The New Hampshire Climate Change Policy Task Force

New Hampshire Climate Action Plan

A Plan for New Hampshire's Energy, Environmental and Economic Development Future

Appendix 4.1: Maximize Energy Efficiency in Buildings

Prepared by the
NH Department of Environmental Services
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RCI Action 1.1 – Maximize Energy Efficiency in New Construction

Summary

Develop a program to maximize energy efficiency and minimize net CO_2e output in new residential, commercial, institutional, and industrial building construction with a phased-in goal for new buildings to use zero net energy. New construction should incorporating state-of-the art energy efficiency and renewable energy systems into the design of the building envelope, operating systems (HVAC in particular), and energy consuming appliances and devices. This action can align with the national level program, Architecture 2030 focused on achieving the same outcome.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* The objectives of high energy efficiency and low CO_2 emissions are to be achieved through a combination of:
    - Outreach, marketing, education and training to building owners, developers, managers, operators, architects, engineers, contractors and trades people;
    - Graduated financial incentives for above-code performance; and
    - Access to attractive financing to amortize the costs of extra energy efficiency measures and renewable energy / low-emission systems over their life times.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* Legislation for building codes, zoning regulations, and potential tax code incentives. PUC actions in program development, incentives, state outreach, and education. Potential funding sources include: System Benefits Charge, Forward Capacity Market, Renewable Energy Fund, and GHG Reduction Fund.
    b. *Resources Required:* Funding for outreach, education, training, financial incentives for above code performance, and capitalization and/or credit enhancement for revolving loan and energy efficient mortgage programs.
    c. *Barriers to Address (especially for medium to low feasibility actions):*
        i. Infrastructure – There is a challenge in capturing, maintaining and disseminating knowledge and skills for state-of-the-art best practices, especially as that is a moving target crossing many building science and related disciplines. There may be issues with regard to capacity in both state government staff and the private sector with a need for skilled workforce development.
        ii. Higher First Cost – Premium efficiency equipment and measures generally commands a higher first cost.
        iii. Lack of Information/Unfamiliar Technologies/Product Availability – A problem attendant to all new technologies is an information and experience gap as compared to the comparable "tried and true" product equivalent. This can lead to reluctance on the part of designers, builders, and end-users to adopt the high efficiency alternatives. Furthermore, there can be problems with product availability and lead times.
        iv. Owner vs. Occupant Issues – Facility owners who do not pay the operating expenses may be reluctant to install premium efficiency equipment. Similarly, occupants who do not own a facility will be reluctant to make capital upgrades in order to achieve efficiency

improvements.

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.):

    a. *Parties Responsible for Implementation:* State and local government, NGOs, utilities, businesses, professional and trade associations, building owners, developers, managers, operators, architects, engineers, contractors and trades people.

    b. *Parties Paying for Implementation:* Current ratepayers through utilities (SBC, RPS, RGGI), investors, lenders, and building owners.

    c. *Parties Benefiting from Implementation:* Builders, building owners, tenants, and occupants, ratepayers, and the entire State of New Hampshire.

4. Related Existing Policies and Programs: CORE program (e.g. Energy Star New Homes Program and High Performance new commercial construction), Federal Tax credits, High Performance Schools (Jordan Institute & State), LEED (U.S. Green Buildings Council), EPA Energy Star programs including appliances, equipment and commercial building benchmarking, BOMA Energy Efficiency Program (BEEP), AIA & ASHRAE programs, local energy committees.

5. Complementary Policies (i.e., those that achieve greater reductions through parallel implementation):

    a. *Existing:* See above plus building and appliance energy codes, including raising standards and compliance.

    b. *Proposed:* EG Actions 1.1, Revenue Decoupling; 1.2, Energy Efficiency Procurement; 1.3, Combined Heat & Power Resource Standard; AFW Action 1.3, Promote Durable Wood Products; and TLU Actions, particularly those related to Goal 2.C.

6. Timeframe for Implementation:

    The CORE Programs have budgeted $5 million for new construction in 2008. With additional funding, there are opportunities for substantial program ramp up starting later this year and likely continuing for several years. By way of background, in 2006 New Hampshire ranked 4th in the nation in the portion of new homes that were Energy Star qualified at 17%, but lagging behind the leaders (New Jersey at 31%, VT at 24% and CT at 23%). One utility service territory in Vermont has approached 100%. 100% Energy Star qualified new construction will take some time and near zero net energy new construction, which is approaching technical feasibility, is an even further reach.

7. Anticipated Timeframe of Outcome: Starting in the near term, increasing over time and sustaining far into the future.

<u>Program Evaluation</u>

1. Estimated CO_2 Emission Reductions ($MMTCO_2e$ /year):

Efficiency Improvement	**Source**	**CO_2 Emission Reductions**		
		2012	**2025**	**2050**
100% More Efficient (Zero Net Energy Use)	Direct Fuel Use	0.18	1.30	3.16
	Electricity	0.28	1.55	3.78
	Total	0.46	2.85	6.93

2. Economic Effects:

    a. Costs:

        i. Implementation Cost:

Efficiency Improvement	Relative Cost
100% More Efficient (Zero Net Energy Use)	Very high (Greater than $1 billion)

        ii. Timing: Constant/even for all scenarios
        iii. Impacts: Evenly distributed for all scenarios

    b. Savings:

        i. Potential Economic Benefits:

Efficiency Improvement	Relative Cost
100% More Efficient (Zero Net Energy Use)	Very high (Greater than $1 billion)

        ii. Timing: Low short-term / mostly long-term for all scenarios
        iii. Impacts: Evenly distributed for all scenarios

3. Other Benefits/Impacts:

    a. *Environmental*: This would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

    b. *Health*: Personal comfort and air quality in building could be improved or indoor air quality can decline with tight construction if not implemented correctly with appropriate ventilation and air exchange.

    c. *Social:* Reducing energy use typically have short-term payback periods and can then provide savings for consumers and economic security for the state in the mid to long-term.

    d. *Other:*

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

    a. *Technical:* There are knowledge and skill barriers to state of the art practices such as lack of technical resources and expertise. Capacity for skilled workforce development to implement high performance best practices in new construction will be a challenge.

    b. *Economic*: In new construction, most EE measures and many renewable energy systems can be incorporated at life-cycle costs that will pay for themselves within the life of the measures, so there is the potential for substantial cost savings over time. There are significant market barriers in that much new construction is not minimizing life-cycle costs. Sometimes the developer is more interested in minimizing up front costs, such as for the sale of homes, or rental property, where the user or purchaser will pay the operating costs.

c. *Statutory/Regulatory*: Demise of federal Energy Tax credit[1].

d. *Social*: The most important factor in new home buyers' decisions to buy or build their home rather than any other home may be the quality of construction. Energy Star homes may not be able to claim outright that a home with the label is better constructed than one without it, although it is likely to use significantly less energy. Price is also a factor and Energy Start homes will tend to have a higher up front cost.
The reasons builders gave during interviews for not marketing energy efficiency included: 1) home buyers don't care; 2) home buyers are not educated about it and not interested in it; 3) they don't see any real need to push it since there is no energy crisis, 4) They don't think it makes any sense to do – customers are not willing to pay the extra cost and many don't want to get out of the realm of standard.

5. Other Factors of Note: Additional data sources may include EPRI EE potential study, NHPUC EE potential study (though not ready until August), McKinsey & Co. Reducing US GHG emissions report, US EPA, DOE and national energy labs, and ACEEE.

6. Level of Group Interest: High

7. References:

[1] In December, 2007, legislation to extend several of the Energy Efficiency Tax Incentives fell one vote short of the 60 required to end a filibuster in the Senate. Some incentives were extended through 2008 by the 109th Congress, in December 2006. As of December 31, 2007, however, the majority of the energy efficiency incentives provided under the Energy Policy Act of 2005 have expired.

RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings

Summary

Develop a program to retrofit existing New Hampshire housing stock to minimize or eliminate net CO_2e output, and further, to ensure that current and future investments minimize embedded CO_2e output with a phased-in goal to retrofit 30,000 homes annually in order to reduce their net energy consumption by 60%. Program elements should include: 1) building shell and window upgrades, including instrumented air sealing, and thermographic inspections; 2) space conditioning equipment upgrades/replacements, including ductwork and duct sealing; 3) domestic hot water system upgrades; 4) ENERGY STAR lighting; 5) water saving measures; 6) ENERGY STAR appliances; and 7) use of renewable energy systems.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* CO_2e reductions achieved through reduced energy usage and displacement of existing energy sources with cost-effective renewables. Vehicles for implementation include:
    - Outreach, marketing, education and training to building owners, developers, managers, operators, architects, engineers, contractors and trades people;
    - Graduated financial incentives for above-code performance; and
    - Access to attractive financing to amortize the costs of extra energy efficiency measures and renewable energy / low-emission systems over their life times.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* As part of the Restructuring Act, RSA 374-F:3 X, electric utilities in the State of New Hampshire have established a set of energy efficiency programs designed for statewide implementation in the service territories of the utilities regulated by the Public Utilities Commission (PUC). On January 1, 2003, the natural gas utilities again began offering energy efficiency programs for New Hampshire customers. In addition, there may be funds available via the Renewable Portfolio Standard (if alternative compliance payments are made), the Regional Greenhouse Gas Initiative, and possibly via SB 1628 (legislation that would provide residential customers a financial incentive for installing qualifying renewable generation).
    b. *Resources Required:* Energy service companies serving residential customers (single family and multi-family buildings) would help identify opportunities and implement appropriate energy efficiency or renewable energy opportunities. Other resources who would assist with or affect retrofit work are building owners or occupants, facility managers, retail lighting, appliance and home improvement stores, etc. Electric and Gas utilities have program implementation staff already in the field working with customers. Revolving loan funds and energy efficient mortgage products might help finance cost-effective measures over some or all of the measure life with neutral or positive net cash flow to the owner.
    c. *Barriers to Address (especially for medium to low feasibility actions):* Having skilled energy auditors or energy service companies who can help make good recommendations for home improvement opportunities and/or cost-effective renewable energy additions. Other barriers include: 1) high first cost of energy efficiency or renewable energy measures; 2) lack of consumer awareness of efficient appliances, lighting, and building technology, and acceptance of these; 3) split incentives, i.e., no incentive for tenant to improve landlord's property and no incentive for landlord to invest if tenant pays utility bill; 4) inability to recognize efficiency measures; 5) lack of retailer/manufacturer interest and marketing support for efficient products; 6) lack of builder/contractor interest and support for

energy efficient lighting; and, probably most important, 7) the potential lack of consumer financial resources to implement recommended energy efficiency/renewable energy improvements.

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.)
    a. *Parties Responsible for Implementation:* New Hampshire utilities and building owners and rental property managers.
    b. *Parties Paying for Implementation:* New Hampshire electric and gas customers (ratepayers) and building owners.
    c. *Parties Benefiting from Implementation:* Anyone living in an existing New Hampshire residence. New Hampshire landlords and property managers.

