Springfield	Operating	• Owned by Marubeni Corp. – Hemphill Power and Light operates the facility
Whitefield	16	Whitefield	Operating	• Owned by Marubeni Corp. – 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 [53]
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[54] • Development proposed by Laidlaw Berlin, LLC, an affiliate of Laidlaw Energy group, Inc.
Bio Energy Hopkinton	30-34	Hopkinton	Proposed	• Expected to burn 300,000- 360,000 tons of wood annually • Development proposed by BioEnergy[55]
Clean Power Developmen t Winchester	20	Winchester	Proposed	• Development proposed by Clean Power Development

[50] Data from US Census (www.factfinder.census.gov) Compiled by the Alliance for Green Heat
[51] http://www.power-technology.com/projects/wood-schiller/
[52] 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
[53] http://www.indeckenergy.com/images/Indeck_Broch.pdf
[54] http://www.nyenrg.com/berlinnhproject.html
[55] Town of Hopkinton Press Release http://www.hopkinton-nh.gov/Pages/HopkintonNH_Bioenergy/press%20release

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[56]
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[57]
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. • Co-generates power equivalent to heat for 1,000 homes
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
Groveton Renewable Energy Park	70[58]	Groveton	Proposed	

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[59].

[56] http://www.nh.nrcs.usda.gov/news/NCRC&D_WoodBiomassHeating.html
[57] http://www.biomasscenter.org/
[58] http://www.nh.nrcs.usda.gov/news/NCRC&D_DistrictHeatingMtg.html
[59] Heating the Northeast with Renewable Energy Biomass: A Bold Vision for 2025; Executive Summary; http://www.nebioheat.org/pdf/heatne_vision_ExecSummary.pdf

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. 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 the Vision proposed by the Northeast Biomass Thermal Energy Working Group[60].

Examples of the economic advantages of developing biomass generation in New Hampshire are plentiful

The Indeck Plant in Alexandria:

- Employs 20 people
- Indirectly supports more than 100, including foresters, loggers, and other workers
- Construction employed about 30 workers for a 3-6 month period.

The Groveton project is provides:

- Over 230 construction jobs and 20 permanent operational jobs
- Sustain or create an additional estimated 150 jobs for forest contractors, truckers, equipment suppliers and support systems.

The Laidlaw Berlin Project:

- is located in a region that experienced the closure of several pulp and paper mills and the loss of approximately 1,000 jobs
- The project involves an investment of approximately $68 million on the part of Laidlaw, its partners, investors and lenders
- $20 million dollars annually is expected to be invested annually into the regional economy for biomass fuel purchases.
- Tax revenue will add to the budget of rural communities.

The Bio Energy Hopkinton

- Is estimated to have an approximate value of $60 to $70 million dollars
- Estimated to provide gross tax revenue from $300,000 to $1,300,000 per year

Preserving working forests and avoiding conversion of forest lands to other purposes will also be critical to the success of New Hampshire's Climate Action Plan. New Hampshire is currently 84% 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[61].

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-

[60] Heating the Northeast with Renewable Energy Biomass: A Bold Vision for 2025; Executive Summary
[61] The New Hampshire Climate Action Plan, NH Department of Environmental Services, 2009

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.

The downtown and state buildings complex in Concord have been served by a biomass-fueled district heating system since 1980. This system co-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. However, according to PSNH, the long-term rate was significantly higher than the market value of the energy. (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 [62]).

The 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. To remain viable, the plants hope to see an increase in the percentage of Class III RECs utilities are required to obtain. The state PUC is currently reviewing the state's Renewable Portfolio Standards, with a report of its findings to go to

[62] http://www.nhbr.com/news/921480-395/four-n.h.-wood-burning-plants-warn-theyll-shut.html

the Legislature in November and new standards to go into effect by July 2012. Older plants need to be upgraded, but care should be taken to prevent the RPS process from dis-incentivizing older plants.

Recognizing the interest and potential in small-scale wood-fueled energy, a residential wood-pellet central boiler rebate program has been developed and is 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 10.3.

Table 10.8. Customer-sited Biomass Rebate Program: Program Design and Performance

ARRA-Funded Residential Wood-pellet Boiler/ Furnace Program – Completed & Reserved Systems (4/2011)								
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	6	546,600	$35,765	$134,459	86.6%
				Systems Under Reservation				
				# Reserved	Total Capacity (Btu/hr)	Rebates Reserved	Estimated Installed Costs	Avg. Efficiency Rating
				3	397,000	$14,738	$72,924	84.4%

This program is the first residential wood-pellet furnace 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.

Recommendations

- **Establish a secure source of funding for the wood-fueled boiler/ furnace program:** The major current limitation for this program is lack of a source of long-term and reliable funding (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
  - 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.

10.13. 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 production 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). 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.

Table 10.9. 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]				

[63] EIA 2008
[64] Deerfield Plant Fact sheet http://www.transcanada.com/docs/About_Us/ConnectDeerplant.pdf

Name	Capacity (MW)	Location	Status	Key Characteristics
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
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
Example of other minor facilities				
Cocheco Falls	0.75	Dover	Operating	• In-service since 1930

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

[65] http://www.psnh.com/RenewableEnergy/About-PSNH/Hydroelectric-Stations.aspx
[66] New Hampshire Department of Environmental Services, http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer_chapter11.pdf

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
- 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 supporting investment in new hydroelectric facilities.

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 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.

- **Develop simplified and streamlined interconnection and environmental permitting processes** for small development. Permitting issues are a major barrier to the development of new small-scale hydroelectric generation. There are currently no special permitting processes that distinguish small- from utility-scale facilities, requiring all projects to undergo extensive time and administrative costs.

[67] New Hampshire Department of Environmental Services, http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer_chapter11.pdf

10.14. 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 five of the projects listed in the following table were certified to produce Class I RECs for 2010.

Table 10.10. Examples of Methane Powered Facilities in New Hampshire

Name	Capacity (MW)	Location	Status	Key Characteristics
UNH CHP Plant – EcoLine	7.9	Rochester – Durham, NH	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		Operating	• The second generator - uses excess summer gas • On-line since 2009
Colebrook Landfill Gas Facility	0.8	Colebrook, NH	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 electricity from the methane produced from dairy waste, for example:

- Brubaker Family Dairy Farm Methane Project
- Wanner Family Dairy Farm Methane Project

[68] EIA 2008

- 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

- **Consider commissioning a study to assess the potential for energy from methane-fueled projects** in the state. Investigation of the potential available in NH's methane market would allow the development of support targeted to the needs of these kinds of projects.

- **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.

10.15. New Hampshire Markets: Geothermal and Other Sustainable Energy

According to the US Environmental Protection Agency (EPA), geothermal heat pumps are the most energy efficient, environmentally clean, and cost-effective systems for temperature control. Although geothermal 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, geothermal 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 geothermal 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 of yet.

The value of residential-scale geothermal heat pumps has been recognized by both PSNH and NHEC 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 geothermal heat pumps with efficiencies of up to 400% in new ENERGY STAR homes. Rebates for conversion to a geothermal heat pump in existing homes are based on 35% of installation costs, up to a maximum cost of $10,000.

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 geothermal technology implementation** in both the residential and commercial sectors:
    - **Establish installation standards** ensuring that only the most efficient, well designed geothermal heat pump systems are used.

- **Commission a study** to assess the efficiency and carbon footprint of a cross-section of geothermal 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.

10.16. Sustainable Energy: Summary of Recommendations

The table below summarizes the recommendations for the Sustainable Energy Sector discussed above.

Table 10.11. Summary of Recommendations for Sustainable Energy Development in New Hampshire

§10.2. Overarching Sustainable Energy Policy - Recommendations
• Enact a general policy for support for sustainable energy

§10.3. Source of Funding for Sustainable Energy - Recommendations
• Establish stable, long-term sources of funding for public support of sustainable energy investment beyond REF – consider:
o Allocating a portion of an expanded Systems Benefit Charge to the REF
o Earmarking portions of the GHGERF, particularly for thermal generation technology support
o Capturing Forward Capacity Market proceeds
o Support cost-effective sustainable technologies (solar hot water, for example) as eligible measures under energy efficiency programs

§10.4. New Hampshire's Electric Renewable Portfolio Standard - Recommendations
• Consider RPS refinements that require at least some investment to be made locally
• Authorize 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

§10.5. Sustainable Energy Permitting and Infrastructure - Recommendations
• Ensure a high level of transparency and effective communication for all policies and regulations
• Further expand net metering opportunities:
o 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

§10.5. Sustainable Energy Permitting and Infrastructure - Recommendations
o Design net metering policy to allow all customers to choose to roll-over the net excess generation credits indefinitely or, at the end of a 12-month period, require the utility to purchase any remaining excess electricity from the customer at the utility's avoided-cost rate
o Expand net metering by allowing meter aggregation for multiple systems at different facilities on the same piece of property owned by the same customer
o Allow net metering for electric customers on a time-of-use (TOU) tariff
• Provide support for community-scale endeavors:
o Expand of net-metering rules to include group net-metering for community sustainable energy projects
o Provide structural support for and facilitation of customer aggregation programs
o Provide community-targeted outreach and education to support community-scale projects
o Enhance support for municipal bonding for community-scale projects
o Tap into excitement generated by the state's 150+ local energy committees
• Streamline permitting:
o Consider enacting simplified solar registration process for small PV systems
o Establish policy to prevent state and local government agencies from charging excessive permit and plan review fees
o 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; give priority to processing permits for sustainable energy projects
• 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:
o Sustainable energy goals for state government buildings and operations, including direct project investment and REC purchases
o Sustainable energy or sustainable energy-ready standards for new public buildings
o Policies that encourage or require the coordination of energy efficiency and sustainable energy into energy decision-making for government buildings and operations
o Green power purchasing for government buildings
o Encourage similar Lead-by-Example policies and practices at all levels and categories of government
• Expand green industry recruitment and support, including manufacturing incentives
• Be ready for sustainable energy's contribution to transportation-related infrastructure

§10.6. Financial Support Mechanisms for Sustainable Energy Development - Recommendations
• Expand the current portfolio of investment support mechanisms
• Incorporate effective design principles, including:
o Sustained long-term funding
o Market responsive and dynamic support structures
o Transparent and efficient incentive rules, requirements, and procedures
o Provide solid market information to stakeholders

§10.7. Customer-sited Sustainable Energy Rebate Programs - Recommendations
• Establish a reliable and long-term source of funding for programs
• Develop long-term plans for program support
• Incorporate thoughtful, long-term, and market-reactive design principles – consider:
o Excellent communication to all stakeholders about the plan and about real-time market performance
o Falling incentive levels based on capacity blocks
o Budget cycles to limit extended periods of program inactivity
o Tiered incentive levels for larger systems
o Inclusive eligibility and incentive levels designed to accommodate a broad range of project types, such as leased systems or community-scale projects
o Flat-rate incentives when jump-starting a market
o Capacity-based incentives
o Performance-based (or production-based) incentives
o Estimated performance-based incentives
o Capacity-based incentive with system site and installation plan review
o Time-of-use incentives
• Establish a coordinated portfolio of programs to support multiple markets – consider:
o Addressing overarching goals for the portfolio of programs
o Harmonizing incentive levels – undertake comparative customer financial analysis across programs and markets
o Other types support available for these projects when considering the customer's return
• 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

§10.7. Customer-sited Sustainable Energy Rebate Programs - Recommendations
• Integrate energy efficiency and sustainable energy as much as possible
• Make it easy for participants – Reduce transaction costs through program delivery and administration that porvides one-stop-shopping for the customer
• Include financing components whenever possible

§10.8. Utility Investment in Distributed Sustainable Energy - Recommendations
• 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
• Consider the value of different approaches to supporting investment by the utilities

§10.9. Sustainable Energy Program Administration - Recommendations
• 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

§10.10. Solar Photovoltaic and Solar Thermal Energy - Recommendations
• 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
• Reconsider the SHW incentive design based on the market response for the current program and an analysis of cost and returns to the customers – consider capacity-based rebates at lower levels
• Consider designing programs to target markets that specifically address goals: low-income participation; non-profits, schools, and government buildings that cannot use tax credits; community-scale projects
• Use interest in PV to test out innovations such as financing options; support for third-party ownership models; leveraging interest in solar to motivate integrating energy efficiency more fully in projects

§10.11. Wind Energy - Recommendations
• Have strong foundational policies in place to address issues of siting, permitting
o Undertake studies to identify appropriate sites for wind development
• Consider program designs that include performance-based components: performance based or expected-performance based incentives; eligible equipment listings; approval by the Small Wind Certification Corporation ; additional incentives for taller towers and site characteristics
• Expand program and other support for larger systems; design programs to support projects with farms, C&I, and community groups

§10.12. Biomass Electric and Heat Generation - Recommendations
• Establish a secure source of funding for the wood-fueled boiler/furnace program

§10.12. Biomass Electric and Heat Generation - Recommendations
• Consider extending and expanding the wood-fueled boiler/ furnace program to include C&I central wood-pellet and wood-chip-fired boilers and furnaces
• Integrate 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
• 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

§10.13. Hydroelectric Generation - Recommendations
• Commission a study to assess the potential for energy from the hydroelectric infrastructure in the state – 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 – consider targeted feed-in tariffs, competitive solicitations, and other strategies
• Develop simplified and streamlined interconnection and environmental permitting processes for small development

§10.14. Methane and Landfill Gas - Recommendations
• Consider commissioning a study to assess the potential for energy from methane-fueled projects in the state – develop support targeted to the needs of these kinds of projects
• Investigate target support for agricultural and animal waste-to energy generation
• Investigate target support for landfill sites and other waste streams suitable for conversion to methane-fueled generation

§10.15. Geothermal Energy - Recommendations
• Provide customer education on the optimal uses of GSHP technology
• Establish installation standards ensuring that only the most efficient, well-designed geothermal heat pump systems are used
• Commission a study to assess the efficiency and carbon footprint of a cross-section of GSHP installations in the state – develop recommendations on best design and installation practices
• Develop a rebate program to incentivize well-designed systems

Section 11: Smart Grid Deployment Review and Assessment

11.1. What is the Smart Grid?

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, which increases the system load factor[1],
- Better integrate variable renewable energy sources,
- Reduce emissions,
- Improve utility outage management, and
- Reduce meter-reading costs.
- Provide information on all fuels and even water use

11.2. 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.

Advanced Meter Infrastructure, or Smart Meters

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 System

This is 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 Meter Data Management System (MDMS) 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 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.

[1] A higher system load factor results in more cost effective use of power system investments.

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 even without special policy focus or investment.

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.

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]***

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. An example of a current technology for storing energy is pumped water storage, in which 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. Energy storage technologies being developed include high-capacity batteries, super capacitors, compressed air, high-capacity flywheels, ice thermal storage for cooling, and others.

An often-mentioned energy storage possibility is via Plug-in Hybrid Electric Vehicles (PHEV) combined with Vehicle to Grid (V2G) technology. This would allow next-generation PHEVs to serve as a dispersed energy storage network for the grid. Cars charged at night and during off-peak periods could be plugged

[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

in at the workplace during the day and used to supply critical peak power and voltage regulation to the grid as needed.

11.3. 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' plug-in hybrid electric cars. 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 (DR) 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 PHEV 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.

4 p.m. – 8 p.m.: After a day of work, workers drive home on the remaining electric power in their PHEVs 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 DR measures from smart appliances. The wind begins to pick up, resulting in increased wind capacity that the grid can immediately put to use.

8 p.m. – midnight: As electricity use and prices fall off, washing machines, dishwashers, and other deferred appliances begin to run. The combination of DR 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.

11.4. 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

[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.

distribution 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.

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.

New Hampshire Electric Co-operative

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. NHEC is rolling out the hardware, and using an opt-in approach to leverage the new equipment's capabilities:

> ***"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.[4]"*

Public Service of New Hampshire

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.[5] Northeast Utilities 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.

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[4] New Hampshire Electric Coop, "Advanced Meter Infrastructure," http://www.nhec.com/AMI.php

[5] "Building New England's Next-Generation 'Smart Grid,"
http://nuwnotes1.nu.com/apps/corporatecommunications/empinfo.nsf/1655e8f1972fb084852566800058799 4/d63cd4ec76ef81a48525760a0069478c?OpenDocument

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. 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.[6]

11.5. 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 percent *increase* in consumption of electricity to a 32 percent 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 percent 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 percent, while real-time whole-house feedback caused 7.9 percent 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, 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 deployed automated meter reading (AMR) systems, these savings are responsible for the bulk of

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[6] 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

[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

[8] B. Neenan, "Characterizing and Quantifying the Societal Benefits Attributable to Smart Metering Investments" EPRI, July 2008

positive net present value analyses supporting AMI deployment. Demand Response (DR) programs, discussed below, also can provide significant savings in energy, cost, and pollution through reduction in peak demand.

Demand Response

Demand Response is a change in customer energy consumption in response to communication from a utility requesting a reduction in electricity demand.

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.

According to the National Institute of Standards and Technology (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."[10]

The management of DR would occur via Home Area Networks (HANs) on the residential level, or Building Automation and Control Networks (BACnets) for large multi-unit residential and commercial buildings. The network would be connected to the smart meter and would be accessed via a Web-based (or similar) interface that would allow customers to set parameters for controlling their electricity-using appliances in response to electricity prices. "Smart Appliances" would be designed to communicate with energy monitoring devices and operate under their control. The information provided by AMI systems presents new opportunities to expand DR to all utility customers. There could be various mechanisms for this, but the primary and most powerful one is dynamic pricing.

