From Potential to Action

How New England Can Save Energy, Cut Costs, and Create a Brighter Future with Energy Efficiency

An Analysis of the Region's Economically Achievable Electric Efficiency Potential

Presented by Northeast Energy Efficiency Partnerships - October 2010

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Analysis By:

Optimal Energy

Integrated Energy Resources

With Support From:

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Natalie Hildt of NEEP authored this report. We would like to thank Jeff Loiter, Tom Lyle, and Alek Antczak of Optimal Energy for conducting the analysis in this report and for serving as on-going advisors. Thanks to NEEP staff including, Jim O'Reilly, Josh Craft, Elizabeth Titus, Ed Schmidt, Julie Michals, Cecily McChalicher, Alicia Dunn, Carrie Nash, Carolyn Sarno, David Lis and Susan Coakley for their contributions. Also thanks to our peer reviewers: Steve Nadel of the American Council for an Energy-Efficient Economy, Paul Peterson of Synapse Energy Economics, Jamie Howland and Derek Murrow of Environment Northeast, Jeff Schlegel of Schlegel and Associates, Seth Kaplan of Conservation Law Foundation, Ian Finlayson of Mass. Department of Energy Resources and Nikolaas Dietsch of EPA for their work on this project. Special thanks to Environment Northeast for their work in providing analysis based on their report, Energy Efficiency, Engine of Economic Growth.[2] This macroeconomic study used the respected REMI model (Regional Economic Models, Inc[3]) that guides many state governments.

Any errors, omissions or opinions expressed in this report are the responsibility of NEEP. For more information, please contact: Natalie Hildt, Manager of Public Policy Outreach at 781-860-9177 x121 or nhildt@neep.org.

About NEEP

NEEP transforms the way we use and think about energy. We are a non-profit organization that builds partnerships among the efficiency industry, communities, businesses and policymakers in the Northeast and Mid-Atlantic states. Through advocacy, collaboration and education, we accelerate energy efficiency and make visible its impacts on the region, the economy, the planet, and future generations.

[1] http://neep.org/uploads/policy/Updated_Achievable_Potential_2005.pdf

[2] http://www.env-ne.org/resources/open/p/id/964

[3] http://www.remi.com/

Table of Contents

Table of Figures

Executive Summary

If the six New England states[4] succeed in capturing the economically-achievable potential of energy efficiency, together they can reduce the region's electricity consumption by about 20 percent of forecasted load[5] by 2018. This can be done by adopting current best-practices in building and industrial energy use and by aggressively pursuing all cost-effective energy efficiency. By cost-effective, this report means energy efficiency resources that can be achieved below the cost of electricity supply. While this study focuses on electric efficiency programs,[6] NEEP acknowledges the importance of strategies to save all fuels and works actively to advance whole-building solutions.

> If the region invested in all cost-effective energy efficiency by 2018, the result would be $19.6 billion in net benefits over the life of the efficiency measures.

From Potential to Action is intended to guide policymakers, program administrators (PAs, such as utility companies and third-party administrators like Efficiency Vermont and Cape Light Compact), advocates and stakeholders in the New England states as they shape energy policy over the coming decade and beyond. By compiling efficiency studies from the six states, this report identifies an existing regional potential to save about 31,800 gigaWatt-hours (GWh)[7] of electricity by 2018. That's equivalent to the energy output of about four large coal-fired power plants, and enough electricity to power 4 million households for a year. While the commercial sector contains the largest prospects for savings, potential exists in all customer sectors and across all end-uses.

Many states have set savings goals based on percentage of electric load in order to achieve this high level of savings. This is true in Massachusetts, whose program administrators share the goal of ramping up over three years to 2.4 percent annual electric savings by 2012. If continued, this would result in cumulative savings by 2018 of approximately 20 percent. Rhode Island is the most recent to adopt similarly ambitious goals, after their potential study completed in September of this year estimated economically-achievable savings potential of approximately 27 percent over 10 years (See sidebar, page 16). The state's proposed targets are to achieve electric efficiency savings of 2.5 percent

[4] These states are Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire and Maine.

[5] Electric load is forecasted by ISO New England. The period of analysis for this report was 2010 to 2018.