4. Related Existing Policies and Programs: CORE Energy Efficiency Programs (Energy Star Lighting, Appliances, Home Energy Assistance, Home Energy Solutions all address residential customers), Gas company efficiency programs, federal tax credits, EPA Energy Star programs and equipment ratings. Note that Renewable Portfolio Standards, Regional Greenhouse Gas Initiative, and SB1628 (legislation providing incentives for renewable generation) will generate additional funding for specific technology improvements.

5. Complementary Policies: *(i.e., those that achieve greater reductions through parallel implementation)*
    a. *Existing:* Electric and natural gas utilities have programs in place funded through utility bill surcharges. The Community Action Agencies have programs for income eligible customers funded through a combination of federal funds and utility bill surcharges.
    b. *Proposed:* Residential Energy Demand Reduction; RCI Action 1.5, Establish an Energy Properties Section in MLS Listings; RCI Action 3.1, Promote Renewable Energy and Low-CO_2e Thermal Energy Systems; Action 4.2, Increase Energy Efficiency through Building Management Education Programs; and Action 4.4, Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program. Integrating renewable energy additions and/or CO_2 reduction strategies into existing weatherization programs.

6. Timeframe of Implementation: There are approximately 600,000 housing units in the state. It is likely to take a decade or more to complete this work.

7. Anticipated Timeframe of Outcome: CO_2e reductions would begin to accrue immediately as each residence is retrofitted.

<u>Program Evaluation</u>

1. Estimated CO_2 Emission Reductions ($MMTCO_2e$ /year):

Efficiency Improvement	**Source**	**CO_2 Emission Reductions**		
		2012	**2025**	**2050**
30,000 homes/year; 60% more efficient	Direct fuel use	0.45	1.91	1.91
	Electricity	0.33	1.38	1.38
	Total	0.78	3.29	3.29

2. Economic Effects

    a. Costs:

        i. Implementation Cost:

Efficiency Improvement	Relative Cost
30,000 homes/year; 60% more efficient	High ($500 million to $1 billion)

        ii. Timing: Immediate / higher upfront for all scenarios
        iii. Impacts: Consumer – evenly distributed for all scenarios

    b. Savings:

        i. Potential Economic Benefits:

Efficiency Improvement	Relative Benefit
30,000 homes/year; 60% more efficient	Very high (Greater than $1 billion)

        ii. Timing: Low short-term / mostly long-term for all scenarios
        iii. Impacts: Consumer – evenly distributed for all scenarios

3. Other Benefits/Impacts:

    a. *Environmental:* Other emissions from electric generation and burning of fossil fuels for thermal loads will be reduced. Potential benefits beyond CO_2e reductions include: water savings, reduced sewage, and peak demand savings.

    b. *Health:* Personal comfort, air quality and the safety of occupants could be improved or indoor air quality can decline with air sealing and airtight retrofit if not implemented correctly with appropriate ventilation and air exchange.

    c. *Social:* Reducing energy use typically have short-term payback periods and can then provide savings for consumers and economic security for the state in the mid to long-term.

    d. *Other:*

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

    a. *Technical:* There are several programs to improve efficiency of existing residential housing stock in place today. Current programs provide weatherization services to approximately 2,000 housing units annually. This number will have to be significantly increased in order to accommodate all 600,000 New Hampshire residences…many more service providers will be needed.

    b. *Economic:* Based on benefit/cost models currently used to evaluate New Hampshire efficiency programs, it is possible that many of the suggested retrofit measures would likely not be cost-effective. Most energy efficiency program funding models are based on a cost sharing arrangement whereby public funds are used to attract private investment as a means of funding each project. This model attempts to maximize the impact of public funds by requiring a significant private investment in each project. To the extent public funding for a project is reduced, more private investment will be required. While this will improve the cost-effectiveness of the public funds, fewer participants will be able to afford being involved in the program. To the extent public funding of a project is increased,

overall available funding will be lower and fewer projects can be completed. Finding the right balance that will achieve the goal of retrofitting all 600,000 New Hampshire homes while treating all participants equitably is likely to be a challenge. Attractive and convenient financing alternatives such as energy efficient mortgages may provide another means for funding extensive retrofits.

c. *Statutory/Regulatory*: Continued SBC funding, availability of RPS or RGGI funds. In addition the New Hampshire Public Utilities Commission is currently examining the issue of decoupling utility revenues from sales volume. Decoupling is intended to remove a potential barrier to a utility taking action to reduce sales and therefore revenues.

d. *Social:* The methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

5. Other Factors of Note:

   Additional data sources may include EPRI EE potential study, NHPUC EE potential study (ECD: August 2008), McKinsey & Co. Reducing US GHG emissions report, US EPA, DOE and national energy labs, CEE and ACEEE.

   Properly installed solar photovoltaic can produce approximately 1,200 kWh/year (per kW); wind is harder to estimate due to the variability of the wind at each specific location.

6. Level of Group Interest: High

7. References:

   - US Census Fact Finder Website, http://factfinder.census.gov/home/saff/main.html?_lang=en.
   - Affordable Comfort, Inc. (ACI) white paper "Moving Existing Homes Toward Carbon Neutrality," http://www.affordablecomfort.org/PDF/Summit_White_Paper_11-28-07_Review_Draft.pdf.

RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings

Summary

Develop a program to retrofit existing New Hampshire commercial, industrial, and municipal buildings to minimize or eliminate net CO_2e output, and further, to ensure that current and future investments minimize embedded CO_2e output with a phased-in goal to reduce existing buildings net energy consumption by 50% by 2030. Program elements should cover the following: 1) lighting; 2) heating, ventilating and air conditioning (HVAC) systems; 3) processes (e.g., air compressor equipment and variable frequency drives; 4) control equipment and technologies to ensure efficient operation of all systems; 5) refrigeration equipment; 6) building shell and window upgrades; 7) hot water system upgrades; 8) reduced water usage; and 9) use of renewable energy systems.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* CO_2e reductions would be achieved though reduced energy usage and/or displacement of existing energy sources with cost-effective renewables. Vehicles for implementation include:
    - Outreach, marketing, education and training to building owners, developers, managers, operators, architects, engineers, contractors and trades people;
    - Graduated financial incentives for above-code performance; and
    - Access to attractive financing to amortize the costs of extra energy efficiency measures and renewable energy / low-emission systems over their life times.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* As part of the Restructuring Act, RSA 374-F:3 X, the electric utilities in the State of New Hampshire have established a set of energy efficiency programs designed for statewide implementation in the service territories of the utilities regulated by the Public Utilities Commission (PUC). On January 1, 2003, the natural gas utilities again began offering energy efficiency programs for New Hampshire customers. In addition, there may be funds available via the Forward Capacity Market, Renewable Portfolio Standard (if alternative compliance payments are made) and possibly via the Regional Greenhouse Gas Initiative.
    b. *Resources Required:* Energy Service Companies serving commercial and industrial customers will help customer identify opportunities and implement appropriate equipment. Other resources who assist with or affect retrofit work are building owners or occupants, purchasing agents, facility managers, equipment suppliers, manufacturer's reps, etc. Electric and Gas utilities have program implementation staff already in the field working with customers to identify opportunities. Larger customers usually have access to funding as long as the payback is within 2 years. Smaller customers usually do not have access to funds, and may benefit from a low/no interest loan, energy efficiency mortgage, or some other quick and easy financing.
    c. *Barriers to Address (especially for medium to low feasibility actions):* The Pressure of Time, Higher First Cost, Lack of Information, Unfamiliar Technologies, Product availability, Owner vs. Occupant Issues, Informed and High Quality Contractors, Financial Resources.

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.):
    a. *Parties Responsible for Implementation:* Electric and natural gas utilities implement existing energy efficiency programs, working with the NHPUC, OEP, and interested parties. Commercial, Industrial and Municipal customers have staff responsible for justifying, approving and installing energy

efficiency measures. Installation is often done by customers themselves or via energy service companies.

b. *Parties Paying for Implementation:* Electric and Gas customers through rates (base rates, SBC, Forward Capacity Market, RPS, RGGI), building owners (via internal budgets, investors or lenders). *Parties Benefiting from Implementation:* Any business operating in New Hampshire (customers/owners, tenants, occupants) will benefit directly, as will energy service companies. All New Hampshire customers and occupants/visitors to the State of New Hampshire will benefit indirectly via rates or cleaner air quality due to reduced emissions.

4. Related Existing Policies and Programs: CORE Energy Efficiency Programs (e.g., Large C&I Retrofit Program, C&I New Equipment & Construction Program, Small Business Energy Solutions Program, SmartStart funding program, Building Operators Management Programs), Federal Tax Credits, EPA Energy Star Benchmarking program, ASHRAE, AFE, ASME, BOMA programs).

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

   a. *Existing:* See above, plus state and federal appliance standards, and state energy codes.

   b. *Proposed:* C&I Energy Demand Reduction; Integrating renewable energy additions and/or CO_2 reduction strategies into existing energy efficiency programs, EG Actions 1.1, Revenue Decoupling and 1.2, Energy Efficiency Procurement.

6. Timeframe of Implementation: There are approximately 44,147 commercial and 2,314 industrial establishments in New Hampshire as of the 2006. It is likely to take a many years to complete this work.

7. Anticipated Timeframe of Outcome: CO_2e reductions would begin to accrue immediately as each business is retrofitted or renewable energy equipment installed.

Program Evaluation

1. Estimated CO_2 Emission Reductions ($MMTCO_2e$ /year):

Efficiency Improvement	Source	CO_2 Emission Reductions		
		2012	2025	2050
50% More Efficient	Direct Fuel Use	0.23	0.97	1.19
	Electricity	0.31	1.33	1.61
	Total	0.54	2.29	2.80

2. Economic Effects

   a. Costs:

      i. Implementation Cost:

Efficiency Improvement	Relative Cost
50% More Efficient	Moderately high ($125 million to $500 million)

      ii. Timing: Immediate / higher upfront for all scenarios
      iii. Impacts: Business – evenly distributed for all scenarios

b. Savings

i. Potential Economic Benefits:

Efficiency Improvement	Relative Cost
50% More Efficient	Very high (Greater than $1 billion)

ii. Timing: Low short-term / mostly long-term for all scenarios
iii. Impacts: Business – evenly distributed for all scenarios

3. Other Benefits/Impacts:

a. *Environmental*: Other emissions from electric generation and burning of fossil fuels for thermal loads will be reduced. Potential benefits beyond CO_2e reductions include: water savings, reduced sewage, and peak demand savings.

b. *Health*: Personal comfort and air quality in building could be improved. Air quality in state could be improved by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

c. *Social*: The methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

d. *Other*:

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

a. *Technical*: There are several programs to improve efficiency of existing commercial & industrial buildings in place today (Electric Companies, Gas Companies). Current programs provide lighting retrofits, HVAC upgrades, air compressor upgrades, etc. There are many energy service companies and electricians in New Hampshire and neighboring states that provide these services, but more will be required.

b. *Economic*: Based on benefit/cost models currently used to evaluate New Hampshire efficiency programs, it is possible that some of the suggested retrofit measures may not be cost-effective. Most energy efficiency program funding models are based on a cost sharing arrangement whereby public funds are used to attract private investment as a means of funding each project. This model attempts to maximize the impact of public funds by requiring a significant private investment in each project. To the extent public funding for a project is reduced, more private investment will be required. While this will improve the cost-effectiveness of the public funds, fewer participants will be able to afford being involved in the program. To the extent public funding of a project is increased, overall available funding will be lower and fewer projects can be completed. Finding the right balance that will achieve the goal of retrofitting all 36,000 New Hampshire businesses while treating all participants equitably is likely to be a challenge.

c. *Statutory / Regulatory*: Continued SBC funding, availability of RPS or RGGI funds. In addition, the NH Public Utilities Commission is currently examining the issue of decoupling utility revenues from sales volume. Decoupling is intended to remove a potential barrier to a utility taking action to reduce sales and therefore revenues.

d. *Social*: Many people would be expected to support efforts to increase efficiency, especially as energy costs continue to rise.