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 AMI-enabled real-time pricing, price signals provided via AMI devices could motivate consumers to shift their energy 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 power generators 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

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[9] Federal Energy Regulatory Commission, Staff Report, "Assessment of Demand Response and Advanced Metering," December 2008.

[10] "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

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.

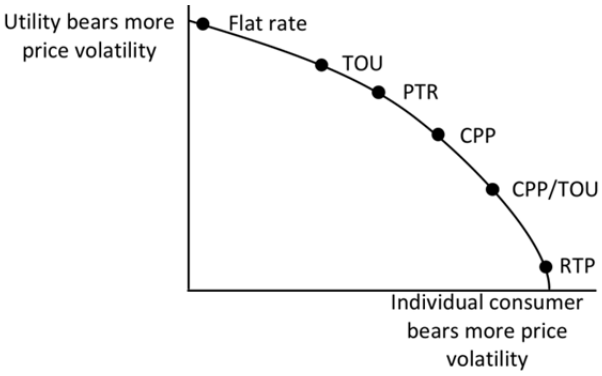
Various pricing frameworks can deliver more accurate price information to consumers. Some of these are:[11]

Time of Use (TOU): The same time-varying prices on all weekdays—not really a dynamic rate.

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.[12]

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.



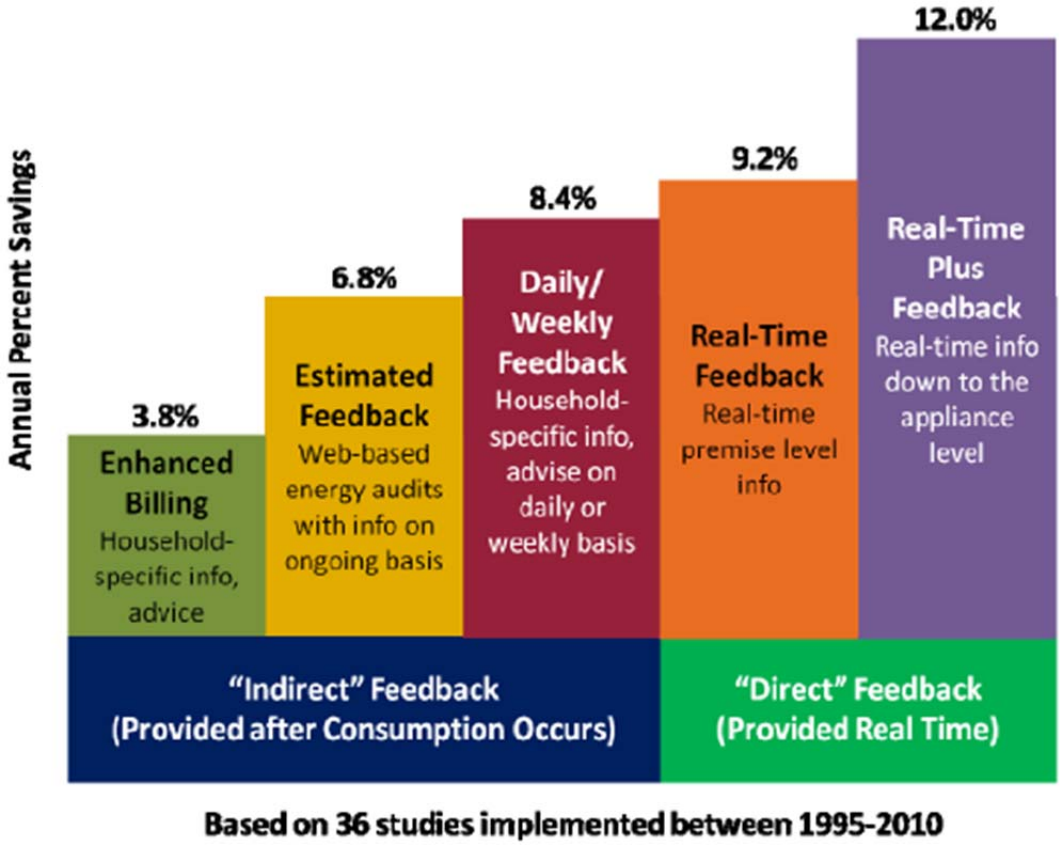
Real-Time Pricing (RTP): Prices change hourly or more frequently in response to market conditions

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 8.1 shows average savings by household for residential units participating in some type 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.

[11] 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.

[12] Nancy Brockway, "Advanced Metering infrastructure: What Regulators Need to Know About Its Value to Residential Customers," National Regulatory Research Institute, February 13, 2008.

Figure 11.1: Average Household Electricity Savings (kWh) by Feedback Type[13]



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 to 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,*

[13] 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

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."[14]

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. Another way to justify a surcharge would be a requirement to maximize customer benefit as a means to obtain a cost recovery surcharge. Focusing on empowering ratepayers to control and reduce their electricity costs so that there is a clear net savings after paying the surcharge can make smart grid more beneficial and less controversial.

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.[15]

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 electricity use, the short-interval increments of data from AMI show how much a customer used and when, which 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 that 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, and if the authorizes it via the web portal, the same information can be made available to third party organizations. However, 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.[16]

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

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[14] 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

[15] Edison Electric Institute, State Regulatory Update: Smart Grid Cost Recovery, http://www.edisonfoundation.net/iee/reports/IEE_State_Update_SG_Cost_Recov.pdf

[16] 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

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.

11.6. Conclusion and Recommendations

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 could chose infrastructure, programs, and policies that are compatible with the existing systems. This would create a common base of understanding between customers in different utility territories and minimize customer confusion.

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. Smart grid, therefore, represents an opportunity for a win-win outcome as both the utility and the customer realize measurable savings and increased services from the electric system. Specific recommendations for an effective smart grid policy include:

- Evaluate the potential utility and customer cost savings from investing in smart grid infrastructure.
- Implement dynamic pricing programs and allow customers to opt-out if they choose.
- Empower ratepayers to respond to their electricity price through HANs and web-based management tools.
- Ensure the privacy of personally identifiable data and give ratepayers the choice of sharing it with third-party energy suppliers.

Section 12: Utility Performance Incentives Review and Assessment

12.1. Introduction

Under traditional regulatory structures, most utilities have an inherent disincentive to aggressively and successfully pursue capture of efficiency resources. Typically the main disincentives result from short term lost revenue (between rate cases), as well as reducing the need for new supply-side investments which can increase a utility's rate base and therefore shareholder earnings. As a result, performance incentives (PIs) can be designed to offset and/or overcome those disincentives, and provide a profit mechanism whereby utilities have incentive (or at least a lack of disincentives) to excel in the capture of efficiency resources. The regulatory framework utilities operate within can greatly influence aspects of good PI design. For example, if decoupling exists, the risk and financial losses to a utility from efficiency are significantly reduced, and PIs may not need to be as generous. Similarly, even without decoupling or lost revenue recovery, if utility rates are set based on forecasts that include the expected energy efficiency savings, then lost revenue may be minimized or eliminated.[1] In addition, there are other long term benefits to utilities from offering efficiency programs. Offering such programs provides new opportunities for utilities to build relationships and improve interaction with customers, and to provide value to them in new ways. Particularly in a deregulated environment, this may bring significant strategic value to a utility.

Presented below is an explanation of the key elements when creating and designing a program administrator shareholder incentive mechanism. ew Hampshire's current incentive approach is compared to several best practices, and possible modifications are suggested for New Hampshire's current incentive that could better align utility goals with the goals of the CORE efficiency programs.

12.2. Key Elements of Utility Performance Incentives

Discussed below (and summarized in Table 12.1.) are key factors or variables that must be considered to design an effective and successful shareholder incentive mechanism.

Level of Financial Reward

Given that the purpose of PIs is to effectively encourage exemplary performance in capturing efficiency resources, a fundamental starting point is to understand the current regulatory structure, efficiency mandates if any, and the financial impacts (both positive and negative) to the utility from efficiency. PI financial rewards should be structured to ensure they are sufficient to effectively motivate utilities, while striving to avoid higher than necessary costs to 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 the best practices section, the incentives in the states with the most aggressive efficiency programs typically fall within this range. In Vermont, for example, the incentives amount to 3% of program spending.2 Some utilities have argued for much higher incentives (sometimes greater than 100% of spending). However there is little evidence that levels

[1] While forecasting EE savings and using this reduced forecast to set rates can remove the loss to utilities from lost revenue, fails to completely remove the disincentives between rate cases because if the utility does not capture all of the EE savings they can collect additional unanticipated earnings. Similarly, any performance that exceeds planned EE savings can result in a loss to the utility. However, it dramatically reduces the overall impact on lost revenues from EE.

[2] Hayes, Sara, et al. Carrots for Utilities: Providing Financial Returns for Utility Investments in Energy Efficiency. ACEEE. January 2011.

Table 12.1. Overview of Key Elements

Level of Financial Reward	Performance Based	Multivariate	Scalable	Penalties vs. Awards	Evaluation, Monitoring, & Verification
Rewards of 4-8% are typically sufficient. It is easier to evaluate the size of the reward when based on program budget, rather than 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 scale with performance to encourage performance even once goals are been met (or once it is clear that goals will not be met).	Some states, impose penalties instead of, or in addition to awards. Penalties may 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.

greater than 10% (at most) are necessary for effective motivation. It is worth noting that just the existence of PIs, even when relatively small dollars are tied to a particular metric, can have a very significant motivating factor. For example, many utility staff will be given internal goals that focus on meeting exemplary levels of performance related to PI metrics, and become highly motivated to meet them regardless of the actual impact to the utilities financial bottom line. Similarly, imposition of penalties can often have a large motivating factor because utilities may view a penalty as more negative than failing to earn a reward.

In setting the level of incentives, one should analyze the potential financial and regulatory risk to the utilities, as well as any relevant legislative or regulatory mandates. 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.[3] Many stakeholders in Illinois view the mandate to perform efficiency as sufficient motivation and therefore do not support additional ratepayer funding going to the shareholders for what they have to do anyway. In an environment where a utility has wide discretion in setting goals and investments in efficiency more generous rewards may be deemed necessary to encourage aggressive efforts.

Throughout this document, the term "rewards" is generically used to indicate any financial or other incentive that could be positive or negative. We recognize that PIs can include financial or other penalties as well as awards, and discuss this issue below.

Performance Based

While it is convenient to think about the level of financial reward in terms of a percent of program budgets, actual reward mechanisms where reward amounts are a function of spending or budgets at best fail to focus attention on the real purpose—performance— and at worst can create perverse incentives. For example, if tied to actual spending (as the current NH PI mechanism is), it provides the utility an incentive to be less cost efficient and spend more funds than may be necessary to increase rewards.

PIs should be tied directly to actual outcomes, and where possible avoid rewards for simply undertaking specific actions. Performance parameters should be objective, unambiguous, measurable, and verifiable

[3] Senate Bill 1592. http://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=095-0481&GA=095

(through EM&V procedures). Focusing on actions rather than performance can result in utilities doing things simply to achieve a PI, rather than focusing on maximizing the ultimate effects of any actions. For example, simply rewarding a utility for conducting a study, offering a trade ally seminar, etc. may encourage unnecessary actions, and also removes the utility focus on ensuring any actions taken result in positive outcomes. In some instances early on in a utility's tenure offering efficiency programs a few action-related metrics may be justifiable to ensure important steps are taken by the utility deemed essential for ultimate success.[4] However, whenever possible it is best to identify the desired outcomes from these proposed actions and articulate the metric in a way that holds the utility accountable to results. This also allows program administrators a level of flexibility in determining the most appropriate actions that will lead to success rather than being committed to something that was originally planned but perhaps later determined to be less worthwhile.

Multivariate

Regulators and policy-makers typically have numerous objectives and goals related to efficiency portfolios. Clearly one primary goal is achievement of cost-effective energy savings. However, it is rarely the only policy objective. In addition, many objectives may create some tension — possibly pushing or pulling in opposite directions. For example, a single goal of maximizing energy savings can create a perverse incentive to "cream skim" by focusing only on those resources that are easiest and cheapest to capture. This can undermine other objectives such as to achieve deep and comprehensive savings in buildings; or market transformation in the future; or equity by focusing on low income and hard to reach customers.

PIs should therefore be multivariate, and use a number of different metrics, with varying weights in terms of reward, to provide a fuller, more complex structure of reward and focus for utilities. Typically the highest weight is applied to a primary goal or goals, such as net savings or net benefits achieved. However, it is critical to have other metrics that provide countervailing influences to protect against a singular focus and encourage a comprehensive approach to efficiency portfolios that balance many important and potentially competing policy objectives. Effective PIs may typically have a large share of earnings on the few primary interests, with a handful of other metrics offering smaller earnings or penalties that provide a balanced perspective.

In establishing PIs, the first step is to comprehensively consider the primary and secondary objectives of efficiency portfolios. In addition, it is important to identify where these objectives may be either: 1) correlated; 2) opposing; 3) reinforcing; or 4) independent. For example, dollar benefits and electric savings may be highly correlated because typical electric efficiency programs derive the vast majority of benefits from the electric avoided costs. Therefore, while maximizing both the parameters may be important objectives, it may not make sense to have separate metrics and rewards for both. Alternatively, one may desire to focus on both but should then consider the overall weight applied to them collectively when considering importance. On the other hand, opposing objectives such as capturing savings cheaply vs. capturing deep and comprehensive savings may both be important criteria. Therefore, focusing solely on one may result in perverse incentives that undermine the other.

While multiple metrics are worthwhile, too many metrics with small rewards can divert focus and increase risk to the utility unnecessarily. A balance should be achieved that ensures some focus on important policy objectives, while maintaining simplicity and primary focus on the overarching objectives. Typically, a large portion of total award will be on the few primary objectives, with at most a handful of smaller ones with secondary objectives.

[4] These can also be considered for minimum qualifying criteria, as discussed below.

Scalable

Financial rewards or penalties should be scalable. In other words, the better the performance is the higher the reward should be. A single target where a utility either achieves a reward or not can result in perverse incentives. For example, if a utility is overachieving and meets its annual goal for a reward early, they may relax and not continue to aggressively pursue even better performance. Similarly, if a utility realizes they will not be able to reach the target three months early they may decide not to try as hard to come close. Scalable rewards provide on-going incentives to strive for the best outcome regardless of likely final performance. It also is viewed as fundamentally fairer, and lowers the risk to the utility. This lowered risk should be considered in the overall context of setting goals and levels of reward.

In scaling metrics, one should think about a starting (or threshold) level, a band within which rewards are scalable, and perhaps an upper cap on rewards. Below the threshold level a utility would earn no reward, or perhaps be exposed to a penalty. Threshold levels in recent PI mechanism have tended to range from65% - 85% of planned performance goals. Typically scaling of rewards once a threshold level is reached is done in direct proportion to the performance outcome. However, more complex scaling methods can be used to more heavily 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, with much more generous rewards for utilities that exceed the design goals.

Many existing metrics that rely solely on rewards rather than penalties will design PIs so the utility earns the target level of financial reward if they meet 100% of the design (planned) goals. However, some stakeholders perceive meeting the plans as relatively expected 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 along with the considerations around current regulatory structure, efficiency mandates, aggressiveness of the goals and budgets, risk exposure to the program administrators, and other related issues.

One should give consideration to reward caps. In theory, with scalable metrics one might want to allow unlimited rewards for unlimited performance achievements. This generally will most consistently support goals in jurisdictions where the pursuit of all cost-effective efficiency is desired, and should be considered. However, unlimited rewards can present challenges in some regulatory structures by potentially permitting unlimited ratepayer contributions that cannot be planned and approved in advance. For this reason, many PIs will cap the ultimate rewards, typically around 110%-125% of design level targets. The ultimate level of any cap imposed should be set in consideration of the stringency of the goals, the level of risk in meeting or exceeding them the utility faces, the process by which goals are set and evaluated, and the possibility of extraordinary overachievements.

Penalties vs. Awards

As discussed above, PIs can include both direct financial penalties and awards, and possibly other non-financial incentives.5 Fundamentally, these can all be viewed the same way – the avoidance of paying a penalty can be seen as the same incentive as earning the correspondent 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 awards, or only one or the other. Many utilities will see penalties as unfair; however, it is likely they will create similar incentives for performance as awards, as avoiding

5 For example, Illinois utilities face a potential penalty of the State taking over delivery of EE programs if they fail to meet goals over a three year period. Legislation ILCS 5/8-103 (http://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=022000050K8-103)

spending a dollar should provide the same net result as earning a dollar.6 Different stakeholders will have different views on this issue. Fundamentally, one must consider issues such as: 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, full cost recovery of efficiency program expenditures is awarded to utilities unless clear evidence or imprudent action is uncovered. Therefore, regulators may decide that there should be some protection to ratepayers if utilities fall below some threshold level of performance.

Minimum Criteria

Another mechanism to consider in a PI framework is adoption of minimum qualifying criteria. While most metrics should allow for scalable rewards, there may be some policy objectives that are viewed as critical to the efficiency portfolio and therefore must be met for a utility to be eligible for any rewards. For example, a jurisdiction may 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 if there are important milestones that stakeholders want a utility to achieve (e.g., setting up a database, having independent evaluations performed, etc.) that may not by themselves warrant financial rewards, but are deemed necessary but not sufficient to successful performance. Minimum qualifying criteria can be viewed as a threshold level before which any awards are deemed earned. If used, minimum qualifying criteria should be designed carefully. Generally they should reflect things that are within the utilities 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 in that it can render other metrics moot.