[6] Due to inconsistencies in natural gas efficiency programs in the region as well as limitations on available state-level data, this report focuses on electric energy efficiency.

[7] 1 gigawatt = 1000 megawatts = 1,000,000 kilowatts = 1,000,000,000 watts.

of total electric consumption annually by 2014. Both states have similar goals for natural gas savings. The estimates listed in this report do not attempt to predict the course that states and PAs will take to set year-to-year targets or multi-year plans. However, we acknowledge that careful ramp-ups are essential to successful programs and resulting energy savings

Achieving this the level of efficiency savings described in these pages would, over the lives of these measures, ultimately increase gross state product (GSP) by $54.6 billion and increase employment by 421,906 job years throughout the region.[8] Moreover, energy efficiency is highly cost-effective, with every dollar invested in efficiency[9] returning approximately $2.60 to New Englanders – savings that stay in the region to be reinvested in local economies.

The most immediate obstacle to reaching this potential is an economic downturn that has tempted policymakers to divert efficiency funding for unintended budget uses. This reveals a long-term need to change the way states value and fund energy efficiency, and to secure that funding so that it can do the greatest permanent good for society. Maximizing the available energy efficiency potential will entail an unprecedented level of coordination, forward thinking and sustained commitment,

Summary of Key Findings

By 2018, efficiency could reduce New England's electricity needs by 31,800 gigaWatt-hours.

- This is approximately 20 percent of regional forecasted load.
- This energy saved is equivalent to the energy output of about four large coal-fired power plants.
- It would be like taking 4 million homes off the electric grid for one year – about equal to the households in CT, MA and VT combined.
- It would result in positive net societal benefits of $19.6 billion.

Reducing power generation by 31,800 GWh would:

- Cut CO2 emissions by nearly 80 million metric tons, equal to the annual emissions of 3 million passenger vehicles.
- Cut annual emissions of sulfur dioxides (SO_2) and nitrogen oxide (NO_x) by 8,500 and 5,000 metric tons in 2018, respectively.

Meeting demand with efficiency costs about a third as much as new generation.

Every dollar invested in efficiency returns $2.60 to New Englanders.

[8] A job year equals one job that lasts one year. These estimates are based on a similar, but not identical scenario analysis performed by Environment Northeast. Benefits would accumulate over efficiency measure life, with some benefits coming after 2018. Howland, Jamie et al. Energy Efficiency: Engine of Economic Growth. Environment Northeast; 2009. http://env-ne.org/resources/open/p/id/964/resource/Energy%20Efficiency%20Engine%20of%20Economic%20Growth

[9] Every dollar invested in efficiency, including program costs and customer contribution, returns $2.60 to the region.

but it is entirely possible and economically achievable, as explained in this report. To get there as a region, we will need:

- Increased commitment by policymakers to treat energy efficiency as a reliable resource, to fund it accordingly and to support related policies that leverage and enhance efficiency programs.

- Creative and powerful leadership from regulators in terms of new rate structures that provide the correct price signals to utilities and customers to value efficiency, and new ways of measuring the impact of efficiency measures. This includes re-examining how we think about "cost-effectiveness" and how savings are attributed.

- Utilities and other program administrators to see themselves as energy solution providers, offering innovative and holistic programs to help their customers use energy more wisely.

Strategies to Move from Potential to Action:

Recommendations for Policymakers

1. Enact policies to capture all cost-effective efficiency
2. Establish funding for all-fuel efficiency programs
3. Demonstrate strong executive leadership
4. Link efficiency to multiple policy goals: energy, economic, environmental
5. Support the development and implementation of common evaluation protocols
6. Integrate efficiency into long-range state and regional energy and air quality planning
7. Ensure adequate, stable, long-term funding for efficiency programs
8. Foster a supportive regulatory framework and effective program planning process
9. Advance complementary public policies
10. Develop and support outside financing mechanisms

Please see the Recommended Actions section at the end of this report for ideas on how policymakers can help maximize the power of energy efficiency in New England.