5. Other Factors of Note: Additional data sources may include EPRI EE potential study, NHPUC EE potential study (ECD: August 2008), McKinsey & Co. Reducing US GHG emissions report, US EPA, DOE and national energy labs, CEE and ACEEE.

6. Level of Group Interest: High

7. References

- Type (NAICS) and Quantity of NH Business Customers, http://www.census.gov/econ/census02/data/nh/NH000.HTM or http://data.bls.gov/PDQ/outside.jsp?survey=en
- Annual MWH Usage of NH Commercial & Industrial Customers, http://www.eia.doe.gov/cneaf/electricity/page/eia826.html
- Annual Fossil Usage of NH Commercial Customers, http://www.eia.doe.gov/emeu/states/sep_use/com/use_com_nh.html
- Annual Fossil Usage of NH Industrial Customers, http://www.eia.doe.gov/emeu/states/sep_use/ind/use_ind_nh.html

RCI Action 2.1 – Create Incentive Programs to Install Higher-Efficiency Equipment, Processes, and Systems

Summary

Incentive programs should be developed to increase the installation of higher-efficiency equipment and the adoption of higher-efficiency processes. Commercial, industrial, and municipal processes can significantly reduce net CO_2 output by properly designing process lines and using high-efficiency lighting and equipment (e.g. motors, transformers, VFDs, energy management and compressed air systems, etc.). The CORE Programs offered by the electric utilities currently provide these services for electricity-saving measures, and the gas utilities have comparable services for reducing natural gas consumption. Programming must be expanded to cover all cost-effective measures that reduce CO_2e emissions regardless of fuel type, including the use of renewable generation and use of combined heat and power (CHP). A combination of targeted and comprehensive energy audits could be used to identify efficiency improvements and opportunities to reduce CO_2 emissions from manufacturing processes. Incentive programs could be offered to retrofit inefficient processes and equipment and to help offset the additional costs of premium efficiency equipment in new construction.

Program Description

1. Mechanism (i.e., how the policy or program achieves the desired result): CO_2e reductions would be a direct result of the efficiency improvements brought about by these programs. Energy audits would determine the potential savings and CO_2e reductions associated with the efficiency improvements, and financial incentives would help bring about the replacement of inefficient processes and equipment as well as the selection of premium efficiency equipment for new construction.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* While new legislation is in place that has the potential to significantly increase funding (see Section 2.b below), administrative procedures which will guide the use and accountability for these funds must be developed (e.g. Sustainable Energy Division under the NH Public Utilities Commission, Energy Efficiency and Sustainable Energy Board).
    b. *Resources Required:*
        i. Funding – Sources may include the System Benefits Charge, RGGI (Regional Greenhouse Gas Initiative), RPS (Renewable Portfolio Standard), Forward Capacity Market (payments from the New England grid operator, ISO-NE, for reductions in electrical demand), SB 451 (legislation with the potential to spur investment in distributed generation)
        ii. Organizations – Public Utilities Commission, Department of Environmental Services, Energy Efficiency and Sustainable Energy Board, electric and gas utilities, Energy Service Companies
    c. *Barriers to Address (especially for medium to low feasibility actions):*
        i. Funding – This issue is two-fold. Not only must there be funding for programs and incentives, but the businesses and municipalities must also have allocated the funds needed to pay for the project(s). Most often the business funding makes up the majority of the project funding and generally must compete with all other capital projects in the organization for the limited capital funds available. The design of the incentives must take this into consideration – paybacks for efficiency projects must be competitive with other projects being considered by the organization or they will not be implemented.
        ii. Higher First Cost – Premium efficiency equipment generally commands a higher first cost.

iii. Lack of Information/Unfamiliar Technologies/Product Availability – A problem attendant to all new technologies is an information and experience gap as compared to the comparable "tried and true" product equivalent. This can lead to reluctance on the part of designers, builders, and end-users to adopt the high efficiency alternatives. Furthermore, there can be problems with product availability and lead times.

iv. Owner vs. Occupant Issues – Facility owners who do not pay the operating expenses may be reluctant to install premium efficiency equipment. Similarly, occupants who do not own a facility will be reluctant to make capital upgrades in order to achieve efficiency improvements.

v. Infrastructure – If funding is significantly ramped up, there may be an issue with having sufficient numbers of trained staff in place to implement the increased demand for projects.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

   a. *Parties Responsible for Implementation:* Energy Efficiency and Sustainable Energy Board, Utilities, Energy Service Companies, Department of Resources and Economic Development

   b. *Parties Paying for Implementation:* Rate payers

   c. *Parties Benefiting from Implementation:* Affected facilities, the public

4. Related Existing Policies and Programs: The CORE Programs offered by the electric utilities currently provide these services for electric measures and the gas utilities have comparable programs for natural gas measures.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

   a. *Existing* – CORE programs funded by System Benefits Charge; efficiency programs offered by the natural gas utilities.

   b. *Proposed* –
   RCI Action 1.1 - Maximize Energy Efficiency In New Construction
   RCI Action 1.3 - Maximize Energy Efficiency In Existing Commercial, Industrial, and Municipal Buildings
   EG Action 1.3, Combined Heat & Power Resource Standard

6. Timeframe for Implementation: Efficiency improvements in the electric and natural gas arenas are on-going through programs offered by the utilities. Expanded programs and funding are not likely to be available until 2009.

7. Anticipated Timeframe of Outcome: Immediate benefits with ongoing cumulative savings in energy and CO_2 emissions reductions.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

   a. Costs:

      a. Implementation Cost: Moderate ($25 million to $125 million)
      b. Timing: Immediate / higher upfront
      c. Impacts: State government

b. Savings:

a. Potential Economic Benefit: Supporting Mechanism
b. Timing:
c. Impacts: Business – Evenly distributed

3. Other Benefits/Impacts:

   a. Environmental: this would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

   b. Health: Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

   c. Social: none known

   d. Other: encourages manufacturers and suppliers to build higher quality, energy efficient equipment.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities): This action has moderate potential for implementation.

   a. Technical: limited number of trained auditors but may be supplemented by revolving loan fund and expansion of Smart Start.

   b. Economic: currently limited funding but may be supplemented by revolving loan fund and expansion of Smart Start

   c. Statutory/Regulatory: unknown

   d. Social: none known

5. Other Factors of Note:

6. Level of Group Interest: High

7. References:

   Related CORE Program Brochures:

   - New Construction And Equipment, http://www.psnh.com/SharePDFs/NewConstructionProgramBrochure.pdf
   - Large Business Retrofit, http://www.psnh.com/SharePDFs/LargeBusinessEnergySolutionsBrochure.pdf
   - Small Business Retrofit, http://www.psnh.com/SharePDFs/SmallBusinessEnergySolutionsProgramBrochure.pdf

EG Action 1.3 – Increase the Use of Combined Heat & Power Resources

Summary

The State should develop mechanisms to promote the use of combined heat & power (also known as CHP and cogeneration) systems for use as an on-site power plant or boiler to generate both electricity and useful heat simultaneously. This technology may be applicable where a thermal load (i.e., for space heating or industrial process heat) already exists or is planned. Combined heat & power would be appropriate for new boilers and for retrofits of existing boilers using cleaner-burning fuels that are not already co-generating electricity. For consistency with the goal of reducing overall emissions, any program designed around combined heat & power would need to define the allowable emission limits and might also specify allowable fuels for program eligibility. Mechanisms could include regulatory changes, incentives and portfolio standards.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*):
   Combined heat & power units enable more efficient electrical generation and the use of waste heat produced during generation and can be promoted through the implementation of incentives, policy and regulatory changes as needed. Clean combined heat & power systems give electricity consumers the capability of generating electricity or mechanical power on-site to meet all or part of their own needs, sell power back to the grid, and, through capture of heat typically lost during power generation, meet on-site thermal needs (hot water, steam, space heat, or process heat) or cooling (for example, through application of absorption chillers).

   Onsite generation of electricity reduces or eliminates electrical transmission needs, and any excess electricity produced by combined heat & power units can be delivered onto the grid. In so doing, combined heat and power raises the overall efficiency with which fuel is used in New Hampshire. Studies in many states have found cost-effective opportunities to reduce energy use by 20 percent or more. In addition to improvements in the efficiency of fuel use, and related reduction in greenhouse gas emissions, expanded use of distributed combined heat & power offers significant electricity system benefits (including avoided electricity transmission and distribution losses, and avoided requirements for electricity grid expansion).

   Enactment of incentives, policy and regulatory changes that promote the expansion of combined heat & power systems in New Hampshire would promote energy-saving opportunities instate and reduce dependence on other resources such as fossil fuels. Policies to encourage the adoption of combined heat & power include a combination of regulatory changes and possibly incentives for adoption of combined heat & power systems. The combination of regulatory changes and incentives would be designed to allow a certain percent of New Hampshire's estimated remaining combined heat & power potential to be realized at some in the future.

   Regulatory changes could affect interconnection standards, avoided-cost pricing rules and the existing net-metering regulations in New Hampshire and in the latter case allow combined heat & power fired by non-renewable fuels to receive payments for the excess electricity fed back onto the grid. Incentives could take the form of investment incentives (e.g., tax credit, rebates) per kW or equivalent incentives per horsepower of capacity or production tax incentives per kWh or equivalent incentives per hp-hour.

   Additional support would come in the form of the education and technical assistance required to support the integration of combined heat & power into siting and planning, building designs and operation by building planners, builders/contractors, energy managers and operators, and state and local officials. Support for research on combined power and cooling systems most relevant to New Hampshire could also occur building on the work that has already begun at the University of New Hampshire with its landfill gas fired combined heat & power system.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)

    a. *Method of Establishment (e.g., legislation, executive order):* Supporting policies, regulation changes and incentives would need to be identified and then implemented.

    b. *Resources Required:* Monies from the RGGI Fund and possible the RPS fund for financial incentives. New education and technical assistance programs.

    c. *Barriers to Address:* Eligibility requirements/emission limits need to be defined so that the installed combined heat & power units achieve actual emission reductions.