Evaluation, Monitoring, and Verification

While not specific to PI mechanisms per se, EM&V plays an important role in development and administration of PIs. As mentioned above, performance metrics should be clear, objective, measurable and verifiable. For PIs to be successfully designed, performance goals should be negotiated or set in a manner that ensures design level targets are aggressive but achievable, and supported by budgets at a reasonable level. 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 reward, as well as the overall scaling mechanism, caps, and financial reward levels.

Similarly, for PIs to be effective and ensure ratepayers are protected, it is important that an independent process is used to measure and verify 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.

Types of Performance Incentive Financial Award Mechanisms

Performance incentives are typically categorized as one of three types. 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, and provide a

6 From a financial opportunity cost perspective, a utility should be indifferent between a dollar lost and a dollar gained. However, in actuality, it is likely utilities may respond more aggressively to avoid penalties than to earn awards simply because they perceive penalties as associated with failure, where awards are viewed as incentives for exceeding expectations. Of course, from a ratepayer perspective, penalties are preferable because they reduce the cost of EE and provide some funds back if the utilities fail to capture the planned EE.

shareholder incentive. So far, the Save-a-Watt model has only been implemented in Ohio, but Duke has applied to adopt the program in Indiana and Kentucky, and reapplied in North and South Carolina, after the initial application was rejected in both states. Fundamentally, these variations pertain to the way financial awards are calculated and applied. So, in theory all of the above issues can be addressed successfully under any of these models. However, while there is considerable flexibility within each type of PI as the amount, size, and manner in which the incentive is offered, each type has its own set of special considerations. The following table provides a brief overview of each of the four types of performance incentives in use in the United States.

Table 12.2. Performance Incentive Comparison

Type	Description	# of States	Advantages	Disadvantages	Average incentive as a % of EE budget
Shared Savings	Incentive is given as a percentage of net benefits from EE	11[7]	• Incentive automatically scales continuously with net benefits. • Naturally awards for amount of net benefit produced, rather than amount spent	• 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 encourage utility performance • In practice tends to discourage focusing on other important objectives by setting award levels based on net benefits only. However, in theory other metrics could be designed and included, with the net benefits simply identifying the total pot of funds to potentially 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 typically developed prior to implementation and not a function of share of net benefits, rate of return, or some other formula.	6	• Straightforward to set multiple performance metrics based on multiple policy goals. • Easy to provide incentives for goals that are difficult to measure • The amount of the potential incentive is transparent and easily calculated • Allows regulators to set limits on incentive amounts and protects ratepayers from excessive and unanticipated earnings. Keeps earnings independent of other utility issues such as supply-side investments.	• Incentive amounts typically capped, so less incentive to continue to perform after reaching a maximum.	6% of program spending

[7] Washington State has a shared savings and a performance target component to its incentive, and is included in both categories

Type	Description	# of States	Advantages	Disadvantages	Average incentive as a % of EE budget
Rate of Return	Allows the utility to earn their allowed rate of return or higher on EE program costs, or to earn a bonus rate of return based on EE performance	1	• Arguably puts efficiency spending on equal footing as 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 EE programs.	1[8]	• A single mechanism provides for program costs, lost revenue recovery, and performance incentives • Arguably puts EE 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 EE to shareholders rather than 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

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 implemented type of performance incentive. Under this model, the total incentive amount is defined up front, and awards are dependent on the utility's ability to reach one or more performance metric such as energy savings. In practice, many jurisdictions set the total

incentive amount as a percentage of EE portfolio funding; however, the earnings are tied to performance. Many of the leading states for 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 does not happen. 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. 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. See the Best Practices section for some examples of how this is done in practice.

- **Evaluation, measurement, and verification:** While similar controversies over net-to-gross ratios exist in the performance target model and the shared savings model, the contention is somewhat mitigated since the incentive amount is not typically so intertwined with net economic benefits. Further, issues regarding non-energy benefits, cost-effectiveness screening methodology, and avoided costs are often avoided entirely.

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 90% of the net present value of the avoided costs 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 got 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 avoided demand costs. On top of this, 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 – it 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.

- **Scalable:** The amount of money received from the Save-a-Watt model naturally scales with avoided costs, and thus kWh and kW 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.

Distribution of Benefits

One important policy consideration when designing performance incentives is how much of EE's benefits should go to utility shareholders versus the ratepayers. The larger the incentive, the more of the net benefits from efficiency flow to the utility stockholders (or non-utility program administrators), rather than showing up as lower electric bills. Each type of incentive clearly has lots of 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 LBNL study[9] 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. Some key findings include:

- Assuming equal performance of EE 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.

[9] Cappers, Peter, et. Al. Quantitative Financial Analysis of Alternative Energy Efficiency Shareholder Incentive Mechanisms. Ernest Orlando Lawrence Berkeley National Laboratory. 2008.

- Compared to EE 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%

- EE 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'd be with no efficiency.[10]

It is important to note that the ACEEE 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.

12.3. New Hampshire Performance Approach and Best Practices

Table 12.3. New Hampshire Performance Incentive

Financial Level?	Performance Based?	Multivariate?	Scalable?
0-12% of spending	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 a 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[11], a working group was charged with further examining the structure of the incentive, to find ways it could be better aligned with energy efficiency goals. In addition, the incentive calculation was changed to be based on actual EE expenses rather than budgeted expenses, to avoid double counting if funds were carried over from one year to the next. The incentive will not be applied to expenses for more than 5% over the budget, although utilities can apply for exemptions on a case-by-case basis. The major aspects of the shareholder incentive, however, remain unchanged. It is calculated using the following formula:

$$Incentive = (4\%\ x\ Budget) x \left(\frac{BC_{Act}}{BC_{Pre}} + \frac{kWh_{Act}}{kWh_{Pre}}\right)$$

Where:

Incentive = Shareholder Incentive

[10] 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.

[11] 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

Budget	= Actual EE 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 C&I sectors
- If the Benefit-to-Cost ratio is less than 1.0, there is no incentive associated with that metric
- If actual gross kWh savings is less than 65% of the goal, there is no incentive associated with kWh savings.
- The total incentives for the Residential and C&I sectors are capped at 12% of their respective budgets

The NH shareholder incentive mechanism includes many of the aspects discussed in the previous section:

- **Performance based:** 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 ratio and 65% of the kWh savings goals are fairly low, 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 freeridership into account.
- **Multivariate:** While technically multivariate in that two different metrics are considered, the two metrics used are very highly correlated. Theoretically, for example, the EE 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, it is possible for the NH utilities to achieve the full incentive even while coming short on the savings goals, if the savings they do achieve are more cost effective than expected. Clearly, by limiting these PI mechanism to only gross savings and cost-effectiveness New Hampshire does not address many other important policy objectives than a more fully multivariate mechanism would.
- **Scalable:** The size of the NH shareholder incentive scales linearly with performance, until actual performance reaches 150% of the goal. There are no tiers which cause the incentive amount to jump up once certain performance thresholds are passed.
- **Evaluation, monitoring & verification**: The two performance metrics used are both measurable and verifiable. However, although some evaluation occurs for the Forward Capacity Market and low-income programs, the shareholder incentive is typically based on self-reported savings numbers rather than third party evaluation efforts. In addition, relying on gross rather than net savings undermines a primary purpose of ratepayer funded efficiency—to make a net difference in energy usage—and creates perverse incentives to the utilities to pursue those measures that already enjoy relatively large market share.

Best Practices

Although it is very hard 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.[12] As Figure 3 shows, this correlation remains even when comparing states with a PI to states with decoupling or other policies meant to encourage EE, but no performance incentive[13]. 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 greatly encourage increased funding for energy efficiency.

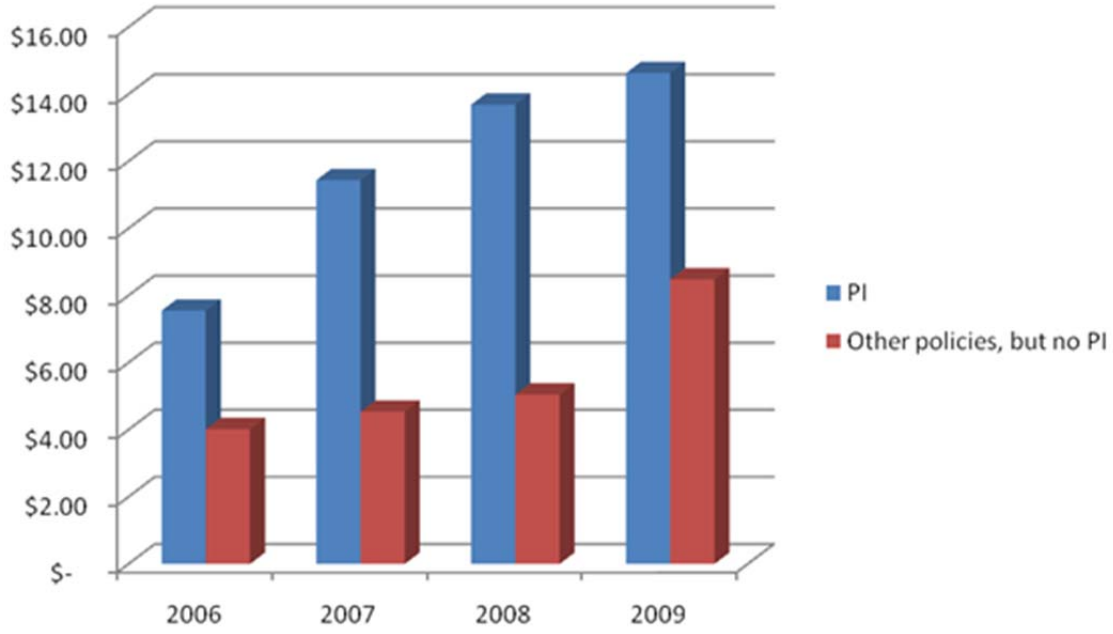

Figure 12.1. Utility EE Spending Per Person

This paper does not attempt to separate the effect of shareholder incentive with the effect of other EE related policies in the states. Rather, it examines the incentive mechanisms in place in states with leading EE programs and results. The table below gives an overview of 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 only applies to a very limited program. The majority of savings in Wisconsin come from the third-party administrator, Focus on Energy. However, investor owned utilities (IOUs) are 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 WP&L's supply sight investments, but is included in the table so a rate of return style incentive can be compared to other practices.

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[12] It is important to note, however, that correlation does not necessarily mean causality. It is certainly possible that those states with the most aggressive policy approach to funding and capturing EE 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.

[13] Hayes, Sara, et al. Carrots for Utilities: Providing Financial Returns for Utility Investments in Energy Efficiency. ACEEE. January 2011.

Table 12.4. 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 the utilities do not implement programs in VT, 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, geo-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

	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.	WPL 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's 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. May be 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 VT.
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.

The following chart provides a rough visualization of how the performance target type incentives listed in the table above scale as performance goals are met and exceeded. A number of simplifying assumptions are 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 style incentives are included, due to the difficulty in comparing net benefits to total program budget.

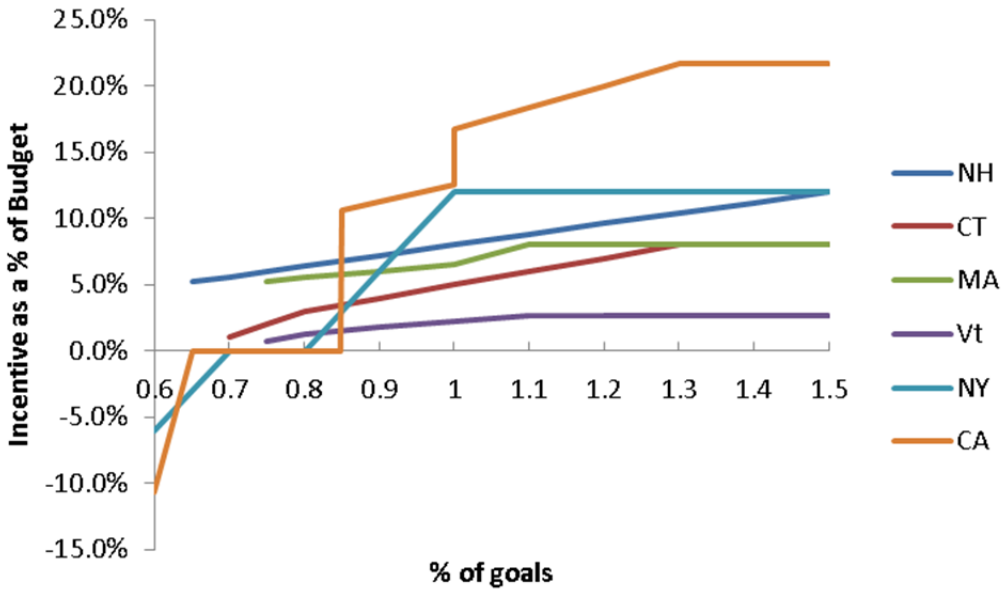


Figure 12.2. Incentive Scaling with Performance by State

As seen above, the size of the New Hampshire incentive is fairly in line t)o that 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 MA and CT on the high end of savings. While NH has the same maximum of incentive as NY, NY utilities would get a penalty at a performance level of 65% of savings, while NH utilities would earn 5.2% of the program budget. The NY incentive starts of lower and climbs faster than the NH, which are benefits, but flattens as soon the goals are achieved, which is a negative. The California data are very rough estimates, since the percent of program budget depends on the cost-effectiveness, but are in general quite generous. This generosity is balanced by the existence of a penalty, and by the aggressiveness of the CA goals, which will be discussed in greater detail below. The Vermont incentive does not have to be large as the other states, since efficiency programs are not run by utilities, and thus there is no disincentive to remove.

Table 12.5. 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.

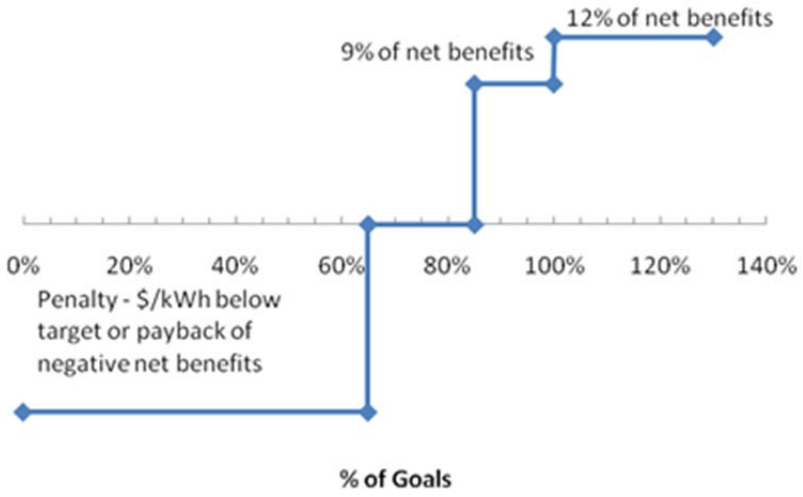


Figure 12.3. California Incentive Structure

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[14].

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.

- **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

[14] http://switchboard.nrdc.org/blogs/dwang/cpuc_shows_progress_making_eff.html

formula. However, the kWh impact portion is based on gross impacts, rather than those actually occurring from the EE effort.

- **Tiered incentive structure:** Once utilities achieve at least 100% of goals, the incentive jumps from 9% of net benefits to 12% of net benefits.

- **Penalty for failure to achieve goal:** A scalable financial penalty is enacted 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 theory, 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 12.6. 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.[15] 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 12.7. Connecticut Incentive Structure

Description	Approved Weight	Approved CL&P $(000)	Approved UI $(000)
HES $/kWh	0.0124	$50.0	$12.1
HES $/kW	0.0124	$50.0	$12.1
RNC $/kWh	0.0124	$50.0	$12.1
RNC $/kW	0.0124	$50.0	$12.1
Performance Contract	0.0100	$40.4	$9.8

[15] DPUC Docket 10-10-03

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.

Table 12.8. 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.

Metric Weighting		
Savings	Value	Performance
45%	35%	20%

Thesholds for Increased Incentive Amounts		
Thereshold	**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 12.9. 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 dead band between 70% and 80% of the goals in which neither penalty nor reward is received. This structure is depicted in the figure below.

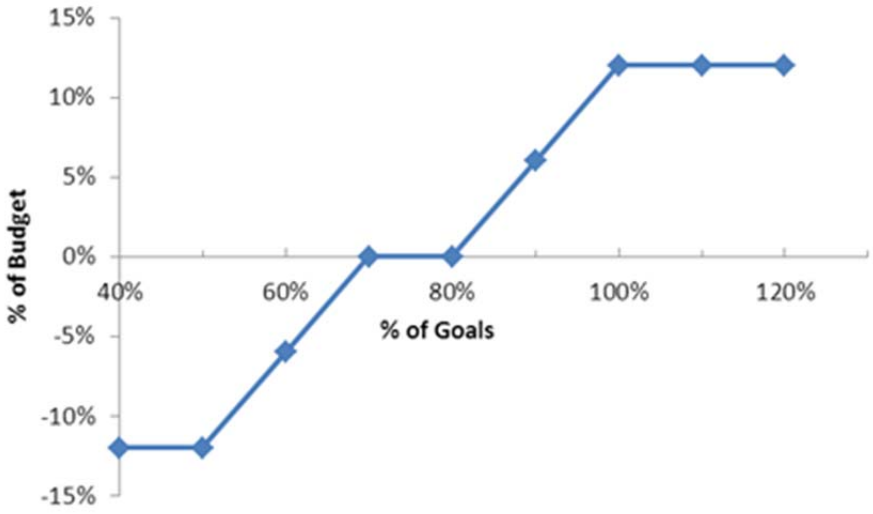


Figure 12.4. New York Incentive Structure[16]

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 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.