Introduction

Energy efficiency is widely recognized as the pathway of choice to control and even drive down energy costs, increase energy security, curb greenhouse gas emissions, foster economic growth, reduce dependence on fossil fuels and contribute to a cleaner, healthier society. Because buildings consume about 40 percent of the nation's energy and resources and three quarters of all electricity,[10] helping people make better choices to save energy in new and existing buildings must be central to national and regional energy strategies.

Unlike conventional power generation, or even renewable energy technologies, energy efficiency is the energy resource we don't see.

As *From Potential to Action* reveals, the six New England states have the potential to reduce electricity consumption by about 20 percent of forecasted load by 2018. At 31,800 gigaWatt-hours (GWh)[11], that's equivalent to the electricity output of about four large coal-fired power plants, and enough electricity to power 4 million households[12] for a year. Realizing this level of savings requires adopting current best practices and aggressively pursuing all cost-effective efficiency. By cost-effective, this report means energy efficiency resources that can be captured below the cost of electricity supply. The average regional cost to meet demand through efficiency is 4.1 cents per kilowatt-hour (kWh), while the total cost of new generation and transmission ranges roughly between 11.4 and 12.6 cents per kWh. Therefore, it is safe to say that efficiency costs about a third as much as generating new supply.[13]

With its successful and innovative energy efficiency programs and policies, New England continues to be a bright spot in the nation. This is true in terms of individual state initiatives as well as through regionally-coordinated efforts. In the latest nationwide ranking by the American Council for an Energy-Efficient Economy (ACEEE), five of the six New England states scored in the top 10, based on multiple policy criteria related to energy efficiency best practices and leadership.[14] Yet even with such an outstanding track record in energy efficiency, the Independent System Operator for New England (ISO-NE, the region's electric grid manager), still

[10] http://www.eia.doe.gov/aer/pdf/aer.pdf

[11] 1 gigawatt = 1000 megawatts = 1,000,000 kilowatts = 1,000,000,000 watts.

[12] U.S. Energy Information Administration. Average Monthly Bill by Census Division and State, 2008. January, 2010.

[13] A greater explanation is found in the Discussion section of this report.

[14] Eldridge, Maggie, et. al. 2009 State Energy Efficiency Scorecard. ACEEE; October, 2009.

anticipates that New England-wide electric energy consumption will increase by almost one percent annually through 2018.[15] This reveals that the ISO has not fully accounted for or fully embraced the potential of efficiency to help meet the region's electric demands.

From *Potential to Action* demonstrates the realistic potential of energy efficiency to "bend the curve downward" in terms of the region's forecasted electric demand. It describes a set of steps that the region can take to build from and replicate individual state successes. It also identifies sectors and end-uses in each state where the greatest reserves of efficiency lie, and it estimates the total economic and environmental benefits of maximizing the efficiency potential. While this report focuses on electric efficiency programs,[16] Northeast Energy Efficiency Partnerships (NEEP) acknowledges the importance of strategies to save all fuels – including natural gas, heating oil, propane and others – by taking a holistic approach to building energy use. As lead analyst for this study, Optimal Energy, Inc. (OEI) conducted a review of recent electric energy efficiency potential studies among states in the region, extrapolated where consistent and current data were not available, and aggregated these into an analysis for New England as a whole. The results are discussed on the following pages, together with NEEP's analysis and recommendations for policymakers.

What's Watt?

A Watt (W) is the amount of electricity generated at a point in time.

A watt-hour (Wh) is how much electricity is consumed over time.

1 gigaWatt = 1000 megaWatts = 1,000,000 kiloWatts = 1,000,000,000 Watts (1 billion Watts.)

Using a 20 W compact fluorescent lamp for one hour consumes 0.02 kWh of electricity. Using a 20 W lamp for one thousand hours consumes 20 kWh of electricity.

Power plants are discussed in terms of megaWatts regarding their output capacity, and megaWatt hours in terms of how much energy they in fact generate.

How much electricity does a home use?
In 2008, the average annual electricity consumption for a U.S. residential utility customer was 11,040 kWh, an average of 920 kWh per month. Maine had the lowest average in the nation at 6,252 kWh. http://www.eia.doe.gov/ask/electricity_faqs.asp#home_consumption

15 Provided by David Ehrlich in a presentation to the Planning Advisory Committee (PAC). March 18, 2010.

16 Due to inconsistencies in natural gas efficiency programs in the region as well as limitations on available state level data, this report focuses on electric energy efficiency.