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.)

    a. *Parties Responsible for Implementation*: PUC, DES and the regulated electric and natural gas utilities.

    b. *Parties Paying for Implementation*: Ratepayers

    c. *Parties Benefiting from Implementation*: Utilities and all citizens.

4. Related Existing Policies and Programs (*i.e., those that address similar issues without interacting*): Today, New Hampshire has utility-administered energy efficiency programs funded by ratepayers through the System Benefits Charge (SBC) on electric bills and through a charge included in gas rates.

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)

    a. *Existing*:

        a. Renewable Portfolio Standard (RPS)

        b. Regional Greenhouse Gas Initiative (RGGI).

    b. *Proposed*

        i. Other policies proposed by the EG working group and the RCI working group.

        ii. SB451 (RSA 374-G) provides a framework for utility investments in distributed energy resources including energy efficiency.

6. Timeframe for Implementation: Enactment could be as early as 2009 with implementation in 2010.

7. Anticipated Timeframe of Outcome: 2010 – 2025.

<u>Program Evaluation</u>

1. Estimated CO_2 Emission Reductions - Analysis assumes 9% reduction in New Hampshire electric generation

    a. Short-term (2012): 0.15 $MMTCO_2e$/year
    b. Mid-term (2025): 0.53 $MMTCO_2e$/year
    c. Long-term (2050): 0.69 $MMTCO_2e$/year

2. Economic Effects

    a. Costs

        i. Implementation Cost: Moderately high ($125 million to $500 million)
        ii. Timing: Low short-term / mostly long-term
        iii. Impacts: Evenly distributed

b. Savings

i. Potential Economic Benefits: High ($500 million to $1 billion)
ii. Timing: Low short-term / mostly long-term
iii. Impacts: Business – evenly distributed

3. Other Benefits/Impacts

a. *Environmental*: Improvements in energy efficiency will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.

b. *Health*: Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.

c. *Social*: Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce "green" jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.

d. *Other*: Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*)

a. *Technical*: The technology exists to deploy combined heat & power systems immediately.

b. *Economic*: Combined heat & power units will have a positive impact.

c. *Statutory/Regulatory:*

d. *Social*: Increased energy efficiency provides a variety of societal benefits, including cleaner air and lower energy costs. The effectiveness of energy efficiency programs, and the degree to which the public embraces them, will depend on the details of their design and implementation.

5. Other Factors of Note: Energy reductions resulting from combined heat & power should not be double-counted as reductions associated with implementation of RGGI.

6. Level of Group Interest:

7. References:

- U.S. Clean Heat & Power Association, http://www.uschpa.org/.
- American Council for an Energy-Efficient Economy, "Energy Efficiency and Resource Standards: Experience and Recommendations," http://www.aceee.org/pubs/e063.htm.
- NH Public Utilities Commission, Energy Policy Commission Interim Report 2007 (12/1/07), http://www.puc.state.nh.us/Electric/electric.htm.
- Connecticut Department of Public Utility Control, http://ct.gov/dpuc/.
- New England Power Pool (NEPOOL) Generation Information System, www.nepoolgis.com.

EG Action 1.1 – Consider Alternative Rate Design

Summary

To the extent that it reduces or does not raise electricity costs and manages the risk to the utilities, the Public Utilities Commission (PUC) should identify and implement appropriate alternative rate designs for utilities in order to remove obstacles to increasing energy efficiency. Existing rate structures may conflict with the State's energy efficiency and alternative energy goals, in that traditional rate design is based upon "throughput" incentives for utilities to sell more energy (e.g., kW, kWh, therms) in order to increase their annual profits. Advocates of alternative rate structures believe that these mechanisms are a necessary ingredient to obtain strong utility support for energy efficiency and would complement other demand side management programs. Consumer advocates have raised issues regarding rate impacts and the potential for customers unfairly bearing all risks related to providing electricity. New Hampshire should explore these issues and develop a fair approach to new rate mechanisms that protect consumers and provide appropriate incentives to utilities to promote energy efficiency.

Program Description

1. Mechanism (*i.e., how the policy or program achieves the desired result*):

Traditional regulatory methods provide strong disincentives for energy efficiency and types of customer-sited resources reduction, as utility revenues and profits are linked to unit sales (e.g., kW, kWh, therms). The loss of sales due to successful implementation of customer-sited resources (e.g., energy efficiency, distributed generation/combined heat & power, demand reduction) will therefore lower utility profitability[2]. Utility spending on energy efficiency programs can affect a utility's financial position in two additional ways: (1) through recovery of the direct costs of the programs; and (2) through the effects on shareholder value of energy efficiency spending versus investment in supply-side resources[3].

The "throughput" incentive is at odds with public policy aimed at reducing the total greenhouse gases emissions by inhibiting a company from supporting investment in and use of least cost energy resources, and encourages utilities to promote incremental sales, even when they are wasteful and more expensive than demand-side resources. To address this issue, ratemaking policy should better allow utilities to align their profit motives with the policy goal of reducing emissions through the most cost effective means, whether energy efficiency or low and non-CO_2 emitting generation[4]. A variety of mechanisms have been developed to better facilitate the achievement of this goal by aligning rate making and such policy goals including:

- Decoupling (full, partial, limited);
- Shareholder Performance Incentives[5];
- Performance Target Incentives;
- Cost Capitalization Incentives;
- Shared Net Benefits Incentives; and
- "Save-a-Watt" Incentives.

[2] Weston, Frederick (2008) Customer-Sited Resources and Utility Profits: Aligning Incentives with Public Policy Goals US EPA Webinar (28 August 2008) http://www.epa.gov/CHP/documents/wbnr082808_weston.pdf

[3] National Action Plan for Energy Efficiency (2007). Aligning Utility Incentives with Investment in Energy Efficiency. Prepared by Val R. Jensen, ICF International. www.epa.gov/eeactionplan.

[4] Weston, Frederick (2008) Customer-Sited Resources and Utility Profits: Aligning Incentives with Public Policy Goals US EPA Webinar (28 August 2008) http://www.epa.gov/CHP/documents/wbnr082808_weston.pdf

[5] Today the New Hampshire electric utilities earn a Shareholder Incentive for the delivery of the "Core" ratepayer-funded energy efficiency programs, in a range of 8% to 12% of the overall annual program budget.

These mechanisms target the key financial barriers to utility support for customer-sited resources while stabilizing utility revenues, and can reduce or eliminate a host of risks for utilities. Customer protections must be included to ensure that all risks are not shifted to customers.

2. Implementation Plan (*i.e., how to implement the specific policy or program*)

    a. *Method of Establishment (e.g., legislation, executive order):* The PUC can implement alternative rate designs either as a general policy, or on a utility-specific basis. There is currently an open docket investigating decoupling and other rate mechanisms (DE 07-065). If the PUC implements decoupling, there would likely be proceedings to review the mechanism and to make any necessary reconciliation every few years.

    b. *Resources Required:* Staff time and analysis to evaluate the impact that individual mechanisms will have on emissions, implementation of additional energy efficiency programs, and customer rates.

    c. *Barriers to Address (especially for medium-to-low feasibility actions):* There is recognition that some mechanisms alone do not provide a positive incentive for new energy efficiency programs by itself. It has been suggested that some mechanisms, such as decoupling, shift some risk from utility shareholders to customers and would therefore justify lower rates of return for utilities. Conversely, in the absence of either a multi-year rate plan or the use of a future period for rate setting purposes, it could increase risk for a utility.

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.)

    a. *Parties Responsible for Implementation*: Public Utilities Commission, regulated electric and natural gas utilities.

    b. *Parties Paying for Implementation*: Customers would experience additional charges or credits on bills.

    c. *Parties Benefiting from Implementation*: Utilities and customers could benefit through greater certainty.

4. Related Existing Policies and Programs *(i.e., those that address similar issues without interacting*): Today, New Hampshire has utility-administered energy efficiency programs funded by customers through the System Benefits Charge (SBC) on electric bills and through a charge included in gas rates. Included in those programs, in addition to recovery of all prudently incurred costs, are monetary incentives of 8-12% of annual budgets paid to the utilities if performance goals are achieved in the implementation of the programs. However, under the current system, utilities in New Hampshire still have a financial incentive to maximize sales.

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*)

    a. *Existing*: See Item 4 above.

    b. *Proposed*:

        iii. The Public Utilities Commission (PUC) currently has an open docket to consider implementing rate mechanisms such as revenue decoupling for NH utilities. (Docket No. DE 07-064, opened May 14, 2007).

        iv. EG Action 1.2 – Energy Efficiency Procurement Energy Efficiency Procurement: In this policy, each electric and natural gas distribution company would be required to increase investments over a reasonable period of time in energy efficiency and demand reduction programs to capture all cost-effective investments (i.e., those available at lower cost than supply) that are reliable and feasible on behalf of all customers. The energy cost savings potential of this policy could be realized with the assistance of a rate structure that removes the throughput incentive for utilities to boost profits by selling more energy.

v. SB451 (RSA 374-G): This legislation provides a framework to utilize ratepayer funds to make investments in distributed energy resources, including energy efficiency, by allowing a utility to include the costs of such investments in rates if the utility can show a benefit to all customers. At this time no utility has filed a proposal at the PUC to take advantage of this new law.

6. Timeframe for Implementation: A PUC docket is underway for decoupling and implementation could be as early as 2009. Should this fail, additional time would be needed for alternatives to be identified and dockets litigated.

7. Anticipated Timeframe of Outcome: See above.

Program Evaluation

In the context of the Climate Change Action Plan, alternative rate structures should be viewed as complementary mechanisms that enable utilities to support a variety of customer-side initiatives, including efficiency, demand response, and combined heat & power , all of which reduce energy consumption. The evaluation of these mechanisms should be based on whether they effectively achieve these objectives at reasonable administrative costs with minimal disruption to customers.

The energy savings and emission benefits of the alternative rate structures, considered by themselves and separate from any specific program incentives to increase energy efficiency, are not directly quantifiable. The magnitude of customer benefits will depend on the nature and investment levels of the specific programs adopted for reducing energy consumption and emissions.

1. Estimated CO_2 Emission Reductions: Emissions for this action are not separately quantified but are included as part of the analysis of RCI 1.1 – 1.3 as this would be a supporting Action.

2. Economic Effects

   a. Costs

      iv. Implementation Cost: Low (0-$2.5 million)
      v. Timing: Constant / even
      vi. Impacts: State government ***(due to administrative costs)***

   b. Savings: Not directly quantifiable; proposed action is a supporting mechanism.