16 NY DPS, Case 07-M-0548. Order Issued August 22, 2008.

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.

- **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 12.10. 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 a third party efficiency provider, Efficiency Vermont. Efficiency Vermont is currently run by the non-profit Vermont Energy Investment Corporation (VEIC), which contracts with PSB 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. Furthermore, there are 5 different performance requirements that don't carry an explicit financial award, but can reduce or eliminate the total incentive. These requirements include a minimum BCR of 1.2, minimum amounts of residential and low income spending, and geographic entity. For more detail about the Vermont incentive, see the PSB Contract, attachment N.

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.

12.4. Analysis of New Hampshire Shareholder Incentive

Strengths and Weaknesses of Current Approach

Some of the strengths of the New Hampshire shareholder mechanism include:

- **Size of incentive:** Although the typical New Hampshire incentive at 10-12% is significantly above the average for Performance Target type incentives, it is below the 14% average for states with the shared benefit model, and right 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 lost revenue recovery mechanism in place. However, evidence in Massachusetts, Rhode Island, and Connecticut imply it may be more generous than necessary to properly encourage exemplary behavior. Consideration should be given to modifying this amount, or perhaps scaling such that utilities only earn at the higher end once they are well above planned achievements.

- **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 based:** the incentive is based on actual performance of the program, rather than spending alone. Although actual spending now also figures into the calculation, potentially encouraging greater spending than necessary. While the mechanism is performance based, 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 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 NH utilities have consistently exceeded the goals and earned very close to the maximum incentive implies that the goals aren't as ambitious as they could be. This is really a planning and EM&V issue, rather than a function of the PI mechanism. However, if the setting of goals and verification of savings are not addressed adequately it can undermine even the best designed PI mechanism.

- **Multivariate:** 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.

Some of the weaknesses of the New Hampshire shareholder incentive mechanism include:

- **Incentive cap not applied to each metric separately:** Multivariate incentives are important in order to encourage performance in multiple categories. Their usefulness is lowered 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.

- **May encourage cream skimming:** the two performance metrics used 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 getting deeper, harder-to-reach savings, or building the infrastructure that would allow utilities to this in the future. This is especially true since the award is based on gross savings, and thus may include freeriders.

- **Goals consistently exceeded:** New Hampshire utilities have wide range to set their own goals and report their own savings numbers. This, combined with the fact that NH utilities consistently earn close to the maximum award available, may undermine the sense that the shareholder incentive is there as a consumer benefit to encourage better EE programs, as opposed to an automatic bonus for the utilities.

- **Low performance threshold:** The minimum thresholds for performance – 65% of savings goals and a 1.0 benefit-cost-ratio – 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 ratio means that there would be zero net economic benefits to the program.

Suggested Modifications in Incentive Structure

- **Add 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 where the 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 only needs to be 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 utilities are only rewarded for each 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 combined with the two performance metrics used, encourages utilities to focus their efforts on promoting technologies such as CFLs, which save a lot of energy and are highly cost-effective, but that are already widely adopted in the marketplace (i.e. have high free ridership rates). 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. Measuring utilities 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.

- **Tie incentive to budget, rather than actual spending:** A Recent change to the NH 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 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 awards good performance. This amount should not increase if the utilities spend more to achieve the same goals.

- **Raise minimum performance thresholds:** As seen in the table above, most states with shareholder incentives in place have a higher minimum threshold than NH. The countrywide average minimum threshold is 81% of goals, significantly higher than New Hampshire's. 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 really encourage exemplary performance. Likewise, the cost-effectiveness threshold of 1.0 is very low, given that most EE programs around the country have BCRs of between 2.0 and 4.0. Further, if an EE 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, which 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 or not to pursue an extra savings is based on the marginal incentive rate, rather than the total incentive level, an incentive structure that starts of low and grows quickly will be more effective than an incentive that starts of high and grows slowly, even if they both grow to the same overall level.

- **Create a tiered incentive structure:** Most other states structure their incentive so that the percent of the budget that a utility receives as an incentive increases as EE 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:** In order to credibly promote performance, shareholder incentives need to be based 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, like it is in Vermont, which instead of having an explicit financial award is a minimum goal that must be achieved before the award is available.

- **Consider adding additional metrics:** Currently, both metrics in use encourage utilities to focus on the low hanging fruit – especially since freeridership is not taken into consideration. As explained above, other states use metrics such as number of contractors trained, retail outlets enrolled in product buy downs, and 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.

12.5. Next Steps for New Hampshire's Shareholder Incentive

Most successful performance incentives were 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 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:

1. Listing the various policy objectives of the CORE programs. These may include economic benefits, cost effectiveness, market transformation, equity across regions or sectors, etc.

2. Determine whether these goals are independent of each other or if there is significant overlap or tension between the goals. 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 may arise between cost-effectiveness and market transformation, it makes a lot of sense to attach separate financial awards (market transformation may involve, for example, training and education efforts that don't translate into measurable economic benefits and thus lower the cost-effectiveness of the program).

3. Find measurable and verifiable metrics that can be used to determine the CORE program's success or failure at reaching the goal. These goals may range from energy savings as a proxy for economic benefits, or number of contractors trained, as a proxy for market transformation.

4. Determine the maximum available incentive and the relative importance of the various performance metrics. This entails creating weighting factors for each performance metric that sum to one. The maximum financial award associated with each performance metric will be the maximum total financial award multiplied by the weighting factor.

5. Determine whether to add additional metrics that don't carry an explicit financial award, but that can affect the size of the overall award. In Vermont, for example, if the program fails to enroll at least 700 small business clients, the overall award is reduced by 18%.

6. Determine minimum thresholds in each performance metric, as well as a method for scaling the incentive with performance. 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.

7. Ensure all stakeholders are comfortable that the performance metrics align with the policy goals, that the thresholds and design goals are set to be aggressive but achievable, and that the incentive will be given out based on measurable and verifiable results.

Section 13: Financing Programs Review and Assessment

13.1. Introduction

Financing is a necessary and popular 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. 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.

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 and consumers. Table 13.1. provides an overview of the programs currently in place and the aggregate funds disbursed through each since its inception, as well as total budgets.

Through these programs, New Hampshire has taken crucial steps towards achieving climate goals by facilitating access to financing for energy projects. For example, programs such as Better Buildings/Beacon Communities and the Enterprise Energy Fund 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. That said, the state continues to face challenges in the creation of an adequately capitalized and sustainable finance model able to serve all market sectors moving forward.

Well-designed and effective finance programs have 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.

Table 13.1. Financing Programs in New Hampshire: Overview

State Programs	Dollar Volume to Date ($M)	Total Budget ($M)[1]	Source	Year of Program Inception	Year of Program Expiration	Sector
Better Buildings	$0	$10	ARRA	2011	2013	Commercial & Residential
Enterprise Energy Fund	$6	$6.6	ARRA	2010	None	Commercial
Municipal Energy Reduction Fund	$1.3	$0.02	RGGI	2010	None	Municipal
Business Energy Conservation Loan	$3.3	$4	RGGI	2009	None	Commercial
Giving Power Back (RMANH)[3]	$1.3	$3.3	RGGI	2009	2013	Commercial
Pay for Performance[3]	$0	$5	RGGI	2011	2012	Commercial
Total	**$11.9M**	**$29M[2]**				
Utility Programs	**Dollar Volume to Date ($M)**	**Total Budget ($M)**	**Source**	**Year of Program Inception**	**Year of Program Expiration**	**Sector**
NHEC Residential EE Loan	$0.068	$0.2	RGGI	2010	None	Residential
NHEC SmartSTART	$0.73	$1	NHEC	2002	None	Commercial
National Grid Residential Loan	$0.003	$0.003	RGGI	2010	None	Residential
National Grid Business Loan	$0.3	Annually Set	SBC	2002	None	Commercial
National Grid Municipal Loan	$0	$0.3	RGGI	2010	None	Municipal
PSNH EE Loan	$0.38	$0.5	RGGI	2010	None	Residential
PSNH SmartSTART	$5.2	$2	SBC	2004	None	Municipal
PSNH Energy Rewards[3]	$3.2	Annually Set	SBC	2004	None	Commercial
Unitil Residential Loan	$0.14	$0.3	RGGI	2010	None	Residential
Unitil Municipal Loan	$0	$0.43	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	$1.8	No cap	Private	2006	None	Commercial
Total	**$1.8M**					

Grand Totals	*Dollars Committed*	*Total Budget*
	$23.7M	***$33.6M[2]***

1 – Total budgets for Better Buildings and Enterprise Energy Fund include administration costs
2 – Does not include figures from People's United, National Grid Business Loan or PSNH Energy Rewards, as they do not have capped budgets. 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

These characteristics of effective programs are not always easy to achieve. Financing programs are typically more complex to operate than grants and rebates, other commonly offered incentives for energy efficiency and sustainable energy. 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.

The current programs in New Hampshire face a variety of challenges and opportunities, as is common in much of the nation.

- **Programs are relatively new and have had only a short time frame for fund disbursement:** Of the nine commercial, five residential, and four municipal 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. Further, the two largest finance programs by dollar amount (Enterprise Energy Fund and Better Buildings/Beacon Communities) are ARRA funded and must disburse all funds by 2011 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. Of the remaining programs, 11 are RGGI funded, the future of which is in question for New Hampshire. This uncertainty can lead to skepticism among business customers, who often require significant time to go from application to audit to financing approval. A business customer may be hesitant to incur the time and expense of a thorough building audit, only to find later that financing assistance may no longer exist.

- **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 NH (People's United Energy Efficiency Loan) has limited participation, at approximately $420,000 disbursed annually. 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 in lenders for participation while lowering the required interest rate offered. With established banking relationships and programs, leverage ratios of 5:1, 10:1, and even 20:1 can be reached. With the exception of Better Buildings/Beacon Communities, none of the current commercial or residential programs in New Hampshire use "financial leverage[1]" to attract financial institution (FI) capital. While BBBC is leveraging capital from financial institutions 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, states that have state-wide programs 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/Beacon Communities program,

[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 (other than small principle and interest payments back into the pool) when all the money is committed. Financial leverage is more important where the loan terms are longer (7-10 yrs), such as in residential and large commercial programs.

utilities and individual finance programs are responsible for developing the financing and securing loans. In NH, utility program managers have made it clear that they can not take on financial risk nor directly provide shareholder capital. There is experience with utilities doing this successfully in Connecticut, which may inform future finance program design in New Hampshire moving forward.

- **Competing terms hindering 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 is 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, results in oversubscription of some programs, and lack of interest of 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.

- **Conflicting requirements for audit processes in commercial and residential sectors:** Energy finance programs are an important one tool in meeting energy and climate goals; but they need to be driven by the first step of having an effective audit completed first. 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 BPI certification, as well as no standard list of priority measures to be considered with every audit performed.

- **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. Of the $15M of financing capital made available over 2010-2011 to all market sectors, approximately $1M (7%) is available to the residential sector. (This does not include the Better Buildings ARRA grant which will allocate in 2011-2012 a portion of its $6M to the residential sector.) The total number of residential energy loans made since inception of all three of the utilities' programs appears to be approximately 176. This compares to an estimated 438,000 owner-occupied units in the New Hampshire residential housing stock.

- **Residential programs are financing low-hanging fruit:** There are currently four active residential financial loan programs[2], offered by PSNH, National Grid, Unitil, and NHEC. The average loan size for each of the utilities is approximately $3,400. This loan amount is less than 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 an HPwES audit (for example).

- **Marketing and outreach could be expanded:** Although there are 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"

[2] Better Buildings/Beacon Communities has not yet made loans through the program

[3] DOE Clean Energy Guide, Third Edition, 2010. MI average $7,000; NYSERDA average $7,700; MA Average$8,080

location where a customer can find information about all of the programs, and then proceed from there.

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 the following sections, current financing programs in New Hampshire are described and recommendations are made for enhancements. The final section includes a number of overarching recommendations, some suggestions for innovative approaches, and a table that summarizes the detailed program-level recommendations.

13.2. Commercial Sector Finance Programs

At roughly $22.5 million, the finance programs offered to the commercial sector in New Hampshire account for the majority of finance capital available 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 is 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 June, 2011, and the remaining $10M by 2013. Table 13.2. provides a commercial program overview.

Table 13.2. Current Commercial Finance Programs in New Hampshire

Program	Year of Program Inception	Funding Source	Interest Rate	Average Loan Term (years)	Finance Mechanism	Total Budget ($M)	Completed Projects: aggregate	Dollar Volume to Date ($M)
NH Better Buildings[1]	2011	ARRA	n/a	n/a	Loan	$10	n/a	n/a
Enterprise Energy Fund	2010	ARRA	2%	7-10	RLF	$6.6	28	$6
Business Energy Conservation Fund	2009	RGGI	Prime to Prime +3%	3	RLF	$4	5	$3
NHEC SmartSTART	2002	Private[2]	Mkt. + 0.5[3]	4	Loan	$1	27[2]	$0.7
People's United EE Loan	2006	Private	Prime-1% 4% floor	5	Loan	No cap	40[3]	$1.8
National Grid Business Loan	2002	SBC	0%	2	Loan	Set annually	123[5]	$0.3[5]
Retail Merchants Association Giving Power Back[3]	2009	RGGI	-	-	Grant	$3.3	4	n/a
PSNH Energy Rewards RFP[4]	2004	SBC	-	-	Grant	Set annually	Not available	$3.2
Pay for Performance	2010	RGGI	-	-	Rebate Incentive	$5	5	0
Total $						**$23**[6]		**$15**

1 – Commercial loan product to be offered at future date

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 assumes only $3M in better buildings funds will go towards commercial specific projects (1/2 of programmatic fund)

New Hampshire Better Buildings/Beacon Communities

Through ARRA funding, DOE has created a nation-wide Better Buildings program from which New Hampshire was allocated $10M. The implementation of this program has been through the existing New Hampshire Beacon Communities initiative (now referred to as Better Buildings/Beacon Communities or BBBC). BBBC 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. BBBC 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 of a building is required to ensure these requirements are met. Overall, the BBBC program-wide energy savings goal is an average 30%. 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 BBBC in order to qualify for a loan.

As of this writing, commercial loan terms are under development with financial institutions (residential terms have been finalized, and are discussed in the Residential Section below), while rebate structures are established for both sectors. The core financial structure of loans and rebates to both sectors is a $6M program fund that houses a loan loss reserve fund (LLR), interest rate buy down funds (IRB), and funds to support the rebate incentives. This structure does not specify budgets for each sector or dedicated funding amounts for the LRR and IRB. The program is designed to be flexible, allowing the program administrator to appropriate funds to meet demand, or lack thereof – if one area is clearly underserved, funds will be shifted to spur demand and meet that sector's needs.

While no commercial loans have been generated yet, BBBC anticipates commercial projects financing to be a minimum of $20,000 and a likely maximum of $100,000. 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 2, and 62 projects in year 3, for a total of 137 commercial projects. BBBC 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). Of the $10M available to the program, $6.2M has been classified as programmatic funding and is apportioned for capitalizing the LLR, IRB, and providing the project rebates.

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 the
- Total rebate/grant is not to exceed $5,000.

The remaining $3.7M available from the grant will be used for administration of the program, which includes technical energy advisor contracts, measurement and evaluation, and Davis Bacon monitoring.

BBBC 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 will have a local office to offer in person loan origination, as well as an online application. The BBBC program has been well received since its public release in April 2011. Over 100 individuals and businesses have visited the community offices to express an interest in project development. Approximately four commercial audits have been completed as of mid-May, and program marketing is ramping up into the end of the second and beginning of the third quarter of 2011.

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) entities, providing zero-money-down 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 Association (CDFA) and the Community Loan Fund (CLF). Within this partnership, the CLF handles small business, while the CDFA handles the larger business 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 set up 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 one to two projects; it was determined that further incentives would be necessary to spur demand and ensure complete fund disbursement by mid-2011 to meet ARRA requirements. In response, 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. The result was an immediate surge of interest, yielding applications for over $12M in energy efficiency improvements for only $4M in available funds. It is anticipated that all funds will be committed by June 2011, and the program was closed to new applications in April, 2011.

As of June 2011, the EEF has approved 31 projects totaling $7.2M, composed of $5.3M in loans and $1.9M in grants. With approximately $6M available for project funding and financing, the EEF is significantly oversubscribed. The program administrator has noted that not all projects will get funding, and final loan and grant amounts will be adjusted to meet the $6M budget. While applicants are not required to pay an out of pocket percentage of the project fees, many choose to bring some amount of cash financing, as well as using utility sponsored rebates. While the self-financing figures are recorded, the data was not available for release at the time of this writing. The average project size is approximately $235,000, with the smallest project coming in at $18,000 and the largest at $800,000. The degree of variance in project size is too great to provide an accurate average size, with the smallest project coming in at $12k, and the largest at over $1M. Of the 31 projects, twelve are projected to cost $100,000 and under; eleven are to fall between $101,000 and $499,000; and eight 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 business is sound enough to service loan debt. While some businesses have already had a level two audit performed, those that do not are able to have one performed through a partnership with the Jordan Institute 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 NH OEP, and individual towns and architects at a project level. The application process is completed online, and consists of a single application form.