Who this report is for

This report is intended to guide policymakers, efficiency program administrators (PAs), advocates and stakeholders in the New England states and beyond as they shape energy policy over the coming decade and into the future. By demonstrating that it is plausible for the region to reduce electricity consumption by about 20 percent without sacrificing quality, comfort or productivity, we hope this report will inform decision makers as to the realistic possibilities and multiple benefits of capturing all cost-effective energy efficiency in New England.

What this report does

Given the national leadership New England has already exhibited in implementing energy efficiency programs, and in light of the challenges still facing the region, this study considers the following questions:

- What is the remaining potential for continued energy efficiency savings in the region?
- In what customer sectors and end-use technologies does this potential exist?
- What are the financial costs and benefits associated with capturing this potential?
- What other benefits, environmental and otherwise, might we attain from capturing this potential?
- What would we recommend to policymakers who seek to move energy efficiency from potential to action?

Where we've been, where we're going

When Northeast Energy Efficiency Partnerships (NEEP) commissioned its first New England efficiency potential study in 2004, the region was faced with rising electric, oil and natural gas costs, transmission and distribution constraints in several states, concerns over global energy security and an increased focus on native energy resources. The New England Governors and Eastern Canadian Premiers had released a Climate Action Plan in 2001, under which they committed to reducing greenhouse gases in the six-state region to 1990 levels by 2010.

Some six years later, the states have made great strides in realizing the potential of energy efficiency to deliver on multiple public policy goals – economic, energy and environmental. They have done this through customer efficiency programs as well as advances in appliance standards and building energy codes and code enforcement. Investments in efficiency have jumped dramatically in recent years. In 2007, the New England states were spending about $333 million on electric and natural gas energy efficiency programs. By 2010, as the wisdom of investing in efficiency became even more evident, that number had climbed to over $680 million.[17] From 2005 to 2009, programs to help residential and commercial customers make their buildings and industry more efficient have saved roughly 5.3 million MWh of electricity.[18]

Several states have policies that literally or in effect mandate that their energy efficiency programs capture all cost-effective energy efficiency before turning to more expensive nuclear or fossil-fuel generated supply. The Regional Greenhouse Gas Initiative (RGGI) has been conducting auctions for two years, yielding nearly $202.6 million to date for New England States to spend on efficiency and renewable energy.[19] New national leadership is forging ahead with progress on building energy codes and appliance efficiency standards, improving coordination among federal agencies and, at time of writing, still seeking national climate and energy legislation.

Not coincidentally, ISO-NE reports that annual electricity use dropped by four percent from 2007 to 2008, and another four percent from 2008 to 2009. While the economy and weather certainly influence the electric region's load, efficiency investments have clearly played a part in driving down energy use.[20]

Despite these significant gains, there remains much work to be done – efficiency not captured equals money left on the table. This is true in terms of delivering savings through proven programs and technologies, ratcheting up building energy codes and product efficiency standards as technology advances, improving coordination of programs and policies across service territories and states, and advancing regulatory efforts so that the programs do, in fact, capture "all cost-effective energy efficiency" as required by legal mandates in a number of states. While impressive progress has been made, the level of savings delivered to customers has fallen short of the potential estimated in our 2004 study. From 2005 to 2009, the region saved, on average, less than a third of what we had estimated as economically-achievable potential in that first study. Probable reasons for states not having

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[17] The 2010 figures includes all funding sources for energy efficiency programs, including ratepayer contributions and Regional Greenhouse Gas Initiative (RGGI) and ISO-New England Forward Capacity Market auction proceeds.

[18] See NEEP's Policy Snapshot: http://neep.org/uploads/policy/policysnapshot.html

[19] Total RGGI revenues including Delaware, Maryland, New Jersey and New York have been over $662.8 million.