3. Other Benefits/Impacts

   a. *Environmental:* Improvements in energy efficiency will reduce emissions of carbon dioxide and other greenhouse gases and primary air pollutants that contribute to climate change and damage our ecosystems. Emission reductions will directly improve air and water quality while indirectly benefitting the fish, wildlife, and ecosystems that depend on clean air and water.

   b. *Health:* Particulate matter and ozone precursors such as VOCs and NOx contribute to cardiac and respiratory ailments in humans and adversely affect the health of other living organisms. In particular, ozone formation increases dramatically during hot weather. Therefore, measures that mitigate climate warming by reducing harmful emissions will also be beneficial to the health of human populations and ecosystems in general.

   c. *Social:* Programs that promote environmental sustainability by conserving natural resources and reducing emissions have immediate and long-term benefits to society. Increased public awareness arising from such programs will help to alleviate climate change. Programs involving

energy conservation and some alternative generation technologies have relatively short payback periods. These programs bolster the local economy in a number of ways: they produce "green" jobs, free up money that can be reallocated to other purposes, and result in greater economic security overall.

d. *Other:* Energy efficiency and emission reductions will reduce the load on our aging infrastructure and will create demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles, and opportunities*)

   a. *Technical*: Alternative rate structures can be implemented relatively easily once the PUC determines appropriate policies.

   b. *Economic*: Alternative rate structures will have a positive impact on utilities and, if combined with incentives for energy efficiency, will promote economic activity in the energy efficiency industry and reduce consumers' energy costs over reasonable payback periods.

   c. *Statutory/Regulatory*: The PUC has the authority to approve alternative rate structures.

   d. *Social*: Increased energy efficiency provides a variety of societal benefits, including cleaner air and lower energy costs. The effectiveness of energy efficiency programs, and the degree to which the public embraces them, will depend on the details of their design and implementation.

5. Other Factors of Note: Alternative rate structures may be combined with incentives for utilities to place greater emphasis on energy efficiency activities if the full benefits of new rate mechanisms are to be realized.

California has had revenue decoupling in place for most of the past 25 years. There, the decoupling mechanism is generally accepted as a way to make the state's electric utilities indifferent to sales levels. Decoupling has had only small impacts on rate volatility. Analyzing ten years' worth of decoupling data, a 1994 U.C. Berkeley study concluded that "decoupling has had a negligible effect on rate levels and has, for [one of the three utilities analyzed], actually reduced rate volatility."[6]

6. Level of Group Interest:

7. References:

- National Action Plan for Energy Efficiency (2007). Aligning Utility Incentives with Investment in Energy Efficiency. Prepared by Val R. Jensen, ICF International. www.epa.gov/eeactionplan
- Weston, Frederick (2008) Customer-Sited Resources and Utility Profits: Aligning Incentives with Public Policy Goals US EPA Webinar (28 August 2008) http://www.epa.gov/CHP/documents/wbnr082808_weston.pdf

[6] Joseph Eto, Steven Soft, and Timothy Belden, *The Theory and Practice of Decoupling*, Lawrence Berkeley Laboratory, University of California, January 1994, Report LBL-34555, UC-350 at 46. The cited excerpt of this report is attached hereto as Ex. A. The full report has been filed electronically, and is on file with ENE and available upon request.

RCI Action 1.4A – Upgrade Building Energy Codes

Summary

To ensure that future editions of New Hampshire's building energy code are appropriate to achieve goals in other building related actions, the state should participate in the IECC energy code update process, either on its own or by providing input through other regional partners that do participate, such as Northeast Energy Efficiency Partnerships (NEEP). However, there is considerable evidence that if the state is to achieve deeper greenhouse gas emission savings, it should make its building energy code more stringent than the current IECC. New Hampshire first adopted an energy building code under RSA 155-D in 1979 and, through legislation, adopted the most recent edition of the International Energy Conservation Code (IECC2006) in 2007. The state recognizes that building energy codes represent one of the more cost-effective ways to reduce energy use (both electric and heating/cooling fuel) and the related carbon emissions. Energy codes can be used to regulate energy use in new construction and substantial renovation of all buildings, and, when administered in tandem with "stretch codes" or "beyond code" provisions, can also inform more stringent high-performance (or "green") construction standards to serve additional state policy objectives. By ensuring the regular update of New Hampshire's residential and commercial building energy codes with reference to the latest national/international model code as a baseline, the state would set as its "floor" the latest technologies and practices inherent in that most recently updated code. In addition, the state could then use an informative appendix to the code (similar to the "Field Guide for Residential Construction" currently available to New Hampshire builders) to define a preferred "higher floor" that sets beyond-code high-performance building standards.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result*): A building energy code is used to establish a minimum level of energy efficiency in new construction, renovations, and additions. The International Code Council (ICC) is a recognized leader in developing through consensus and technical review the latest building construction practices to maximize energy efficiency, as represented in the International Energy Conservation Code (IECC). New Hampshire currently has in place, through legislation, the most recent edition of that code. To ensure that future editions of the state's code are appropriate, the State of New Hampshire should participate in the IECC energy code update process, either on its own or by providing input through other regional partners that do participate, such as Northeast Energy Efficiency Partnerships (NEEP). However, the state could achieve deeper greenhouse gas emission savings by making its building energy code more stringent than the current IEC. It could do so by amending the code through the Building Code Review Board or by providing options or models for enhanced energy use standards that cities and towns could adopt pursuant to their authority under RSA 155-A:2 IV and 674:51 I. For example, using the most current IECC as a baseline, New Hampshire could set its own more stringent state building energy code to achieve energy savings of at least 20 percent beyond the IECC baseline in all new construction and substantial renovation. That standard could then continue to slide upward as the code is regularly revised and enhanced on a three-year cycle. In order to be consistent with RCI 1.1, Maximization of Energy Efficiency in New Construction, the state should track and consider adoption of those codes associated with the Architecture 2030 initiative.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*

    a. *Method of Establishment (e.g., legislation, executive order)*: Building energy codes can be adopted by the General Court as in RSA 155:A IV or amended by rule by the Building Codes Review Board to the extent the board deems that such updates are necessary, subject to ratification by legislation within two years in accordance with RSA 155-A:1IV In several states in the region, legislation has been enacted or is under consideration to mandate that the state's building energy code be updated within a defined time frame, generally a year, from the date of the publication of the latest national model energy code.

b. *Resources Required*: TBD

c. *Barriers to Address (especially for medium to low feasibility actions)*: Current barriers to adoption of a more rigorous building energy code include the absence of a more recent version of a reference model code, the lack of any requirement for the state to update its building energy code when national model reference codes are updated, as well as the absence of a link between state energy and climate policy and state building code policy. In general designers and builders also need a reasonable length of time to adjust to changes and operate under new codes. The code development community appears to have adopted a three year cycle as reasonable.

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.):

   a. *Parties Responsible for Implementation*: The New Hampshire General Court establishes the state building energy code; the Buildings Code Review Board may adopt changes it deems necessary subject to ratification within two years by the General Court; individual cities and towns administer and enforce the code, as they do other building codes (mechanical, structural, health and safety, etc.). In addition, all new construction or substantial building renovation in the state of New Hampshire and parties related to it – architects, engineers, builders/contractors, local building officials, owners and occupants – will be impacted when new codes are adopted.

   b. *Parties Paying for Implementation*: The costs of implementation of updated codes are born by the administering and enforcing authorities including the Public Utilities Commission, the Fire Marshall, the municipalities and their code enforcement. These costs include education, training and administrative expenses. Under the provisions of RSA 155-A:9, municipalities may establish fees to defray their costs.

   c. *Parties Benefiting from Implementation*: All citizens and businesses in New Hampshire benefit from having buildings meet minimum building energy codes through reduced energy use, which can help to lower energy bills on an individual basis as was as through wholesale market clearing prices for electricity and other fuels. Additional benefits are realized by all parties from the reduced emissions of nitrous oxides, sulfur dioxide and carbon dioxide that are associated with electric generation.

4. Related Existing Policies and Programs: Currently, the New Hampshire Core utility energy efficiency programs offer incentives and/or technical support for new construction and retrofits. The programs' guidelines are reviewed and adjusted annually by the utilities and stake holders with Public Utilities Commission approval to ensure consistency with codes and standards as well as cost effectiveness and energy savings and emissions reductions goals.

5. Complementary Policies (i.e., those that achieve greater reductions through parallel implementation):

   a. *Existing*: As referenced, building energy codes should continue to work in a complementary fashion with:

      vi. Ratepayer-funded energy efficiency programs, both for new construction, as well as those addressing specific technologies, such as lighting or HVAC equipment

      vii. State demonstration projects or programs addressing construction or renovation of publicly-funded facilities

      viii. Revenue programs to provide incentives for certain types of private sector actions, such as new construction standards

      ix. State guidance to municipalities seeking to implement energy management or climate change strategies at the local level.

   c. *Proposed*:

SB 259, pending action by the Governor, would establish certain minimum appliance efficiency standards to be administered by the PUC. The state should regularly look to set new standards for product efficiency where appropriate. Where those standards are integral to building systems, i.e., HVAC, commercial lighting, those policies will need to be aligned with upgraded building energy codes. Similarly, if new energy efficiency programs are contemplated as a result of an increase in available funding, those programs addressing particular technologies will also need to be integrated with building energy code efforts. HB 1561, pending action by the Governor, would establish an Energy Efficiency and Sustainable Energy Board to promote and coordinate energy efficiency efforts by the state and would include representation from the State Fire Marshall's office.

RCI Action 1.1 – Maximize Energy Efficiency in New Construction
RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings
RCI Action 1.4B – Improve Building Energy Code Compliance
RCI Action 4.2 – Increase Energy Efficiency through Building Management Education Programs
RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach
RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program *(formerly RCI Action 1.6)*
RCI Action 4.5 – Create an Energy Efficiency and Sustainable Energy Systems Web Portal
GLA Action 1.1 – Establish an Energy Management Unit
GLA Action 2.1 – Apply High-Performance Building Standards to New Construction and Renovations
GLA Action 2.2 – Maximize Energy Efficiency in Existing Government Buildings
GLA Action 3.1 – Encourage Renewable Energy and Energy Efficiency Projects for Existing State-Owned Buildings and Facilities
TLU 2.C actions are all complementary proposed policies.

6. Timeframe for Implementation: New Hampshire has recently adopted the most recent version of the IECC (2006), which is currently being revised and is scheduled for approval in September 2008, and then becomes available for adoption in January 2009.

7. Anticipated Timeframe of Outcome: Improvements to the building energy code, and related processes and policies, as well as the adoption of a beyond-code informative appendix, will yield long term energy savings and related emissions reductions as the building stock is replaced.