The RLF feature was built into this program to ensure ARRA funds would continue to work for the state after the initial disbursement deadline passed. As of this writing, 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 5 years, and 2% interest, we estimate that the RLF will generate approximately $1M annually. This also assumes that the CDFA will discontinue grant funding after ARRA disbursement requirements are met. Based on the programs current figures of funding 28 projects with $2.3M, we estimate that the program will fund 12 projects annually through RLF payments from 2013 onwards.

Business Energy Conservation Revolving Loan Fund

The Business Energy Conservation Revolving Loan Fund, administered by the NH 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 Revolving Loan Fund is expected to continue in perpetuity through the RLF feature, or 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 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 measures built into the BFA's program.

Presently, this program has approved $3.3M in funding over 5 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 total project costs. An additional $700k has been reserved to fund a project in the third or fourth quarters of 2011. As of March 31, 2011, the RLF has $2.18M in outstanding loans, and is receiving over $30k per month in loan repayments. Once the primary loan funds have been completely disbursed, we estimate 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. As of April, 2011, the BFA is working with the CDFA in attempts 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 NH Business Resource Center.

NHEC 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. To date, 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 offered 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 for 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 project. 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 NH People's United branches, and is marketed in conjunction with the NH 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 of 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 the Retail Merchants Association of New Hampshire (RMANH), an organization that has a fifty-five-year history. GPB was initiated in 2009 with $1.3M to conduct audits 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. The RMA 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 from 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 75 audits in 2012. As of June, 2011, the program has performed approximately 10 phase one audits, and is just ramping up marketing of the phase two program. For the 2011-2012 budget allocation, the RMA 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 BBBC 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 when the current RGGI allocation has been exhausted.

PSNH 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 to 3 projects from 5 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 for any of the twelve months prior to application. 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.

Presently, the program has 12 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 being conducted through TRC.

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 five recommendations for achieving optimal program uptake and results.

- ***Move toward a "team" approach to unify finance programs:*** Presenting consumers with multiple options, as is the case in NH, 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 overall. An alternative market development approach is to address consumers with a unified and consistent message, as well as a single source of contact and 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. Multiple program managers state that many applicants presently expect "free money."
- The quick infusion and disbursement of money through numerous programs may resulted 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 to complete the audit process, receive financing approval, and fully implement 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 of 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 a more unified message, terms, and outreach could gain trust, "buy-in" and 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, 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 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 effective approve for increasing the effectiveness of funding used for audits is to move towards standard auditing practices and state-wide certification standards for auditors.

- ***Examine commercial finance programs with respect 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. 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 o 6% of New Hampshire's retail customers (with limited repayment period options). Better Buildings is 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 sector needs and barrier. 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.

- ***Evaluate marketing and outreach of programs:*** 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, requests for information by the study team found it challenging to find knowledgeable individuals at multiple utility programs through the customer service desk, and 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 funding 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. Based on climate goals alone, 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 CT, 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 CT 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.

- *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 – as will be discussed in the residential section below. 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 intending to attempt to move this program into the commercial sector in the future.

  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 NH financial institutions may well find attractive.

  In the residential sector, a pathway for NH 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. If that is successful, it is recommended that NH also attempt to extend this concept to the small business community. This structure could to serve as a vehicle for the BBBC program once funding ends in 2013.

- *Commercial property assessed clean energy (PACE)*: In the commercial sector, PACE programs are being developed and deployed in some states, although several obstacles still remain. 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, such as public service ESCOs, to address underserved parts of the market:** 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. ESCOs that dominate the energy performance contracting market are corporations with the primary purpose of maximizing profits to owners or shareholders. The attractive by-product of energy savings is an ESCOs secondary purpose. This business structure's order of priorities leaves much of the potential market un- or underserved. That is, traditional ESCOs do not attempt projects that: (1) demand a customized approach for achieving deep savings, (2) present a higher risk in meeting a threshold rate of return, or (3) are on a scale too small to justify the ESCOs necessary upfront analysis and contracting costs. In turn, such potential energy improvement projects—many of which can be found in the public sector, and which could have an immediate and positive effect on the populations they serve—are typically too large to be financed from future energy savings if venture capital returns are the necessary metric.

  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 business, and is envisioned to eventually serve the residential sector. As such concepts become refined and tested in the market, NH could implement its own programs to provide much-needed support to these customer types.

13.3. Residential Sector Finance Programs

New Hampshire currently offers five financing programs to the residential sector that are relatively small in size compared to other sector's programs, and to residential programs within other states. The four 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 13.3. provides an overview of these programs and their relevant terms.

Table 13.3. Current Residential Finance Programs

Program	Source	Interest Rate	Max Loan Term[1] (years)	Finance Mechanism	Total Budget	Completed Projects: aggregate	Dollar Volume to Date
NH Better Buildings	ARRA	1%[2]	1 – 10	Loan	$10M	0	0
NHEC Residential EE Loan	RGGI	0%	1 – 7	RLF	$200K	23	$68,000
PSNH Residential EE Loan	RGGI	0%	4 – 6	RLF	$500k	112	$380,000
Unitil Residential EE Loan	RGGI/ ARRA	0%	2 – 7	RLF	$295k	41	$140,000
National Grid Residential EE Loan	RGGI	0%	2	RLF	$3k	3	$2,400
Total $					**$4M[3]**		**$526,800**

1 – Program guidelines dictate maximum repayment terms by loan amount
2 – Introductory rate
3 – Figure assumes $3M of better buildings funds will go towards residential (1/2 of programmatic fund)

Better Buildings/Beacon Communities

The structure of the BBBC program was discussed in the commercial sector section and applies to the residential sector as well. At the time of this writing, 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.

BBBC 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 BBBC seeks to reach.

The primary criterion for approval is a *minimum* projected 15% energy savings per household, with an average BBBC program goal of much a much larger savings (30%). BBBC requires a comprehensive building evaluation, and will propose a comprehensive range of energy savings measures. There is no restriction on the type of measures that can be implemented, including renewable energy installations. 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 BBBC a no upfront cost program.

New Hampshire Better Buildings formed partnerships with three local financial institutions to leverage program funds: Merrimack County Savings Bank, Laconia Savings Bank, and Woodsville Guaranty Savings Bank. To mitigate the perceived risk of loans to the residential sector, the BBBC 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, BBBC will attempt to negotiate with the participating financial institutions to reduce the required LLR (however, this may be hard to do under the very short 2-yr timeframe of the program). The IRB has been structured to provide consumers with a 1% loan, regardless of the term (repayment period). The BBBC program is paying approximately $2,000 per loan to pay for this buy-down from a market rate of 8% down to 1%.

While projects must meet BBBC'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. At the time of this writing, 12 residential audits have been completed, but no loans have been generated. BBBC 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, starting at a base of none as of summer, 2011.

New Hampshire Electric HPwES 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 HPwES 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, we estimate 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 HPwES 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, we estimate 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.

Recommendations

Despite the increased participation of the utility based EE loan programs and potential success of BBBC, these five programs leave the majority of the residential sector underserved. Unlike the commercial sector, the primary issue with New Hampshire residential energy financing is a lack of programs with adequately sustainable funding.

- ***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 NH utilities have stated that loans are not offered to the residential sector specifically because of the high risk involved. However, the energy loans have significantly lower default rates than the 3.5% of typical unsecured consumer loans. The following are profiles from 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.

- ***Allow more time for programs to become effective:*** One of the largest hurdles BBBC is facing may be time. 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.

  BBBC provides an important pilot for New Hampshire. To maximize the $6.2M available from ARRA, the BBBC might seek to reduce the LLR requirements as quickly as possible. The 50% LLR requirement could potentially be reduced as a successful track record of payment history is established. This would free up money for more projects, More importantly, the BBBC pilot overall is likely to be well worth funding, long after the ARRA funds used to create it are disbursed. The search for alternate funding sources should be started now, in the hopes of providing a seamless program that endures beyond ARRA.

  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.

- ***Continue program coordination efforts:*** The BBBC and the 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.

- ***Increase funding to sufficient and sustainable levels:*** Concurrent with an ambitious timeframe to further develop markets in New Hampshire, the primary hurdle facing with financing programs is a lack of available capital. BBBC 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.

Loan Loss Reserve Comparisons

Washington
- $1M LLR
- 10% reserve requirement (5% in certain counties)
- $11M in loans supported

Michigan
- $3.2M LLR
- 5% reserve requirement
- $60M+ in loans supported

Pennsylvania
- $1.2M LLR
- 5% reserve requirement
- $24M in loans supported

Wisconsin
- $2.5M LLR
- 5% reserve requirement
- $50M in loans supported

Colorado
- $2M LLR
- 5% reserve requirement
- $40M in loans supported

California
- $1M LLR
- 5% reserve requirement
- $20M in loans supported

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 .006%. This is a difference of 13 times.

- ***Optimize the residential loan programs through centralization and leverage:*** BBBC offers an example for the rest of NH 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, BBBC offers the potential for the $3M LLR to create $6M in loans. 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, the states of CA, CO, WI, WA, PA and MI have all established LRF 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.

  Creating sufficient volume is critical to attracting financial institutions in participating in a residential loan program. For this reason, most states have taken the approach of creating a program that is administered by one of the state agencies, rather than by the utilities. This structure would also have the benefit of fully coordinating programs, outreach efforts and marketing, which results in significant savings on overhead and administration costs.

- ***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. In recent years, many states have significantly improved their participation rates by co-opting either a pre-approved set of contractors or using "energy advocates" to be a continual resource to the customer throughout the loan application process. Turn-around 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 CT and MI, 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 CT the utilities contract with select (currently 20) vendors to perform the home energy audits. Several of these firms have set up a system whereby one the members of the technical crew to call into the office mid-way through the audit if they've identified opportunities and interest by the homeowner to implement further measures. A senior member of the firm then arrives at the home before the end of the audit – or at an agreed-to follow-up time in order to quote specific prices and introduce the opportunity for financing. This program is heavily regulated with significant QA/QC so as to ensure no unscrupulous sales tactics are used and the quality of the work is exemplary. Michigan saves is has successfully implemented a 1.99% contractor fee on loans generated. This was actually a contractor suggested (and now heavily supported) measure that was implemented foremost to ensure the sustainability of the program – and contractor income through the program. This fee covers the QA/QC of the program, some administration costs, as well as maintaining the 5% LLR requirement. 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. We recommend that NH do the same. This will be significantly easier to implement

once the audit programs are standardized and have higher accreditation requirements of their audit crews.

- ***Use Qualified Energy Conservation Bonds to engage private capital to build financial institution relationships[4]:*** 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. To reach optimal leverage ratios, significant time must be spent developing relationships with financial institutions. 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 partnership. New Hampshire's Better Buildings program is focused on only three municipalities and therefore did not have as its objective to develop state-wide relationships with banks. However, in order to use BBBC as an example to potentially roll out on a state-wide basis, developing this deep relationship with several NH financial institutions will be critical to creating a future state-wide program. It is difficult and time-consuming to create this structure from scratch. Therefore, we have broken the entire process into two steps that can be addressed as New Hampshire's program structure evolves. It is essential that step one be implemented as soon as possible to allow time for relationship development and program success. Once that is complete, we envision step two will be ready to implement on a timeline that coincides with the sunset of the BBBC funding period, allowing for the program to be transitioned into a new structure.

  *Step 1:*Attract NH financial institutions quickly by encouraging them to participate in a revolving loan pool that lends out funds dollar for dollar (unleveraged). We anticipate banks being willing to perform the front end - the loan underwriting and origination services - but not to be required to have a long-term commitment to holding these loans on their balance sheet. Instead, the banks would sell their loans once they have accumulated sufficient volume to a newly created special entity that will issue tax-advantaged NH Qualified Energy Conservation Bonds (QECBs)[5]. The banks are thus able to remove the loans from their balance sheet and are thereby protected from future credit risks and yet start developing a strong relationship and understanding of residential energy loans.

  Step 2: Once NH banks have developed familiarity and comfort with the very low default risk of residential energy loans, we encourage the state of NH to introduce a more favorable structure which can take advantage of financial leverage – which can significantly increase the amount of loans that are made, rather than merely lending out dollar for dollar. This is accomplished by

[4] 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 capacity was expanded from $800 million to $3.2 billion by the American Recovery and Reinvestment Act of 2009. The Department of Energy estimates that between 10 and 15 percent of this issuance capacity has been used. 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.

[5] 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.

creating a loan loss reserve – or central default pool – which attracts more financial institutions to participate, as well as doing so at a significantly lower interest rate.[6]

- ***Re-examine PACE for the residential sector:*** NH enacted PACE legislation in late June 2010. There are two distinctive features of NH'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.

  Just days after NH enacted its PACE legislation (July 2010), the Federal Housing Financing Agency (FHFA) issued a statement concerning the senior lien status associated with most PACE programs. 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 NH, 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 the both the Efficiency Maine PACE program and also Vermont's proposed PACE structure.

  NH'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 NH 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 ARRA money, so has limited applicability as a model for other programs which do not have the benefit of large amounts of cessionary money.

[6] The ultimate interest rate charged to a residential borrower is generally lower than the FI's cost of capital, as it is generally bought-down using SBC or other funds. Typical energy loan rates being offered by other programs range from 0-5%. This is a separate discussion, but obtaining a low cost of capital from FI's is critical to decreasing the amount of SBC (or other) funds that would need to be spent.

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 (LLR), funded by Regional Greenhouse Gas Initiative (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 New Hampshire, in November 2010, the 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.

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 cannot or are unwilling to use traditional banking products.

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

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 since September, 2010, 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

13.4. 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 NH 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 13.5 gives an overview of these programs.

Financing projects through municipalities creates quite a challenge for four primary reasons: 1) Each municipality can only take out one loan per year, which must be voted on at a town meeting; 2) Any loan that is generated must be closed during the tenure of the administration that opened it necessitating a short payback period; 3) Municipalities are cash-strapped, and reluctant to devote 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 13.4. Current Municipal Finance Programs

Program	Year of Program Inception	Funding Source	Interest Rate	Max Loan Term (years)	Finance Mechanism	Total Budget ($M)	Completed Projects: aggregate	Dollar Volume to Date ($M)
Municipal Energy Reduction Fund	2010	RGGI	2.5-4%	10	RLF	$1.5	5	$1.3
PSNH SmartSTART Municipal	2004	RGGI	Flat 5%	7	RLF	$2	150	$5.2
Unitil Municipal Loan	2010	RGGI	0%	10	RLF	$0.43	0	0
Nation Grid Municipal Loan	2010	RGGI	0%	2	RLF	$0.3	0	0
Total $						**$4.23**		**$6.7**

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 5 projects; 1 in 2010 and 4 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 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, we estimate 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.

PSNH 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 3 to 7 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 writing, 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. The difficultly in placing municipal loans can result in a large portion of allocated funds to remain untouched, as is the case with two of New Hampshire's municipal finance programs. Key findings and recommendations on optimizing uptake of municipal projects are presented below.

- ***Prioritize education and outreach:*** 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. New Hampshire's municipalities are required to vote on all loans at town

meetings to receive approval. Further, 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. Program managers have all cited that today's the tight economic climate has created a town meeting environment that does not look favorably upon new financing proposals. There are situations where the energy retrofit is completely paid for upfront, and savings are shown to exceed costs, yet the project is still rejected.

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. CDFA has stated that it is conducting significant outreach and education to an over budget scenario, however, the program still has not been able to allocate all of its finance capitol. It is recommended recommend that the CDFA and PSNH work to coordinate their municipal outreach strategies to most effectively allocate municipal financing funds available in New Hampshire.

- ***Standardize audit processes:*** 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. It should be noted that the TRC was recently awarded $300k in ARRA funds through the NH OEP to conduct 30 -35 comprehensive municipal building audits. 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. This information could be used as a foundation to create standard audit templates and procedures for municipal buildings, as well as to further outreach and education efforts.

- ***Aggregate municipal projects for ESCOs:*** 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). ESCOs typically pursue projects with a minimum threshold of a few hundred thousand dollars. As mentioned above, a recent trend in ESCO projects has been to pursue more comprehensive measures with much longer paybacks. Taking this all into consideration, we recommend piloting ESCO aggregation projects in one or two large communities to assess the level of project comprehensiveness and savings that may be achieved.

13.5. Energy Financing Program Administration

The current landscape for energy project financing in NH 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.

Recommendation

- ***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[7]. 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 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.

13.6. Conclusion and Summary of Recommendations

The table below presents an overview of the recommendations provided in this chapter. The first section of the table outlines **high-level and cross-cutting recommendations** that help New Hampshire more effectively use energy finance as a tool to meet its energy and climate objectives. These are distilled from the in-depth recommendations made within each sector. They are intended to apply as general

[7] Referencing programs run by NY, MA, MI

guidance that can serve to make all programs more effective. The rest of the table summarizes the recommendations provided in the sector discussions above.