[20] According to the ISO-NE 2008 Annual Markets Report, the increase in electricity prices was moderated by a drop in electric energy consumption of about 2 percent in 2008. This drop was caused by three factors—a decline in economic activity, more efficient use of electricity, and higher prices. See page 2 of the report: http://www.iso-ne.com/markets/mktmonmit/rpts/other/amr08_final_061709.pdf

achieved that full potential include: diversion of ratepayer funds from energy efficiency programs to other unrelated uses; unwillingness or inability of regulators to approve more aggressive energy efficiency spending and savings targets; failure to adopt new appliance efficiency standards or aggressively enforce building energy codes; and inflexible caps on how much program administrators can spend on efficiency programs.

A recession that began in 2008 is still weighing heavily on the economy, and several states in the region have chosen to divert ratepayer efficiency funding to general state budgets. While states have benefited from a tremendous influx of funding under the federal American Recovery and Reinvestment Act (ARRA), revenue constraints have also tempted many states to use those dollars to supplant, rather than supplement existing efficiency program spending, in clear violation of the legal mandate under ARRA.

But beyond the more well-publicized economic challenges, states also face challenges of operating under out-dated regulatory frameworks while trying to fit the new paradigm of all-cost effective efficiency. For example, old methods of determining cost effectiveness do not account for savings from programs aimed at changing consumer behavior, professional training on things like building energy code compliance, building maintenance, or deep building retrofits that yield greater savings but have longer payback periods.

Despite these challenges, NEEP remains encouraged by the progress at both the state and federal levels. For example, Vermont has shown it is possible to bend their electric demand curve down with innovative and aggressive efficiency policies. Massachusetts is now operating under the ground-breaking integrated efficiency programs set in motion under the Green Communities Act of 2008, and has goals of reducing electric use that will save $4.9 billion over three years. Maine is moving to a new all-fuels model of energy efficiency program administration with the launch of the Efficiency Maine Trust. All states are looking to develop new financing opportunities to help customers invest in efficiency upgrades, and many are revising their rate structures to decouple volumetric electric and natural gas sales from rates, thereby removing a disincentive for utilities to aggressively pursue efficiency in buildings.

Discussion of Methodology and Findings

This study estimates the region's achievable potential,[21] an estimate of energy savings based on a variety of program and policy strategies– for example, limiting incentive payments to 50% of the cost of efficiency measures. These funding- or program-constrained scenarios are most appropriately described as "program potential studies." Such constrained studies underestimate the "maximum" amount of cost-effective energy efficiency potential that may be achieved. A "maximum achievable potential" includes all cost-effective energy savings and an efficiency program delivery infrastructure that is unconstrained by funding and other extraneous policy decisions – this models what could be possible under optimum circumstances. (See the box at right for further information) In the sections below, we describe the aggregate economically achievable potential resources in the six New England states, the costs to achieve this potential, and the resulting economic and environmental benefits.

Notwithstanding the considerable constraints of each state-specific study, we based our estimates on an extrapolation of the individual state's program potential and estimates of additional resources that would likely result from more aggressive programs that adopted today's best practices. More aggressive programs would seek to acquire all cost-effective energy savings and would be unconstrained by outside factors.

Defining "Achievable" Potential

The National Action Plan for Energy Efficiency defines Maximum Achievable Potential as: "…the amount of energy use that efficiency can realistically be expected to displace assuming the most aggressive program scenario possible (e.g., providing end-users with payments for the entire incremental cost of more efficiency equipment)." It takes into account real-world barriers to convincing end-users to adopt efficiency measures and the non-measure costs of delivering programs. Many potential analyses, including those reviewed for this report, do not estimate maximum achievable potential, often because limits are placed on incentive payments or program approaches. Instead we examine what is economically-achievable in a world where funding is not unlimited – what we see as a more realistic scenario.

Defining "Cost-effective" Efficiency

"All cost-effective" is generally termed as the amount of efficiency that can be captured at less than the cost of new supply. Program cost effectiveness is evaluated in terms of one of several formulas that calculates the ratio of costs to benefits. One of the most common is the Total Resource Cost (TRC) test, which measures net costs based on the total costs of the program, including both the participants' and the program administrators' costs.

[21] Study period was 2010-2018, however much of 2010 has passed at time of publication.