Program Evaluation

1. Estimated CO_2 Emission Reductions ($MMTCO_2e$ /year):

Efficiency Improvement	Source	CO_2 Emission Reductions		
		2012	2025	2050
50% More Efficient	Direct Fuel Use	0.15	0.65	1.58
	Electricity	0.05	0.22	0.55
	Total	0.21	0.87	2.13

2. Economic Effects

   a. Costs:

      i. Implementation Cost:

Efficiency Improvement	Relative Cost
50% More Efficient Thermal	Moderately high ($125 million to $500 million)

ii. Timing: Constant / even for both scenarios
iii. Impacts: Evenly distributed for both scenarios

b. Savings:

i. Potential Economic Benefits:

Efficiency Improvement	Relative Benefit
50% More Efficient Thermal	High ($500 million to $1 billion)

ii. Timing: Low short-term / mostly long-term for both scenarios
iii. Impacts: Evenly distributed for both scenarios

3. Other Benefits/Impacts:

a. *Environmental*: Reductions in nitrogen oxides, sulfur dioxide and carbon dioxide, as well as other pollutants, resulting from decreased energy consumption.
b. *Health*: Additional benefits to code-compliant and high performance buildings include improved indoor air quality and fewer sick days. In urban areas, rates of childhood asthma may also impacted by reduced electric generation due to more efficient buildings.
c. *Social*: More efficient buildings save energy and money and help address the need to act to mitigate global climate change. In addition, evidence has shown improvements to occupant comfort and productivity in high performance buildings.
d. *Other*: Economic development also benefits through the growth in the "clean energy" sector of the state's economy, both in white collar (planning and implementation; inspection) and blue collar (installation; construction) jobs.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

a. *Technical:* Technically, the largest challenge in improving building performance through code and beyond code standards will come in the training and deployment of building officials who enforce the code as well as builders and contractors who understand and construct in compliance with the code.

b. *Economic*: The potential costs to the state and/or its communities and the construction sector is in higher construction costs that are typically outweighed by the economic benefits to the growth of the clean energy economy (see 3d, above), energy savings among consumers and businesses, and slowing of climate change that negatively impacts several key New Hampshire business sectors.

c. *Statutory/Regulatory:* New Hampshire has a legislatively defined process for reviewing and updating building energy codes. See RSA 155-A States across the Northeast are looking at building energy codes as a means of meeting both climate change goals and controlling energy costs, meaning a variety of information and best practices can be made available to inform either statutory or regulatory efforts.

d. *Social: Consumers*: Setting policies that address the biggest users of energy in the world – buildings – will require some education of the public. But once people understand that the average home uses exponentially more energy than the average car, the social acceptance of higher performing buildings is a much easier sell. Individuals and businesses are increasingly willing to make changes that reduce

their energy costs and their carbon footprints, although many people may not fully appreciate the energy and climate impacts of their actions.

5. Other Factors of Note:

   Objections may come from certain local building officials who constantly have to learn the provisions of a new code. Objections may also come from builders, for the same reason. Caution must be used in adopting new energy codes to ensure that the new code actually increases energy efficiency. Safeguard language on "backsliding" is generally used where states mandate updates to the latest model code, and is recommended for any strategy New Hampshire may pursue.

   It may be helpful to note that the idea of taking climate change action through building codes and standards is increasing in the states of the Northeast U.S. Maine has recently adopted legislation tying its first ever mandatory statewide building energy code to the IECC, as well as to increase compliance levels through training and certification of specialized building energy code inspectors. Pending legislation in Massachusetts would do the same. Other policy efforts in this regard have been seen in recent months in New York and New Jersey as well. In addition, many states also want to go "beyond code" to set even higher performance standards in order to achieve even greater energy savings where possible.

6. Level of Group Interest: High

7. References:

RCI Action 1.4B – Improve Building Energy Code Compliance

Summary

New Hampshire should consider mechanisms that would result in stricter enforcement of energy codes. Building energy codes represent one of the more cost-effective ways to reduce long-term energy use (both electric and heating/cooling fuel) and the related carbon emissions. Energy codes can be used to regulate energy use in new construction and substantial renovation of all buildings, and, when administered in tandem with "stretch codes" or "beyond code" provisions, can also inform more stringent high-performance (or "green") construction standards to serve additional state policy objectives. However, any effort to capture savings from building energy codes has to come with the understanding that the best code is only as good as the compliance with that code. The state might consider a formal certification process for inspectors beyond the current voluntary process offered through the ICC. Consideration should be given to developing a system to promote strict enforcement of the state's building energy code, even in rural communities, to ensure that all new structures are in compliance. Such programming could include required third party certification, whose fee is included as a cost of construction.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):*

   Many New Hampshire communities do not have a local code official to enforce any aspect of the state's building code, effectively leaving new construction in those communities un-inspected. And although free training on the building energy code has been offered to builders and code officials consistently since the inception of the code nearly 30 years ago, the training process must continue to be examined for areas of improvement.

   Consequently, the state should consider mechanisms that would result in stricter enforcement of the energy code. Measures might include a formal certification process for inspectors beyond the current voluntary process offered through the ICC and development of a system to promote strict code enforcement even in New Hampshire's rural communities.

   Although there is no definitive analysis of compliance rates with the building energy code in New Hampshire, NEEP did commission a survey of code officials in New Hampshire and Rhode Island in 2001 to gain a sense of the local issues related to administration of the building energy code. Of note were the following:

   - A question asking local code officials to assess their knowledge of the residential building energy code revealed that only 41 percent considered their knowledge of the code "very good." With regard to the commercial code, only 16 percent assessed their knowledge level as "very good," and a full 30 percent said they had "not very much" knowledge at all.
   - Only 30 percent of the officials had ever received any training in the commercial energy code.
   - Perhaps most troubling, the report noted that: "Large areas of the state, generally central and northern New Hampshire do not have anyone responsible for energy code compliance at the town level. Responses from the contact activity suggest this lack is generally a resource lack: there is no one with the appropriate expertise in the energy codes (other aspects of building codes are enforced), or there is a lack of financial resources to fund this aspect of compliance activity."

   The state legislatively adopts the energy code on a statewide basis, but it is enforced on a municipal level, along with other aspects of the building code. Thus, realizing the energy savings in the code depends on appropriate administration and enforcement at the local level; and, as noted above, there is at least significant anecdotal evidence that compliance rates fall well short of 100 percent. Perhaps the most

effective model for increasing code compliance rates is the Washington state model of specialized building energy code enforcement, where trained and certified building energy code inspectors are responsible for the energy portions of the building energy code. This specialized inspector would ideally be a third party, although local building inspectors could opt to perform that specialized energy inspection themselves, provided they are properly trained and certified. The specialized inspection could be paid for out of the building permit fee or otherwise included as part of the cost of building the structure, sparing the municipality from any unfunded mandate. A "safety valve" could be written into the code such that when a builder applies for an inspection, if they do not receive it in a specified length of time then they are "presumed to pass"[7]. The state of Maine, in recently adopting that state's first-ever mandatory statewide building code, included a provision for establishing such a specialized enforcement function for review and approval of the energy section of the building code.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*

    a. *Method of Establishment (e.g., legislation, executive order)*: Regulations governing building energy codes can be set either administratively or legislatively. However, to develop the appropriate mandate and link code regulations to other state energy policies – such as those addressing climate change action – it is recommended that a legislative mandate be pursued. Such mandate should direct the appropriate state agency to develop requirements and promulgate regulations for the training and certification of municipal building inspectors regarding the provisions of the state building energy code. Further, that mandate should require that all new construction or substantial renovation of buildings pass inspection only by inspectors who have been trained and certified, demonstrating full compliance with the energy provisions of the state building code.

    Under existing statute, RSA 155-A:7I, the State Fire Marshal or his designee has authority to enforce the state building code in municipalities without a building inspector. Provision II of that statute allows state agencies, boards and commissions to provide advisory services and technical assistance to any enforcement authority requesting such service. Obviously, staffing and monetary constraints limit the amount of such support that is available but additional funds and resources might be made available to underwrite such help. Either Executive Order or budget authority could be used to expand the availability of these existing resources to more municipalities.

    Locally, under RSA 155-A:9 a municipality may establish fees to cover the costs of administration, implementation and enforcement of the building code. However, for whatever reasons, many municipalities do not devote significant resources to energy code enforcement, while some do. A state-wide mechanism to certify inspectors beyond the current voluntary system could be established. As trained inspectors are currently often employed by multiple municipalities, the cost of certifying inspectors for each community could be minimizing by sharing personal on a regional basis. RSA 21-J:14-h-j, concerning cooperative assessment districts provides one model that might better enable regional cooperation on code enforcement.

    b. *Resources Required*: Funding for such an effort or to provide supplementary inspectors devoted to the energy code could come from various sources, including special building permit fees and the GHG Emissions Reduction Fund under RSA 125-O:23 Continued training of code officials at the state level remains essential.

    c. *Barriers to Address (especially for medium to low feasibility actions)*: The current barriers that exist to greater compliance with building codes in general and building energy codes in particular often relate to:

[7] This addresses the fact that there may not be enough building auditors at present to meet the demands of such a code.

- Resistance to government regulation and inspection by some members of society and the traditional primary role of municipalities in code enforcement, both of which result in varied levels of enforcement;
- Lack of a mechanism to ensure enforcement at the municipal level;
- Lack of understanding of building energy codes at the municipal level; and
- The lower priority given to energy codes by local building officials in comparison with health and safety codes.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*
    a. *Parties Responsible for Implementation*: Building energy codes can be adopted by the General Court as in RSA 155-A:1, IV or amended by rule by the Building Codes Review Board to the extent the board deems that such updates are necessary, subject to ratification by legislation within two years in accordance with RSA 155-A:10, V. Individual cities and towns administer and enforce it, as they do other building codes (mechanical, structural, health and safety, etc.). In addition, all new construction or substantial building renovation in the state of New Hampshire and parties related to it – architects, engineers, builders/contractors, local building officials, owners and occupants – will be responsible for increased compliance.
    b. *Parties Paying for Implementation*: In a system of supplemental or specialized energy code inspectors, the certified energy code inspectors would be responsible for certifying compliance with the code to the local building official. Those supplemental or specialized energy code inspectors could be paid for by the owner or builder as part of the building permit fee in order to relieve the municipality or the state of the budgetary burden. Otherwise, other grants or programs would be needed to fund the specialized code inspectors, which might include the GHG Emissions Reduction Fund under RSA 125-O:23.
    c. *Parties Benefiting from Implementation*: All citizens and businesses in New Hampshire benefit from having buildings meet minimum building energy codes through reduced energy use, which can help to lower energy bills on an individual basis as well as through wholesale market clearing prices for electricity and other fuels. Additional benefits are realized by all parties from the reduced emissions of nitrous oxides, sulfur dioxide and carbon dioxide that are associated with electric generation.

4. Related Existing Policies and Programs: Currently, the New Hampshire Core utility energy efficiency programs offer incentives and/or technical support for new construction and retrofits. The programs' guidelines are reviewed and adjusted annually by the utilities and stake holders with Public Utilities Commission approval to ensure consistency with codes and standards as well as cost effectiveness and energy savings and emissions reductions goals.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*
    a. *Existing*: As referenced, building energy codes should continue to work in a complementary fashion with:
        i. Ratepayer-funded energy efficiency programs, both for new construction, as well as those addressing specific technologies, such as lighting or HVAC equipment, including Energy Star Homes.
        ii. State demonstration projects or programs addressing construction or renovation of publicly-funded facilities
        iii. Revenue programs to provide incentives for certain types of private sector actions, such as new construction standards

iv. State guidance to municipalities seeking to implement energy management or climate change strategies at the local level.

b. *Proposed*:

SB 259, pending action by the Governor, would establish minimum appliance efficiency standards, and the state should regularly look to set new standards for product efficiency where appropriate. Where those standards are integral to building systems, i.e., HVAC, commercial lighting, those policies will need to be aligned with upgraded building energy codes. Similarly, if new energy efficiency programs are contemplated as a result of an increase in available funding, those programs addressing particular technologies will also need to be integrated with building energy code efforts. HB 1561, pending action by the Governor, would establish an Energy Efficiency and Sustainable Energy Board to promote and coordinate energy efficiency efforts by the state and would include representation from the State Fire Marshall's office.