Table 13.5. Summary of Recommendations for Energy Financing Programs in New Hampshire

§13. Overarching Recommendations for All Finance Programs
Level 1: Steps that would bolster existing finance programs and achieve optimal effectiveness within the current framework and available capital
• Implement "Team" approach to coordinate programs (especially short-term programs with disbursement deadlines) to ensure all finance capital available to NH is disbursed effectively
• Standardize and coordinate both commercial and residential audits across all finance programs
• Pool QECB allocations to structure residential and/or commercial finance program for purpose of building relationships with financial institutions and demonstrating value proposition of energy finance
• Aggregate multiple municipal buildings for one to two ESCO pilot projects that seek comprehensive measure implementation and long-term paybacks (15 years+)
• Increase education and outreach, and tailor to town hall settings to tap unused municipal finance capital
Level 2: Transition the Better Buildings/Beacon Communities program from a three-year, three-community pilot to a sustainable program that serves customers throughout the state
• Work with local community banks, credit unions and community development financial institutions (CDFIs) to participate in a pooled revolving loan fund for the residential sector
• Allocate funding of between $1 - $3M to create a loan loss reserve facility that will support a pooled revolving loan fund
• Implement streamlined sales and processing structure, i.e. contractor driven sales approach that is directly linked to audit process: uptake is highest when loans are sold, not bought
• Advance residential and commercial PACE

§13.2. Commercial Sector Finance Programs
• Examine commercial finance programs with respect to sector needs
• Evaluate marketing and outreach of programs
• Address available finance capital levels and sustainability of funding post-ARRA and RGGI funding
• Consider innovative program structures, such as public service ESCOs, to address underserved parts of the market

§13.3. Residential Sector Finance Programs
• Re-examine program structure and risk assessment
• Allow more time for programs to become effective
• Continue program coordination efforts
• Increase funding to sufficient and sustainable levels
• Optimize the residential loan programs through centralization and leverage
• Adopt a contractor-driven sales approach

§13.3. Residential Sector Finance Programs
• Use Qualified Energy Conservation Bonds to engage private capital to build financial institution relationships

§13.4. Municipal Sector Finance Programs
• Prioritize education and outreach
• Standardize audit process
• Aggregate municipal projects for ESCOs

§13.5. Energy Financing Program Administration
• Consolidate finance programs into a single-administrator, coordinated state-wide program

Section 14: Conclusion

New Hampshire has an impressive array of energy efficiency and sustainable energy strategies, programs, and initiatives that are helping individual customers, businesses, and institutions lower their energy bills by taking advantage of emerging sources of clean, sustainable energy. The people of New Hampshire clearly recognize the enormous individual, community, and statewide economic benefits of pursuing these energy efficiency and sustainable energy resources. This assessment confirms there is great interest, initiative, and dedication on the part of many individuals and organizations throughout the state on energy efficiency and sustainable energy issues. This report highlights the numerous and impressive efforts that are under way already, and notes the policies, programs, and initiatives already in place that provide an important framework for the future.

New Hampshire has the potential to provide significantly greater benefits to its people and communities. Through clear, coordinated, sustained, and appropriately supported investments, that further develops and matures efficiency and sustainable energy markets in the state, New Hampshire can:

- Improve its economy;
- Lower reliance on imported fossil fuels;
- Improve the environmental profile of its energy use; and
- Diversify its energy mix.

Presented below is a discussion of the overall policy context in New Hampshire, presently, based on our review of current policy and regulations, our assessment of programs and initiatives already underway, and our reflections after interviewing and interacting with more than 100 thought leaders and stakeholders from around the state. This is followed by seven broad areas in which there is opportunity for improvement that would make a significant and lasting difference to the people of New Hampshire, and to its energy future. The discussion builds upon the conclusions and recommendations presented previously for each of the key areas reviewed and assessed in this study. The discussion in this section reflects the beliefs and opinions of the VEIC team leading this study; the text is written in the first person in recognition of this.

The Ideological and Policy Context in New Hampshire Today

It is our belief that new, exciting opportunities exist for the State of New Hampshire to play an essential and sustained leadership role in advancing energy efficiency and sustainable energy development and use in the future. We recognize that despite all of the initiatives under way – many with governmental and regulatory support and funding -- there is a deep ambivalence in New Hampshire about whether it is appropriate -- or just how it is appropriate -- for government to provide leadership in these markets. This ambivalence presents itself in three ways:

- **Lack of a clear policy** guiding regulation, public investments, and market development;
- **Lack of funding** that is adequate, sustained, and clearly focused on investments that will develop energy efficiency and sustainable energy markets; and
- **A level of regulatory and programmatic complexity** caused in part by recurring policy disagreements that are not resolved at the state level and therefore end up being addressed in

forums that are not fully capable of resolving them. This complexity and the uncertainty it engenders actually holds back development of markets.

In November 2000, the New Hampshire Public Utilities Commission issued Order No. 23,574 in which the Commission refers to its interpretation of New Hampshire's legislation restructuring the utility system in RSA 374-F 3 X in a previous Order:

> *"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 347-F… We believe that efforts during the transition toward market-based DSM 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".*[1]

While this language is more than ten years old, it expresses the continued ambivalence in New Hampshire policy and regulation that public involvement in energy efficiency markets may be just a questionable "interference" in the markets that would otherwise find their own way to broad adoption of efficiency without "subsidies". This ambivalence operates at a deep level and tends to preclude a focused discussion of how sustained systematic and intelligent investment in energy efficiency markets might actually contribute to developing those markets.

The underlying assumption in the PUC Order cited above (and repeated in numerous succeeding Orders) appears to be that markets should (and will) provide efficiency services on their own, and the first goal is to avoid interfering with that "market" process. Only in cases of overwhelming inability of consumers to invest in energy efficiency (such as low income weatherization programs) does the concept of "market barriers" seem to have relevance for the Commission. Despite the authority of the PUC to increase the SBC to fund enhanced cost-effective EE savings there appears to be an underlying assumption that it is not appropriate to do so.

The outcome is that while the PUC has continued to approve efficiency CORE Program funding at a relatively stable rate, there is actually very little focus on fundamental questions such as:

- **Do the savings goals represent the appropriate level of effort in New Hampshire efficiency markets?**
- **Are these programs helping mature the New Hampshire efficiency markets?**
- **Are the programs gaining savings efficiently and reaching all market sectors?**

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 ACEEE paper on Energy Efficiency Resource Standards discusses in detail the evolution of policy in different U.S. jurisdictions and identifies how leading states have moved to aggressive energy efficiency investment strategies.[2] The evidence is substantial that these markets will not "automatically" figure out how to maximize energy efficiency benefits for consumers.

[1] New Hampshire Public Utilities Commission, Order No. 22,875

[2] 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.

It is critically important to be precise in defining and actively engaged in discovering and overcoming market barriers by adopting appropriate strategies to address them in each market segment. The point of the programs and interventions should be to develop, engage, and help mature the markets**.** The ambivalence about just what the "rules of engagement" are for New Hampshire programs and investments actually appears to inhibit a focus on effective energy efficiency performance and developing markets.

Research and assessment of energy efficiency and sustainable energy activity in New Hampshire for this study leads us to recommend the following approach for informing efficiency and sustainable energy investment going forward:

- The only justification for conducting efficiency and sustainable energy programs, services, and other market interventions should be that the **actions are developing markets and helping overcome deeply embedded "market failures"** that prevent what might otherwise be expected to be "logical" or "predictable" changes in the relevant market segments from taking place.

- These investments will **result in both near term and long term benefits** to consumers, communities and the New Hampshire economy.

- If efficiency and sustainable energy services are not meeting this standard, they should be **re-focused to do so**; and where the market is already working well, direct intervention should be strategically reduced and phased out.

- **New products and savings opportunities should be continuously identified** and strategic focus should give them priority and adequate funding.

Reframing the discussion in New Hampshire by adopting a common priority to provide benefits to consumers, businesses, and the economy through a widely-shared commitment to developing dynamic efficiency and sustainable energy could unleash innovation and dramatic mobilization of resources. By creating an evidence-based common effort, New Hampshire could lower customer bills, improve reliability, reduce reliance on fossil fuels, and grow the state's economy. The seven major steps for achieving that are described below and provide a road map for moving forward.

Step 1 - Establish a Clear Policy Direction

Despite a long history of legislation and many regulatory dockets concerning energy issues, New Hampshire lacks clear policy direction for both energy efficiency and sustainable energy efforts. While there are a multitude of programs and initiatives under way in both sectors, the lack of a clearly articulated policy has contributed to a situation in which good things are happening but there is not a sustained, coordinated, adequately funded investment process that is resulting in full market development and steadily increasing customer benefit.

Energy Efficiency

Adopt a policy framework that guides coordination and appropriate investment in energy efficiency: The policy should shape the direction of future electric and gas regulation, inform public policy across state and local government, promote coordination of energy efficiency efforts and initiatives, and provide clear signals to the growing energy efficiency markets in New Hampshire.

The ACEEE Paper on Energy Efficiency Resource Standards provides a useful summary of current energy efficiency investment activity in the U.S. It defines two types of state implementation efforts and

indicates that both types of programs are planning for savings increases that double or even triple current savings levels. The first is "Established Savers" that are already performing at a high level of EE 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 on.[3] [4] The paper lists four key strategies being used by both Established Savers and Rapid Start states:

- Increasing program funding;
- Establishing supportive utility regulatory policies;
- Establishing complementary policies to capture non-program savings; and
- Involving stakeholders in collaborative processes for program development and implementation.

Five significant strategies are discussed that utility or program administrators are using to meet the new 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.

In a discussion of the history of energy efficiency procurement evolution, four phases are described including the:

- Energy Crisis Era (1970-1973);
- IRP Era in the mid to late 1980's;
- Restructuring/Public Benefits Era in the mid- to late 1990s; and the
- Resource Procurement Era in the late 90s.

The discussion of the Restructuring/Public Benefits Era describes remarkably well the mindset reflected in the PUC Orders noted above:

[3] While we use the terms "market barrier" and "market development" in our discussion of both EE and RE markets it should be acknowledged that there are differences between the two markets. In general EE resources as they are identified in current EE 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 EE measures to greater market acceptance, and ultimately full market penetration. With SE, 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 RE investments the challenge is to provide efficient and effective strategies that support sustainable market development and state development goals.

[4] "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)

"Just as utility energy efficiency spending was accelerating, the electric industry "restructuring" movement was launched in 1994 and quickly spread across the nation. Unfortunately, for a variety of reasons, restructuring created economic pressures that tended to cause utilities to reduce or abandon energy efficiency programs. In addition, the move toward more limited regulation under restructuring tended to weaken or eliminate prior mechanisms that had helped facilitate energy efficiency, such as IRP. Nationwide, annual electric utility energy efficiency spending plunged by over 50% from 1994 to 1997…

In recognition of these adverse effects of restructuring on energy efficiency, many states included in their restructuring policy the creation of a "public benefits" funding mechanism, to continue some level of energy efficiency programming. The rationale for these programs was not to provide electric system resources (the "market" was to be responsible for that), but rather, to ensure that the beneficial effects of energy efficiency for the public (including environmental benefits) would not be lost. Arguably, the strategy of "public benefits" energy efficiency "saved" the concept of utility-sector energy efficiency and was able to begin to reverse the downward trend in utility energy efficiency spending, beginning in the post 1998 time period."[5]

As noted above, we believe New Hampshire has not progressed in any broadly-shared way beyond the energy efficiency regulatory policy of "the Restructuring/Public Benefits Era." New Hampshire is not identified in the ACEEE paper as either an "Established Saver" or a "Rapid Start" state, and is not considered to have an Energy Efficiency Resource Standard in place. Many of the recommendations made in this study for Core Program Residential and C&I enhancement are consistent with these more aggressive strategies being adopted throughout the country. We are persuaded that without taking action at the policy level by adopting some form of Energy Efficiency Resource Standard (EERS), New Hampshire will not be able to expand the level and scope of its energy efficiency investment consistent with other high-performing states who are mobilizing their markets.

Sustainable Energy

Enact a general policy of support for sustainable energy: While there is language in the Purpose statement for the NH 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 support for this sector more broadly. We strongly urge the establishment of an overarching policy that outlines the state's support for activities that encourage investment in sustainable energy across the spectrum of implementation strategies. 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

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. Such a policy would provide guidance and a reliable message to regulators, state government, utilities, investors, and other market stakeholders. It would guide and support the specific adjustments to implementation of the RPS that are made in Chapter 10 and summarized below.

[5] ACEEE paper, Background, p. 2

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 activities. We strongly recommend the establishment of a funding source for sustainable energy investment, to serve as leveraged funding through the mechanisms currently in place and enhancements recommended for the future. This will be critical to the ability of the state to undertake activities in compliance with a general policy overall. Sources of funding could include an increase in the Systems Benefit Charge, allocation of a portion of RGGI funds, or use of a portion of Forward Capacity Market proceeds.

Provide full authority for fund administrator(s) to respond flexibly to the attainment of established goals: The current policy framework requires legislative action to authorize each change to the current mechanisms for providing financial support for sustainable energy activities. We recommend that long-term plans be established and approved for the delivery of services to support sustainable energy market development that include performance goals, and that program administrators are authorized to manage these programs independently in a market-responsive manner to achieve those goals.

Provide appropriate mechanisms to 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. We recommend that the state address obstacles to speedy and efficient project review at the state and local levels.

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-buy programs for renewable technologies. Enacting appropriate permitting, net-metering and interconnection requirements, and other standards and model ordinances that provide appropriate support for these projects allows investment that take advantage of the excitement about sustainable energy at the community level and offers valuable opportunities for market development.

Step 2 - Lead by Example

As the single largest user of energy in New Hampshire, State Government can play a large role in stimulating and developing energy efficiency and sustainable energy markets. And the State has already started to be a leader in actually implementing 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.

As it implements 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 efficiency and sustainable energy in new construction; the State of New Hampshire can accomplish several important objectives simultaneously:

- Save the taxpayers of New Hampshire money;
- Model the behavior New Hampshire says others should follow by being an efficiency and sustainable energy leader and innovator;

- 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 learning what keeps good things from happening in State facilities and figuring out new ways to address those obstacles; and
- Demonstrate the kind of coordination and resource mobilization that will be needed throughout the state.

The third area of government leadership is for government to get its own house in order so that in its institutional structure and its wide range of policies, programs, and other actions it becomes a demonstration of "systems" thinking in a way that effectively supports the underlying energy policy 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 EE and RE 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
    - 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, all-fuels initiatives can all be designed to support and complement the underlying energy efficiency and sustainable energy policies.
- Anticipate and provide leadership in regulatory discussions such as Smart Grid to ensure that energy efficiency and sustainable energy benefits, and customer savings and empowerment will be a first priority.
- Enhance permitting processes to give support to sustainable energy and transportation initiatives that will provide long term EE benefits.

Step 3 – Develop Clear Regulatory Guidance to Utilities and Adopt Appropriate Incentives

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 reflect an aggressive approach to securing high and increasing levels of efficiency saving and it does not actively promote full development of efficiency markets. If there is an aggressive EERS set in New Hampshire, more aggressive goals, better verification, and some modification and re-design of the metrics used in the performance incentive will be essential. If an EERS is not adopted, there could still be changes to the current system that would ensure greater benefits for New Hampshire customers.

New Hampshire now provides the opportunity for utilities to seek "decoupling" of their revenues from their sales to remove the "disincentive" the current regulatory system creates for utilities to reduce sales through EE, net metering, or CHP. This provision is discretionary, however, and there has been little

advancement in this important policy area. We believe it is essential, however, that the considerations of "revenue decoupling" take place in a context in which an aggressive EERS is adopted and thoughtfully implemented. We are not at all persuaded that simply offering more performance incentives and offering the risk mitigation afforded by "decoupling" will actually motivate utilities to aggressive efficiency implementation in the absence of a clear mandate to do so.

Our strong preference is for a clear mandate, a decoupling mechanism, and a strong performance-based incentive that gives such a clear signal to utilities that it motivates them to active and aggressive implementation and innovative approaches to building the marketplace for energy efficiency. In this context, it will be appropriate to consider ways to reward utilities appropriately for activities that contribute to long-term savings by promoting codes, standards, and other measures that will provide long term benefits that do not require customer incentives in the future.

Step 4 - Improve the Regulatory Environment

Adopt some form of aggressive EERS supported by a clear underlying energy policy for the state: This action, consistently supported, and backed by adequate funding, should provide clear direction to regulators, utilities, market participants, and customers in New Hampshire and will provide:

- Clarity about a new role and mandate for utilities.
- Decreased regulatory uncertainty, and a clearer focus for stakeholder input. Discussions should be about how can we make this work? What resources are needed to accomplish these goals? Is this being done as efficiently and effectively as possible? How can we leverage more resources?
- An opportunity for greater collaboration. We recommend that as part of an EERS both an annual and a longer-term planning cycle (three years is used in many jurisdictions) for energy efficiency investment should be implemented. We envision a focused, efficient, time-limited collaborative process to assist in this planning effort and to build consensus about just what the program investment strategy will be. This approach means that utilities can begin to think not just about how to meet this year's goals, but also about what it will take to have to meet higher goals in the future. And this collaboration would occur in a non-adjudicative setting, prior to the filing of annual plans with state regulators. This would build upon current committees and working groups and would increase the impact and focus of those groups.
- A new approach to program implementation. Experience in high-performing energy efficiency efforts is that in exchange for a challenging performance-focused regulatory structure, utilities get significant flexibility to adjust programs, incentives and strategies to respond to improved understanding of the markets, new products, new costs, and new opportunities.

We do not make a recommendation in this report for a new implementation structure. We believe the CORE Programs, with new direction, coordination, financing, and oversight could provide substantially increased benefits to New Hampshire. While creation of an Energy Efficiency Utility (EEU) might be an alternative way to provide an aggressive savings ramp-up, we are very clear that the fundamental and highest priority recommendation is to set the policy of least cost procurement in New Hampshire law, to provide clear guidance to utilities and regulators, and to provide stable planning and funding of EE investments in a way that is performance-based, market responsive, intelligent and dynamic.

The risk in recommending a specific change to the implementation structure is that the need for a clear policy decision (the "what and why") may get lost in the structure debate (the "how"). We suspect that in some instances in the current discussions in New Hampshire the debate over an EEU serves as a proxy for the underlying policy debate. We are persuaded that if the policy, direction, and goals can be clearly articulated, and if there is a form 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.