To develop a regional efficiency potential estimate, we reviewed the most recent, and therefore most relevant potential studies available for New England states. The states that have conducted potential studies in the last few years are Vermont, New Hamshire and Connecticut.[22] In addition to these potential studies, the states of Rhode Island, Maine and Massachusetts recently commissioned their own meta-analyses,[23] the results of which are also incorporated in our report. Rhode Island released its potential study in September 2010, after the analysis for this report was completed. That report finds an even greater level of efficiency than was estimated in this report.[24] We made a number of qualifying adjustments to the results of these six studies and analyses in order to more accurately determine the total potential for New England. Such adjustments are necessary to account for differences in the underlying assumptions of each study (penetration rates, incentive levels, approaches to specific market types, etc.).

The regional estimate is based primarily on the reported results of the Vermont, New Hampshire and Connecticut potential studies, as well as data from Residential and Commercial market assessments from the Massachusetts meta-analysis.

Energy savings estimates are calculated based on the statewide annual electrical load, regardless of electric distribution company or efficiency program administrative structure. In states where efficiency programs are delivered to only some customers (e.g., excluding those served by municipal utilities), the resulting estimates will exceed current and future efficiency program targets.

We also included adjusted results from the Maine and Rhode Island meta-analyses. In our opinion, the reported results for these states are overly conservative and do not reflect maximum achievable potential as a result of the following:

- Arbitrary constraints to study parameters, such as ignoring certain technology advancements and certain markets all together;
- Omitting the effects of measure interactions that result in greater savings potential; and,
- Averaging results from various studies, which has the tendency to exacerbate the effects of flawed assumptions.

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[22] These studies are referenced at the end of this report as Primary Sources.

[23] Meta-analysis is the process of combining the results of several studies, each addressing a set of related research questions. In this instance, studies of the efficiency potential in Rhode Island, Maine and Massachusetts were in turn based on actual potential studies performed for a variety of other jurisdictions.

[24] The Rhode Island potential study conducted by KEMA Consulting can be found at: http://www.ripuc.org/eventsactions/docket/4202page.html

Please see Optimal's Phase 1 Memo[25] that preceded this report for a full discussion of methodology and more detailed information by state and end-use.

Our findings indicate that region-wide cumulative reductions of at least 20 percent of forecasted load are achievable by 2018, an average of 2.2 percent per year[26] (see Table 1 on page 13). Because the underlying studies sought to assess an achievable level of efficiency savings in the context of limited program funding and incentive (rebate) spending, this should be viewed as a reasonable and plausible scenario. Realizing this level of savings would require adopting current best-practices and aggressively pursuing all cost-effective efficiency. Achieving these savings would not require unrealistic events to occur or spending beyond the cost of alternative supply options. Had the underlying studies estimated a "maximum achievable" potential level, our savings estimates would be even higher. Please see the sidebar on page 9 for additional discussion on this topic.

As depicted in Graph 1, achievable annual efficiency savings can reach 31,800 gigaWatt-hours by 2018. Regardless of sector, the average regional cost to meet demand through efficiency is 4.1 cents per kWh, which is approximately one-third the cost of meeting demand through new electricity supply. Total avoided cost ranges roughly between 11.4 and 12.6 cents per kWh. This estimate is based on avoided supply cost of energy for Connecticut from AESC 2009[27] of 8.7 cents per kWh, plus adjustments for line losses and avoided transmission and distribution (T&D) capacity. Such avoided T&D costs can range from $55 to $92 per kW-year, which we've converted to dollars per kWh.[28]