RCI Action 1.1 – Maximize Energy Efficiency in New Construction
RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings
RCI Action 1.4A – Upgrade Building Energy Codes
RCI Action 4.2 – Increase Energy Efficiency through Building Management Education Programs
RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach
RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program *(formerly RCI Action 1.6)*
RCI Action 4.5 – Create an Energy Efficiency and Sustainable Energy Systems Web Portal
GLA Action 1.1 – Establish an Energy Management Unit
GLA Action 2.1 – Apply High-Performance Building Standards to New Construction and Renovations
GLA Action 2.2 – Maximize Energy Efficiency in Existing Government Buildings
GLA Action 3.1 – Encourage Renewable Energy and Energy Efficiency Projects for Existing State-Owned Buildings and Facilities
TLU 2.C actions are all complementary proposed policies.

6. Timeframe for Implementation: Initiatives to enhance energy code compliance can and should begin as soon as possible.

7. Anticipated Timeframe of Outcome: Increased building energy code enforcement and related processes and policies, will yield long term energy savings and related emissions reductions as the building stock is replaced.

Program Evaluation

1. Estimated CO_2 Emission Reductions ($MMTCO_2e$ /year):

Efficiency Improvement	Source	CO_2 Emission Reductions		
		2012	2025	2050
80% Compliance (6.6% greater thermal efficiency)	Direct Fuel Use	0.02	0.09	0.21
	Electricity	0.01	0.03	0.07
	Total	0.03	0.12	0.28

2. Economic Effects

a. Costs:

i. Implementation Cost: Low (0-$2.5 million) for both scenarios
ii. Timing: Constant / even for both scenarios
iii. Impacts: Local government

b. Savings:

i. Potential Economic Benefit:

Efficiency Improvement	Relative Benefit
80% Compliance (6.6% greater thermal efficiency)	Moderate ($25 million to $125 million)

ii. Timing: Low short-term / mostly long-term
iii. Impacts:

3. Other Benefits/Impacts:

a. *Environmental*: Reductions in nitrogen oxides, sulfur dioxide and carbon dioxide, as well as other pollutants, resulting from decreased energy consumption.

b. *Health*: Additional benefits to code-compliant and high performance buildings may include improved indoor air quality and fewer sick days. In urban areas, rates of childhood asthma may also impacted by reduced electric generation due to more efficient buildings.

c. *Social*: More efficient buildings save energy and money, and address the need to act to mitigate global climate change. In addition, evidence has shown improvements to occupant comfort and productivity in high performance buildings.

d. *Other*: Economic development also benefits through the growth in the "clean energy" sector of the state's economy, both in white collar (planning and implementation; inspection) and blue collar (installation; construction) jobs.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

a. *Technical:* There is no technical reason why the energy code should not be strictly enforced. The tools are available to assess air exchange rates (blower doors) and insulation deficiencies (thermal imaging).

b. *Economic:* The potential costs to the state and/or its communities of increased compliance with code and higher construction costs would be outweighed by the energy savings among consumers and businesses and the state's reduced reliance on imported energy and slowing of the climate change that negatively impacts several key New Hampshire business sectors.

c. *Statutory/Regulatory:* New Hampshire currently has the most aggressive nationally recognized energy code. Several states in the region have also recently begun to set more aggressive policies regarding state building energy codes as a means of addressing multiple policy issues, ranging from the high costs of energy to climate change action strategies. Maine, for example, this spring just enacted its first ever mandatory statewide building code, and included in it provisions for specialized energy code inspectors as a means of enhancing compliance with the code. Similar legislation is expected to be enacted in Massachusetts in the current session. New Hampshire can benefit from the experiences and expertise of these two states in developing both its legislative language mandating enhanced training and certification processes, as well as the regulations governing compliance.

d. *Social:* Consumers – individuals and businesses – are looking for more opportunities to reduce their carbon footprints and control energy costs. Most citizens expect that if a code exists, then it is

enforced and any structure complies. It is only fair to building owners and builders that a "level playing field" be maintained meaning that the consumers gets what she or he pays for.

5. Other Factors of Note: Objections may come from some builders, who may argue against any changes in the status quo. They may object to increases in building costs and permit fees. Caution must also be used if requiring specialized, third-party inspectors, to ensure that the market is adequately prepared to handle such a mandate. Because there could initially be a scenario where there wouldn't be enough qualified raters to deal with all new construction in New Hampshire, default plans may be required so that if a qualified inspector cannot be secured in a reasonable time frame, a building would be deemed to be in compliance with the building energy code.

   It may be helpful to note that the idea of taking climate change action through building codes and standards is increasing in the states of the Northeast U.S. As noted, both Maine and Massachusetts have either enacted or are about to enact legislation to tie their state building energy codes to the latest IECC, as well as to increase compliance levels through training and certification of specialized building energy code inspectors. Other policy efforts in this regard have been seen in recent months in New York and New Jersey as well. In addition, many states also want to go "beyond code" to set even higher performance standards in order to achieve even greater energy savings where possible.

6. Level of Group Interest: High

7. References: Local Code Officials Survey, Conducted for the Northeast Energy Efficiency Partnership, Inc. (NEEP) by Peregrine Energy Group, November 2001.

RCI Action 1.5 – Establish an Energy Section in MLS Listings

Summary

An energy section should be included in the Multiple Listing Service (MLS) real estate listings. This measure would provide for the establishment of a specific, defined set of energy-related criteria/ratings for properties presented in the MLS listings. The concept behind an MLS energy section is to reinforce the fact that energy is a major factor in home buying and to provide the consumer with a means for comparing energy usage between homes.

Program Description:

1. Mechanism *(i.e., how the policy or program achieves the desired result):* Including an energy section in MLS listings would promote energy savings by educating realtors, consumers, home sellers, and home buyers. Presumably, properties that are energy-efficient would be favored over similar properties that require greater energy consumption; and market pricing would reflect this advantage. This program is not unlike mileage stickers on new cars.

2. Implementation Plan (*i.e., how to implement the specific policy or program*):
    a. *Method of Establishment (e.g., legislation, executive order):* In the short-term: develop criteria; established standards; and implement listings changes. In the medium-term: develop awareness of these standards; and increase consumer demand for energy efficient/low carbon footprint construction
    b. *Resources Required:* Educational programs and materials to educate the real estate agencies regarding that the ratings mean and how to help homeowners and homebuyers inexpert their meaning.
    c. *Barriers to Address (especially for medium to low feasibility actions)*

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.):
    a. *Parties Responsible for Implementation:* The NH Department of Environmental Services, other state agencies, the New Hampshire Association of Realtors, the Energy Efficiency and Sustainable Energy Board, the legislature, individual towns, and potentially the State Real Estate Board.
    b. *Parties Paying for Implementation:* Real estate industry, homeowners, builders and developers.
    c. *Parties Benefiting from Implementation:* New homeowners

4. Related Existing Policies and Programs:
    a. The rating system information has become integral to the housing market in Alaska. A home's energy rating is included in the MLS and the state's appraisal institute data base. Because of this market data, appraisers routinely add value for higher-rated homes. Other states are taking steps to incorporate the collection of this market data. The rating systems in Colorado, Rhode Island, and Oregon now have the option of including the energy information in the MLS. However, in reviewing the listings, the energy usage and green rating are not yet available. See the following websites: http://resnet.us/ratings/overview/resources/primer/HP09.htm and http://www.rmls.com/RC2/UI/search_residential.asp.
    b. Listedgreen.com is an online MLS exclusively listing energy efficient, sustainable homes, and housing developments worldwide. They require a $20 monthly fee for each listing. See http://www.listedgreen.com/).

c. Washington, California, Nevada, Arizona, Colorado, Texas, Wisconsin and Georgia have organizations that provide information to their residents and builders to help them buy and build green, and issue green ratings. See the following websites:

http://www.builtgreenwashington.org/
http://www.builditgreen.org/
http://www.nvgreenbuilder.com/
http://www.scottsdaleaz.gov/greenbuilding/
http://www.builtgreen.org/about/overview.htm
http://www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/index.htm
http://www.greenbuilthome.org/owner/index.php
http://www.earthcrafthouse.com/

d. The University of North Carolina's NC HealthyBuilt Homes Program provides a certificate for green residential homes. See http://www.healthybuilthomes.org/.

e. MyEnergyLoan.com offers green loan packages where they incorporate all available incentives into the loans. See http://www.myenergyloan.com/.

f. Ecobroker International offers online courses to for licensed real estate brokers to earn the Ecobroker certified designation. Participants have to complete energy, environmental and marketing training programs which will allow them to stay current on the green real estate market. See http://www.ecobroker.com/eb/default.aspx.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

a. *Existing:* Through the existing electric and gas utility programs incentives are provided for Energy Star rated single and multi-family residential construction. This involves plan review, inspection and rating of each project consistent with the Energy Star Home Energy Rating Systems (HERS). A basic infrastructure of qualified and experienced home energy raters has developed partially in response to these other residential audit and weatherization programs, providing a foundation for expanded home energy audits and ratings. See also www.repa-nh.org.

b. *Proposed:* There are limited existing Energy Efficient Mortgage (EEM) programs, including through HUD/FHA, VA, Fannie Mae, and Freddie Mac. The basic concept of an EEM is to finance more capital investment in above standard energy efficiency measures over the term of the loan (in both new and refinanced/retrofitted homes) that will reduce operational costs for heating and cooling, resulting in net savings. Normal debt to income ratios may be adjusted accordingly. The Energy Programs Consortium (EPC) (www.energyprograms.org) is a joint venture of the National Association of State Community Services Programs (NASCSP), the National Association of State Energy Officials (NASEO), the National Association of State Regulatory Utility Commissioners (NARUC), and the National Energy Assistance Directors' Association (NEADA), that is working to facilitate a large scale expansion of EEMs, including through state housing finance authorities. A number of foundations, US EPA and US DOE are supporting this effort and this product is on track to be designated an "Energy Star" mortgage. EEMs necessarily entail the use some form of a home energy rating system. For more information see www.energyprograms.org/briefs/0704-EEM.pdf.