Step 5 - Increase Program Coordination and Further Streamline Administration

With an EERS approach to energy efficiency program implementation the issues of streamlined program delivery, coordinated implementation, and a focus on customers and market development become priorities. Opportunities for internal consistency among programs become opportunities for meeting goals more effectively and building the market infrastructure so that EE becomes part of the service offering of more and more businesses. Important themes to address and questions to consider are:

- How can we increase consistency among program offerings so that customers and trade allies find consistent offerings in the marketplace?
- How can we integrate Gas and Electric EE programs so that customers get a full suite of services from an informed single point of contact when dealing with their utility?
- When and how do we adopt an "all fuels" approach to delivering customer EE services - so that New Hampshire's majority of consumers using delivered heating and process fuels get equal service with utility customers?
- What are the opportunities for "upstream" marketing" and leveraging of high-efficiency technologies so that manufacturers and wholesalers contribute to lowering measure costs, customer complexity (coupons) is reduced, and stocking patterns change?
- Should we adopt and use aggressively and consistently a single New Hampshire-wide "identity" for energy efficiency savings that improves customer recognition and improves customer participation?
- How to we begin to identify new and underserved market sectors and strategies to address them?
- How do we integrate with other New Hampshire state priorities such as:
    - Codes and standards?
    - Financing strategies for different market segments
    - Integrated and complementary use of other discretionary funds
    - Partnerships with community and regional EE and RE initiatives
    - Tax policy
- How do we establish an effective and efficient EM&V system as an independent function focused on increased effectiveness and solid documentation/accountability?

Step 6 - Use Public Funding and Policy to Stimulate and Leverage Private Investment

Another example of how clear state policy and an EERS should guide emergence of New Hampshire's energy efficiency and sustainable energy industries is in developing innovative ways to make funding available for the significant up-front costs of some efficiency (and sustainable energy) investments.

We recommend that the State be strategic in this approach and not rush to create new lending programs (though it may be able to expand on certain state lending functions already in place.) Further, we do not recommend that utilities become banks for energy efficiency lending either (though is some settings on-bill repayment may be useful). We recommend an approach in which public and ratepayer resources are developed to utilize the lending expertise of existing financial institutions to the greatest extent possible. We also recommend that in identifying new lending strategies planners and program implementers use the

same skills they are expected to utilize throughout energy efficiency program implementation by recognizing that "lending efforts" need to be responsive and tailored to the needs of different market sectors. In this context State and utility planners should:

- Leverage state and federal grant dollars for loan loss reserves, etc. as appropriate (creating as much leverage as possible).
- Support with legislation and strategic capability building PACE and other small customer and community focused lending strategies.
- Wherever possible have loans be available for all cost-effective EE and RE investment even if the actual program using 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 Standard development and support represent a form of leveraging and financing…as they require consumer investments in higher efficiency buildings and products and therefore drive the market to more efficient norms.
- The State can also take the lead in supporting and advocating for increased Weatherization funding and take the lead on addressing the need for delivered fuels EE funding

Step 7 - Create a Home for Efficiency and Sustainable Energy Implementation Support and Oversight in State Government

We recommend that an entity within state government, or at least chartered by state government , be given clear responsibility for advocating on behalf of energy efficiency and sustainable energy; assisting in and leading collaborative planning efforts and providing expert oversight and advocacy to enhance the effectiveness of efficiency and sustainable energy implementation over time. Our preliminary suggestion that this group be charged with implementing the overall policies with regard to EE and RE that this report recommends. It should have broad ability to operate across government departments and divisions. It should be:

- Supported by and charged with assisting in the implementation of EE and RE mandates.
- Chartered to advocate for EE and RE in both governmental and non-governmental forums including :
    - Advocate at PUC
    - Consult and advise re: CORE Programs and other EE and RE implementation efforts in New Hampshire
    - Coordinate with other agencies of state govt.
    - Support Community EE and RE initiatives.
- Provided with resources that will allow it to conduct analysis and advocacy that will contribute to regulatory, legislative and governmental decision making in a way that will lower consumer bills, increase energy independence and strengthen the local and NH economy by building a vibrant NH EE and RE public/private partnership.

Conclusion

A sample policy statement is presented on the adjoining page, for consideration in New Hampshire. It provides a statement of energy policy overall, creates an Energy Efficiency Resource Standard, establishes a stable funding mechanism, and creates an entity within state government that could provide a focal point for leadership on energy policy. Such a policy would provide important clarity and would dramatically alter the regulatory context and the implementation direction in New Hampshire. The numerous specific recommendations made throughout this study would be facilitated by the adoption of such a policy and structure. The policy might be implemented by modifying existing legislation, such as RSA 9-A, the State Development legislation.

Proposed 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, while at the same time creating local jobs, helping stabilize the state's energy infrastructure and reducing greenhouse gas emissions;

Whereas, energy efficiency is a non-emitting 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 the potential of 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;

Whereas the inefficient and wasteful use of energy resources runs contrary to the state's economic interests and societal values; and,
Whereas, a diverse set of state leaders, including policymakers, utility executives, businesses and environmental non-profits have committed to the goals of the New Hampshire Climate Action Plan, with maximizing efficiency as a core tenet of the plan,
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 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.

Therefore, the legislature hereby charges the Energy Efficiency and Sustainable Energy (EESE) Board with advancing this policy by crafting recommendations for its implementation in coordination existing State entities responsible for energy planning and energy efficiency and renewable energy implementation and with the Public Utilities Commission (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 the gas distribution companies shall, every three years, each jointly prepare and submit to the 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 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.

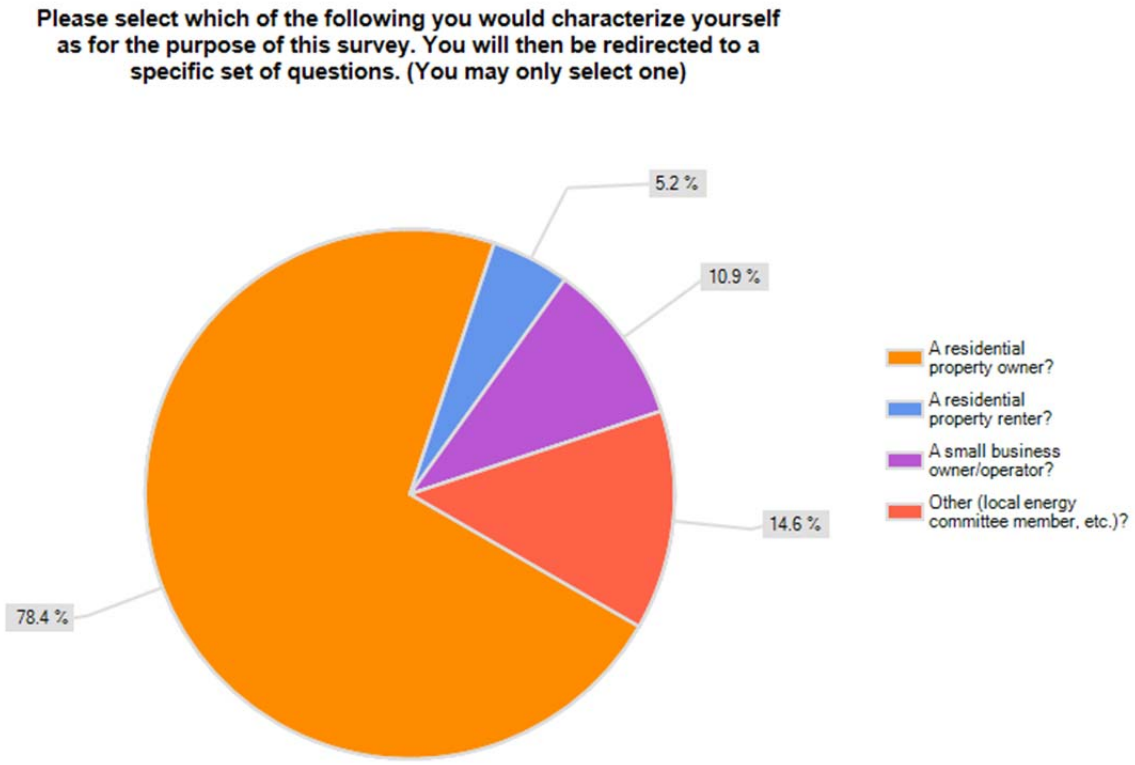
The EESE Board shall be funded annually with proceeds from the Systems Benefit Charge (SBC) and/or other efficiency funds as determined by the PUC. The funding shall be adequate for the Board to secure technical consultants specifically in order to review the ratepayer-funded electric and gas programs 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 consultants shall review and make recommendations to the EESE 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.

Appendix A: New Hampshire Energy Survey

A.1. Introduction

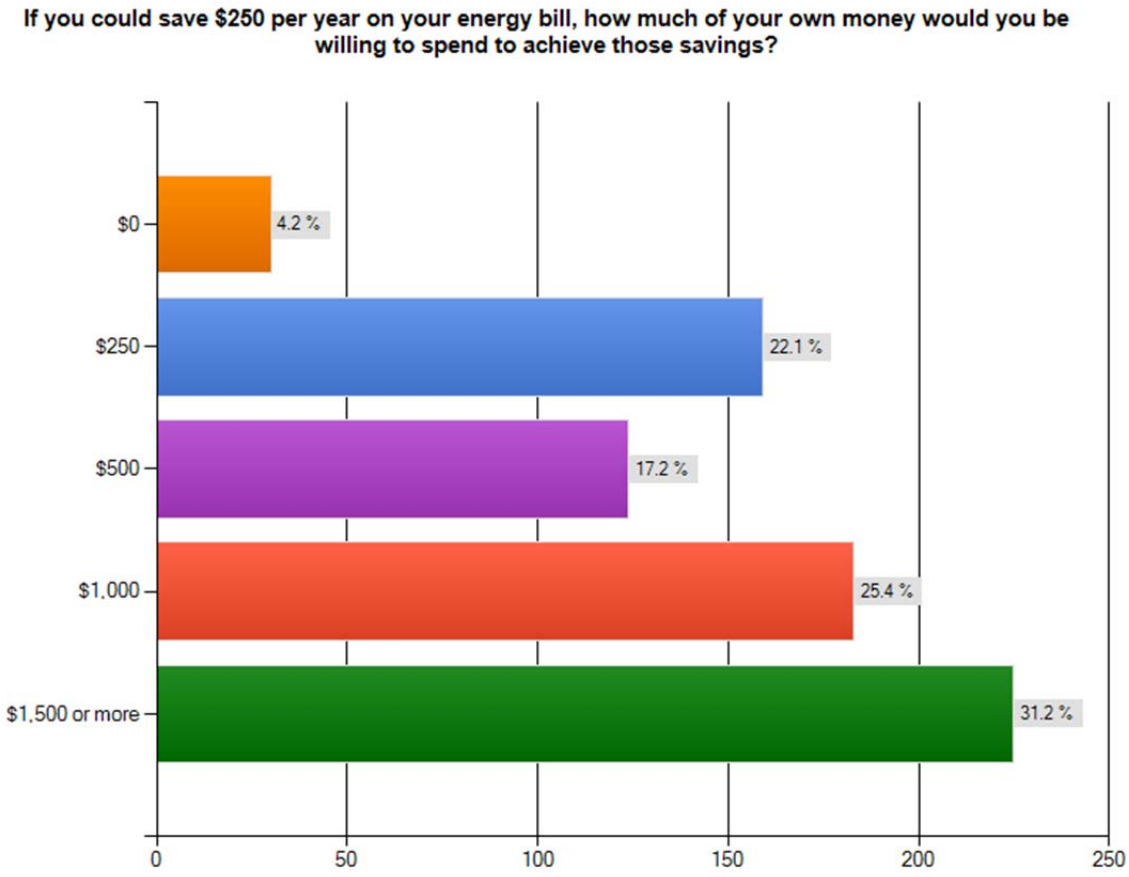
This online survey was developed to provide an opportunity for members of the public to participate in the *Independent Study of Energy Policy Issues* (as called for in a bill passed by the Legislature in 2010 referred to as "SB 323"). The survey was developed with input from members of the EESE Board 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.

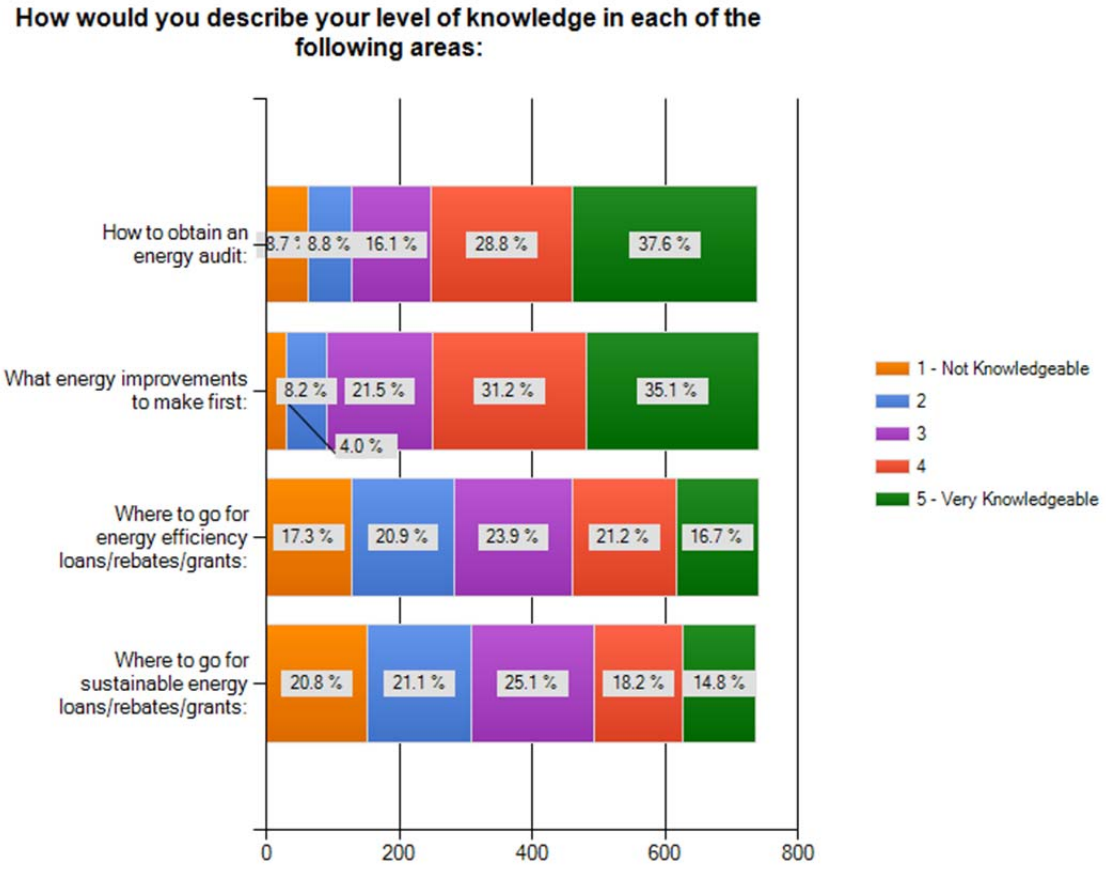


The majority of respondents (78.7%) feel it is very important for New Hampshire to increase energy efficiency, increase sustainable energy use (75.9%), and decrease use of fossil fuels (67.8%). A small number of respondents (3%) do not feel that decreasing the use of fossil fuels is important, and as 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.