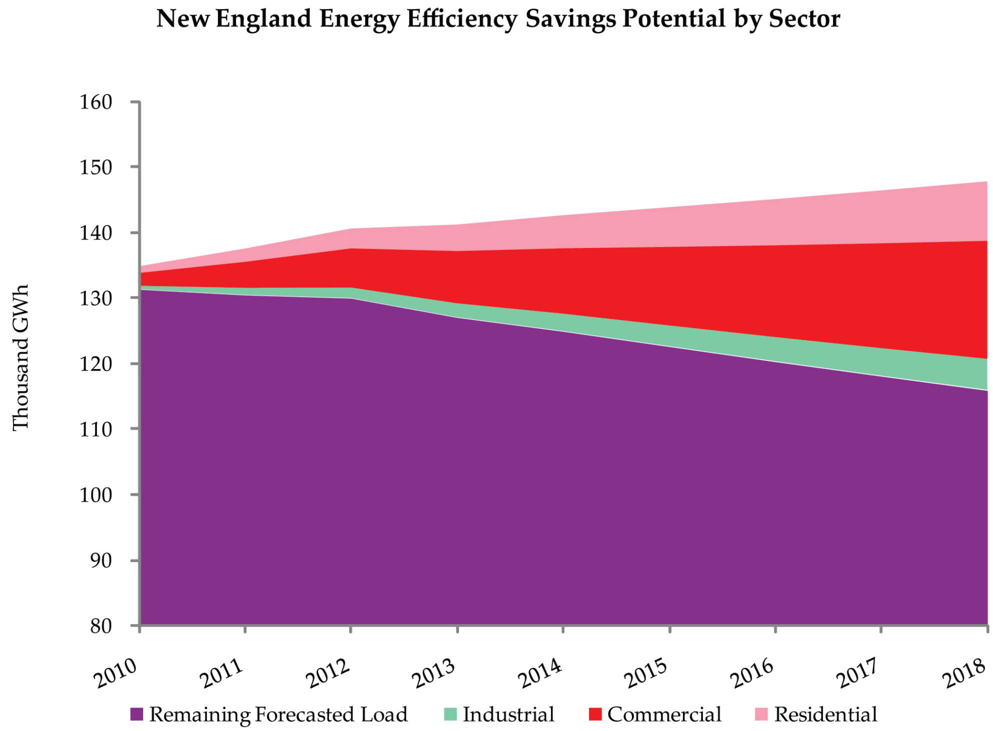
[25] The New England Potential Analysis Phase 1 Memo is available on our website: http://neep.org/public-policy/policy-outreach-and-analysis/potential-study

[26] The study was based on the years 2010-2018. States agree in a regulatory setting how they should ramp up their savings targets.

[27] Avoided Energy Supply Costs in New England: 2009 Report. Hornby, Rick, et. al. Prepared for: Avoided-Energy-Supply-Component (AESC) Study Group; Cambridge, MA. 21 August 2009.

[28] This assumes 3,000 annual kWh per peak kW (AESC Exhibit 6-43), resulting an average avoided T&D cost of between 11.4 and 12.6 cents per kWh, as noted above.

Graph 1: New England Energy Efficiency Savings Potential by Sector



This graph demonstrates the potential to meet customer needs through efficiency without growing electric load.

Table 1: Analysis of Savings Potential by State and Sector

State	Study Year	Study Period	Analysis Period (Years)	Achievable Cost Effective Potential	Total Achievable Energy Savings by Sector		
					Residential	Commercial	Industrial
Connecticut	2009	2009-2018	10	20.3%	18.0%	27.0%	23.0%
Maine	NA	NA	NA	20.5%	20.9%	19.9%	21.1%
Massachusetts	NA	NA	NA	20.3%	18.0%	27.0%	23.0%
New Hampshire	2009	2009-2018	10	20.5%	20.9%	19.9%	21.1%
Rhode Island	NA	NA	NA	16.3%	16.3%	18.1%	19.9%
Vermont	2007	2006-2015	10	19.4%	21.3%	21.3%	14.5%

Notes: “NA” indicates lack of a current and comparable state-specific potential study. For these states, the analysis relied on data from studies of other states as well as other state data sources to estimate savings potential. Rhode Island recently completed its own study, which estimated 27 percent over 10 years.[29] Please see Optimal’s Phase 1 Memo on NEEP’s website for more on the methodology behind this study.

How Efficiency Impacts the New England Electric Energy Forecast

The estimates of achievable energy savings in the sections that follow are based on the percentage savings by sector (shown in Table 1) and the ISO-NE state-by-state “Regional System Planning 10 Long Run Forecast.”[30] The ISO forecast includes the effects of energy efficiency committed through the Forward Capacity Market (see sidebar). Because we assume that these reductions in consumption partly or wholly overlap with the energy efficiency potential estimates from the state-level studies, we used the forecasted level of

The Forward Capacity Market (FCM) is the mechanism by which ISO-NE ensures sufficient capacity will exist to meet New England’s future electrical needs. Energy efficiency and other demand-side resources may participate in this market but are not required to do so. It therefore represents the minimum amount of efficiency expected to occur in the near future, and does not account for all of the programs and policies delivering efficiency.