RCI Action 1.1 – Maximize Energy Efficiency in New Construction
RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
RCI Action 1.4B – Improve Building Energy Code Compliance
RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach
RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program *(formerly RCI Action 1.6)*
RCI Action 4.5 – Create an Energy Efficiency and Sustainable Energy Systems Web Portal

6. Timeframe for Implementation: Immediate and ongoing.

7. Anticipated Timeframe of Outcome: Results will be small at first, but grow exponentially as changes are understood and accepted.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

    a. Costs:

        i. Implementation Cost: Moderately low ($2.5 million to $25 million)
        ii. Timing: Constant / even
        iii. Impacts: Consumer – evenly distributed

    b. Savings:

        i. Potential Economic Benefit: Supporting mechanism only
        ii. Timing:
        iii. Impacts: Consumer – evenly distributed

3. Other Benefits/Impacts:

    a. *Environmental:* This would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

    b. *Health:* Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

    c. *Social*: Increased awareness and implementation of energy saving and sustainable generation efforts through public participation and education will alleviate climate change. However, methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

    d. *Other*: Supporting renewables and conservation lowers the amount of greenhouse gases emitted into the atmosphere, reduces the load on our aging and maximized infrastructure, and creates a demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*):

    a. *Technical:* Ground breaking work has been initiated in other states and New Hampshire should be able to build on this work. While some relatively sophisticated home ratings are already in use in New Hampshire (e.g. HERS), a simple solution such as including the annual fuel usage over the past year on all property listings may be equally effective (e.g. gallons of oil/propane, therms of natural gas, kWhs of electricity, etc).

b. *Economic:* Methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

c. *Statutory/Regulatory:* It may be possible to work with industry organizations to implement this change without additional statues or regulations – but they are an option.

d. *Social:*

5. Other Factors of Note: Massachusetts is considering home energy scoring language in Senate Bill 2468 during the 2008 session of the legislature.

6. Level of Group Interest: High

7. References:

RCI Action 1.8 – Conserve Embodied Energy in Existing Building Stock

Summary

State-wide policies and programs should be developed that recognize, quantify, and encourage the conservation of the energy embodied in the New Hampshire's older building stock. This action would reduce future energy consumption and emissions both directly through energy conservation and indirectly through the preservation of the embodied energy in existing buildings. If these potential energy savings and reduction in carbon emissions are to be realized, the proposed action will require research, education, and incentive programs that incorporate conservation of embodied energy as well as life-cycle assessment of buildings, components and materials.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):*

   The action would preserve the embodied energy of the existing building stock. "Embodied energy is the total expenditure of energy involved in the creation of the building and its constituent materials," and the energy invested in it throughout its use.[8] Embodied energy is a key component of life-cycle analysis, which examines the environmental impact of building materials and systems from raw material, through use within a building, to demolition and disposal. Under this concept, energy is conserved within the existing building, it is not expended in demolition or new construction, and new materials needs are minimal, even in an efficiency-increasing project.

   Research and educational programming are first needed to implement this action. The methodology requires calculations to be made, appropriate to New Hampshire conditions and building stock, that take into account life-cycle analysis and embodied energy when energy audits are performed or when rehabilitation projects are planned. Existing research and calculations will make this process easier, requiring only study to determine which models are most appropriate for New Hampshire. The final product would be New Hampshire-specific testing tools and an energy rating system, possibly to be used for the energy audits recommended as a baseline calculation in HB 1434 (2008).

   Education programs are needed to widely introduce the concept of embodied energy, which is unknown to most people – even professionals in the building and construction industries. Professionals, building owners and managers, and homeowners would be the target of this education, accomplished through a variety of public outlets and public-private partnerships. A list of best practices and demonstration projects that increase the energy efficiency of historic and older structures while preserving embodied energy would be developed and widely distributed.

   Greater reductions could be achieved through incentives developed at the state and local levels. Incentives may already exist, or may be proposed in other action items; these could be adapted to promote good use of embodied energy and encourage life-cycle analysis of systems and materials proposed in building upgrades. Further reductions could be achieved with the implementation of state or local regulations that mandate building conservation (not incorporated into this action item).

1. Implementation Plan *(i.e., how to implement the specific policy or program):*

[8] Donovan Rypkema, "Economics, Sustainability, and Historic Preservation," keynote address at the National Trust Conference, Portland, Oregon, 1 October 2005.

a. *Method of Establishment (e.g., legislation, executive order):* The proposed action could be implemented at the direction of a commission comprised of architectural, preservation, and building professionals to research and develop calculations and educational programming. Other participants would include a council of existing state and local agencies, including the municipal energy committees proposed by HB 1434, and appropriate private industry partners to formulate educational opportunities and incentives programs.

b. *Resources Required:* Existing research and previous initiatives within state government (1970s energy policy, 2000 smart growth initiative, as well as others) will provide the information necessary to craft the calculations systems. The formation of a board to helm this initiative would keep it on track; the programs can then be implemented as part a variety of existing programs.

c. *Barriers to Address (especially for medium to low feasibility actions):* Misinformation and a lack of knowledge concerning the importance of embodied energy will require outreach to and education for officials, professionals, and property owners. Market barriers and mistaken assumptions, such as the idea that new materials, such as PVC, are more energy-efficient than traditional wood, need to be addressed.

2. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

   a. *Parties Responsible for Implementation:* Legislature, Governor's Office, Executive Council, state agencies, municipal government, educational organizations.

   b. *Parties Paying for Implementation:* Implementation would build on existing programs. The state, educational institutions or private industry would fund the development of research and education programs.

   c. *Parties Benefiting from Implementation:* Property owners would benefit from the enhancement of their properties, better access to energy efficiency programs, and reduced energy costs. Towns would benefit from the reduction in construction waste and decreased stress on infrastructure.

3. Related Existing Policies and Programs: LEED certification, Smart Growth initiatives, code flexibility for historic buildings, energy conservation education through OEP and local utilities.

4. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

   a. *Existing*: RSA 266-1, RSA 21-I-9, International Existing Building Code (existing, but not adopted in New Hampshire), House Bill 1434, 2008, state fire code, NFPA 909 and NFPA 914.

   b. *Proposed*:
   LEED 3.0/2010
   RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
   RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings
   RCI Action 1.4A – Upgrade Building Energy Codes
   RCI Action 1.4B – Improve Building Energy Code Compliance
   RCI Action 1.7 – Preserve Older Buildings and Neighborhoods as Components of Sustainable Communities
   RCI Action 4.1 – Include Energy Efficiency and Conservation in School Curriculum
   RCI Action 4.2 – Increase Energy Efficiency through Building Management Education Programs
   RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach
   RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program

5. Timeframe for Implementation: Study commission created as soon as feasible. Education programs to be developed contiguously.

6. Anticipated Timeframe of Outcome: Each phase to be implemented as information develops.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

    a. Costs:

        i. Implementation Cost: Moderately high ($125 million to $500 million)
        ii. Timing: Constant / even
        iii. Impacts:

    b. Savings:

        i. Potential Economic Benefit: High ($500 million to $1 billion)
        ii. Timing: Constant / even
        iii. Impacts:

3. Other Benefits/Impacts:

    a. *Environmental*: "The continued use of our existing buildings reduces the amount of demolition and construction waste deposited in landfills, lessens unnecessary demand for energy and other natural resources, and conserves embodied energy."[9] Also, most older buildings are constructed of renewable, sustainable, natural materials requiring a minimum of manufacturing energy to create and maintain.

    b. *Health*: Sustainable historic materials and traditional construction promote a healthy indoor environment through the use of natural ventilation, natural light, and minimally manufactured materials that do not emit toxic gases at the beginning of their life cycles.

    c. *Social*: "[P]reservation of existing neighborhoods and commercial districts embodies the concept of a sustainable society. Preserving and continuing to use existing neighborhoods with their closely integrated network of houses, schools, parks, open spaces, streets, alleys, and religious institutions provides residents with an environment that encourages human interaction." [10]

    d. *Other*: "The long-term erosion in the inventory of old homes is basically irreversible. Demolitions and disaster losses are the current major reason old residential units fall out of the inventory, and there is no recovery from these processes. The number of old units is likely to continue to dwindle through decay and through outright elimination in order to reuse the property. However, these old houses have already weathered numerous storms in their lifetime, and many have the utility, substance, and unique character to continue as housing for many more years."[11]

[9] National Trust for Historic Preservation, "Sustainability Fact Sheet," quoting an US Energy Information Agency study. Accessed 7 May 2007 at http://www.preservationnation.org/issues/sustainability/additional-resources/the-facts-about-preservation-a.html.

[10] Call for Papers: 6th National Forum on Historic Preservation Practice, A Critical Examination of Preservation and Sustainability, October 2007.

[11] Barbara T. Williams, "These Old Houses: 2001," Current Housing Reports, US Census Bureau, February 2004, 22.

4. Potential for Implementation *(i.e., including challenges, obstacles and opportunities):*

    a. *Technical*: There is already sufficient theoretical knowledge to deal analytically and technically with the adaptation of older buildings for enhanced social benefit while preserving their embodied energy and thereby reducing potential CO_2 release.

    b. *Economic*: Funding may be required in order to induce developers to undertake such projects, thereby instilling confidence and illustrating the feasibility of rehabilitating upper floors and other underutilized portions of older buildings.

    c. *Statutory/Regulatory*: Further legislation may be required to enable communities to adopt appropriate criteria for the continued use or reuse of older commercial and industrial buildings, and to ensure that matters of life safety, fire protection, structural integrity, handicapped accessibility, energy conservation, traffic, parking, and other health and safety considerations for such buildings are satisfied in a responsible but flexible manner.

    d. *Social*: Social factors affecting the potential for implementation may include changing attitudes toward mixed building uses, residential occupancy of upper stories, reliance on public transportation as distinct from the automobile, and increased population density in village or urban districts. Current demographic studies indicate that Americans are willingly returning to cities and are readopting urban modes of living. These trends suggest that there will be a positive social response to the principles of this policy, thereby ensuring the realization of the environmental benefits that underlie the policy.

5. Other Factors of Note:

    "The Northeast had the smallest supply of housing in 2001 – 18.8% of the nation's total…The Northeast was home to 43.4% of the nation's stock of about 10 million old homes [defined as any house built before 1920]…, reflect[ing] its earlier period of settlement."[12]

    The federal census reports that approximately 140,000 of the estimated 660,000 total housing units in the state were built before1940.[13] Buildings constructed prior to 1920 have shown, in recent studies, to be more energy efficient than those built at any time in the rest of the century.[14] The majority of these buildings were constructed using sustainable, often local, and repairable materials, were site-oriented for maximum energy efficiency, and incorporate passive energy-conserving design features (natural lighting, cross-ventilation, etc.). Best practices for the maintenance of these older buildings, including energy efficient improvements, call for repairing existing building fabric or replacing in-kind with traditional building materials, which tend to be renewable and require minimal manufacturing. This results in a smaller carbon footprint for the project than would full replacement with new materials. Research, education, and incentives will increase the number of these types of projects in New Hampshire.

6. Level of Group Interest: Medium

7. References:

[12] Barbara T. Williams, "These Old Houses: 2001," Current Housing Reports, US Census Bureau, February 2004, 3.

[13] According to the NH Office of Energy and Planning website, accessed 6 June 2008, 32.3% of net energy overall is used to heat buildings and structures, and another 36.6% is used to generate electricity. Net energy use by the residential sector is 14.7% of the total NH energy use.

[14] Energy Information Administration, "2003 Buildings Energy Consumption Survey: Building Characteristics Tables." Revised June 2006, Table B24, 150.