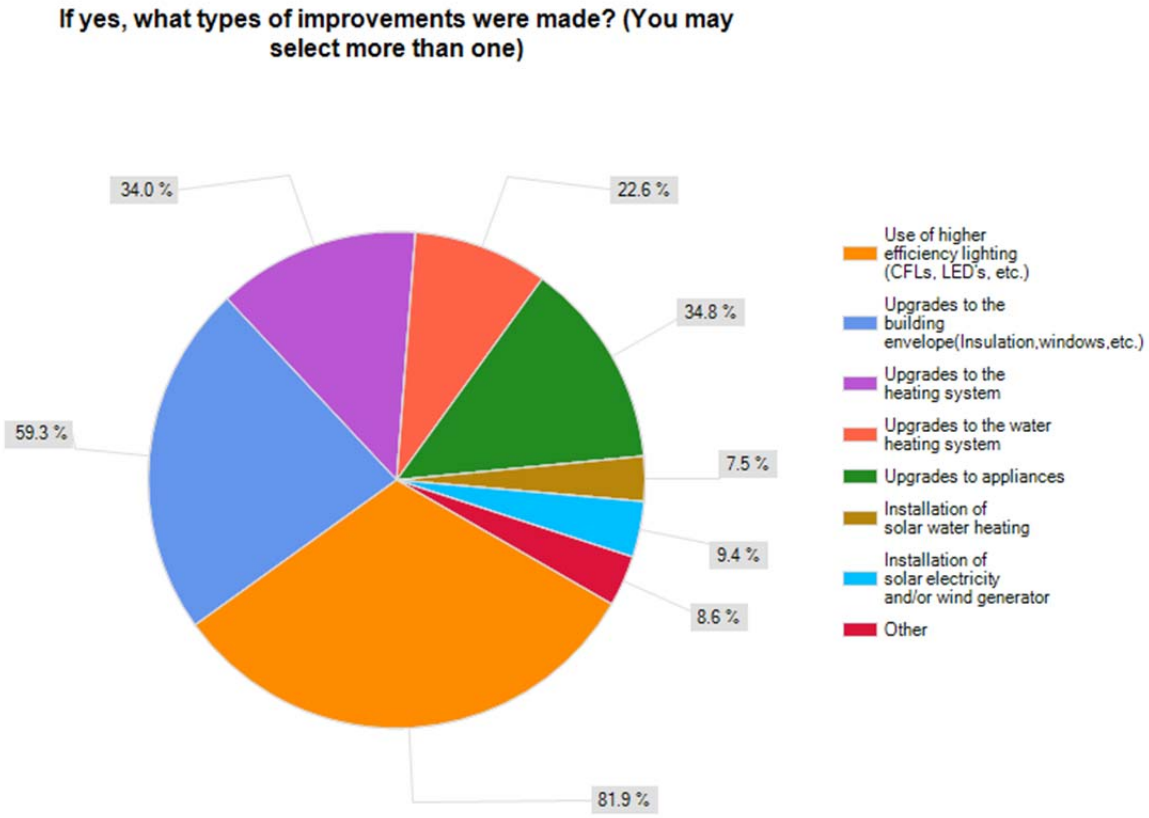
When asked about their level of knowledge on how to obtain an energy audit, make improvements, and access funding or financing the results were mixed:



A.2. Residential Property Owners and Renters

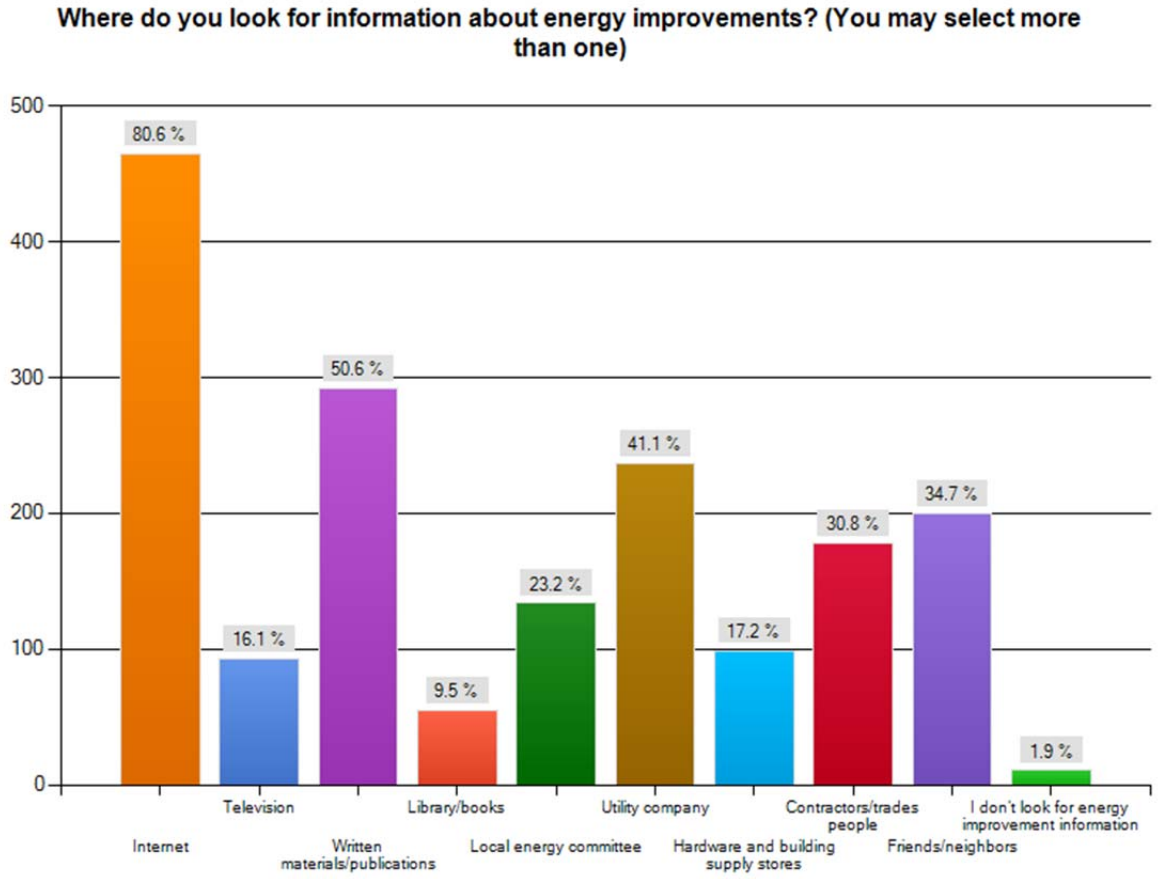
Residential property owners and renters reported that reducing their energy bills was important (77.7% Owners; 71% Renters), and within the past 12 months 83.8% of Owners and 56.4% of Renters reported making energy related improvements to their properties. Many Owners (31%) have plans to make energy 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:

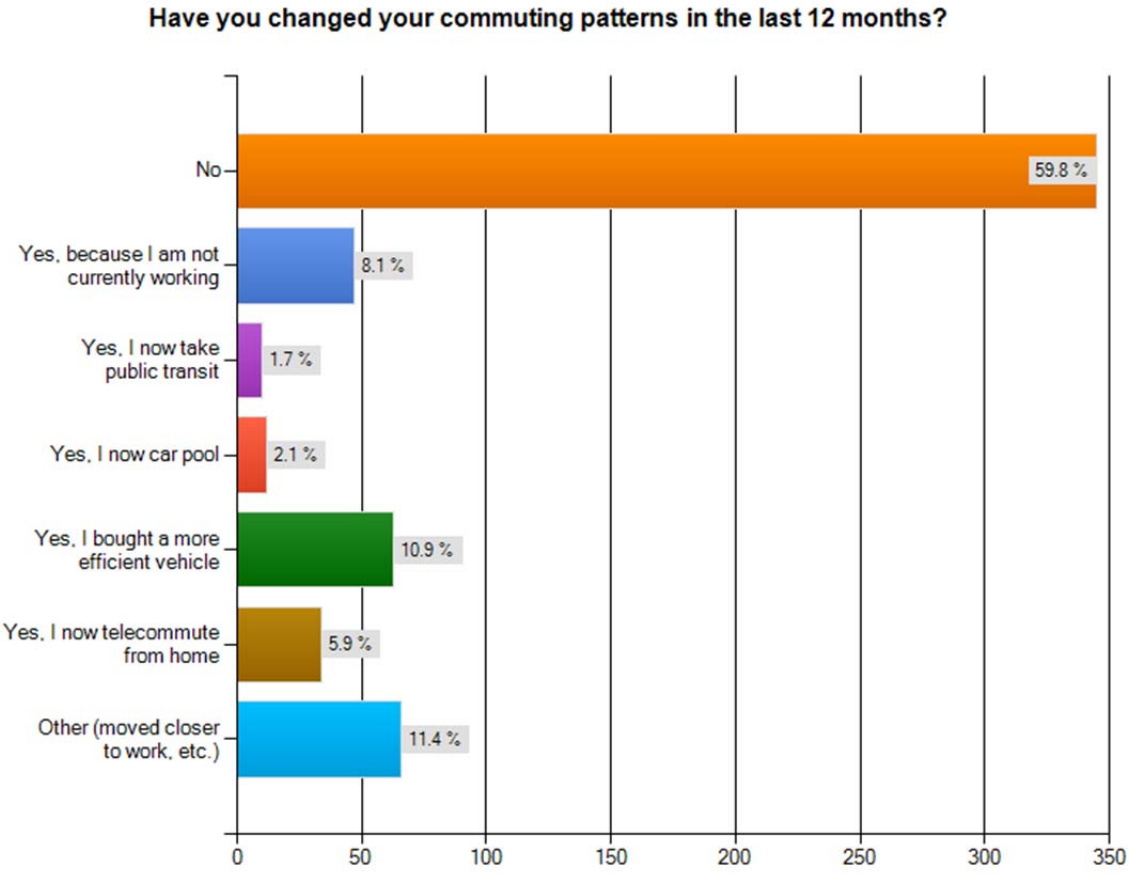


The Owners and Renters primarily reported reducing their energy use to save money (35%) and because of concern for the environment (40%). Increased fuel cost was only a motivation for 17.6% of Owners, but it was a motivation for 23.7% of Renters.

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.



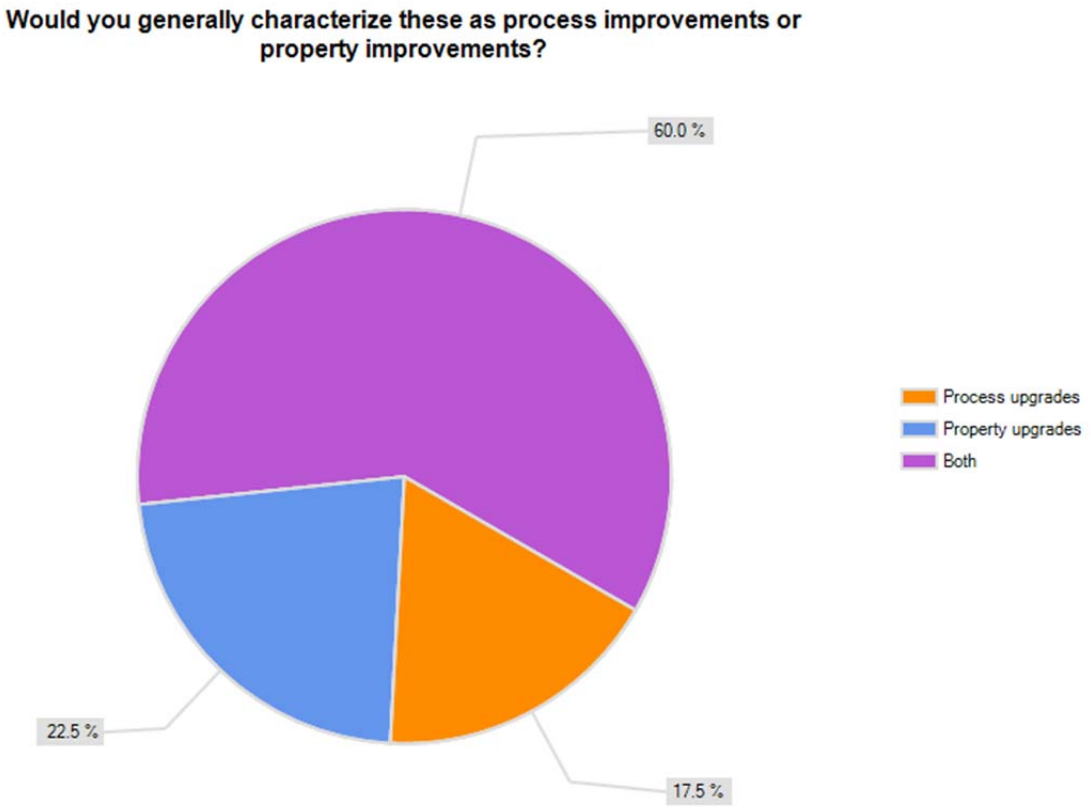
When asked what other energy-related issues they would like to convey to state legislators or the Public Utilities Commission in New Hampshire the comments from both groups included a similar range:

- 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.

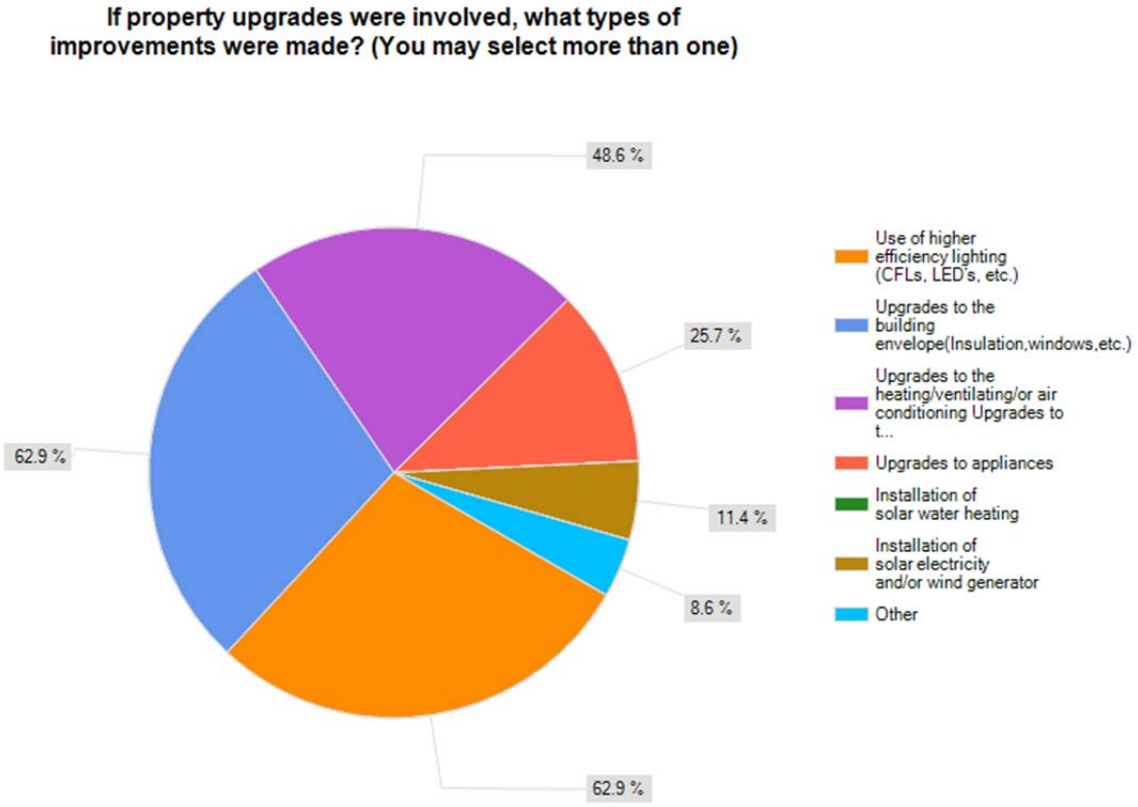
A.3. Business Owners and Operators

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.

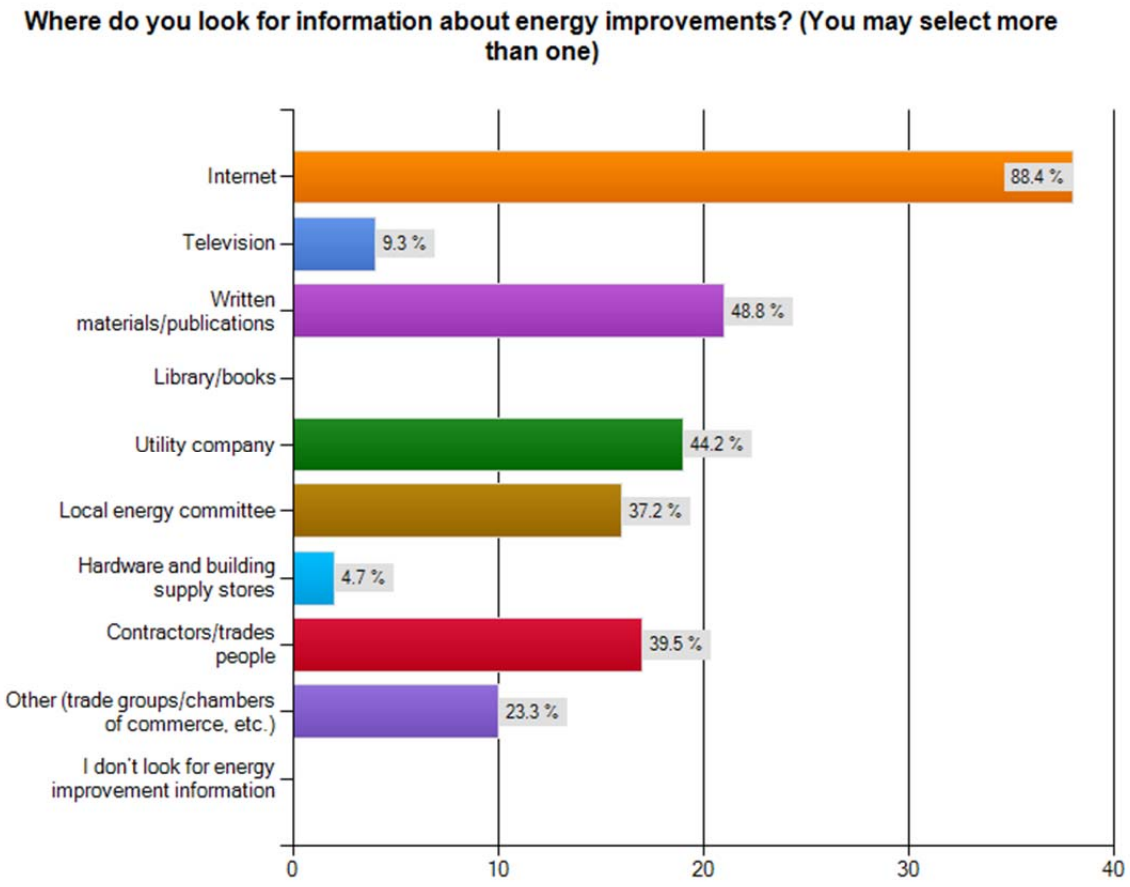


The majority of process related upgrades were related to increased recycling (62.5%) and improved scheduling (43.8%)

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 B: 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.

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