[29] The Rhode Island potential study finds that 27 percent of the state’s electric energy needs, or 2,046,000 MWh, can be met over 10 years through economically-achievable energy efficiency measures.
Full report: http://www.ripuc.org/eventsactions/docket/4202page.html

[30] Provided by David Ehrlich in a presentation to the Planning Advisory Committee (PAC). March 18, 2010.

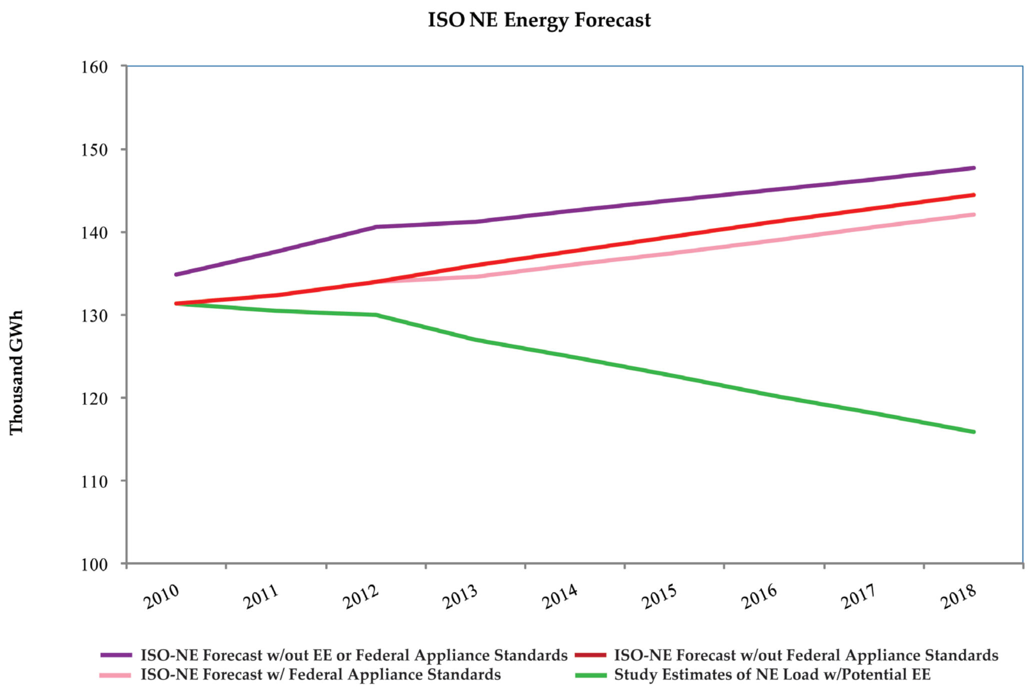
energy consumption without Forward Capacity Market (FCM) efficiency reductions as the basis for calculating energy savings. Savings estimates are assumed to be "at meter," relative to customer use and not at the point of electricity generation.[31] ISO-NE anticipates that aggregate New England-wide energy consumption will increase by roughly 1.16 percent annually through 2018 without fully accounting for active efficiency programs or federal appliance standards (Graph 2, purple/top line). When the impacts of efficiency and federal appliance standards beginning in 2013 are included in ISO-NE's forecasts, the growth in energy consumption is reduced to 0.9 percent annually (Graph 2, pink line). Without appliance standards, we see the trajectory continue straight upwards (Graph 2, red line).

ISO-NE estimates the effect of efficiency in its long range energy forecasts based on the amount of passive demand resources that have been cleared in the FCM.[32] This is not equivalent to an estimate of achievable efficiency potential in the future, but reflects only a portion of current levels of efficiency activity (see sidebar on page 13). The cumulative impact of FCM efficiency and federal appliance standards is approximately 6,500 GWh in 2018, or 4.4 percent of expected load. Graph 2 shows that this is far less than our achievable potential estimate for New England. Overlaying the estimates from this study—approximately 20 percent demand reduction by 2018 (shown in green/bottom line)—demonstrates how much more achievable efficiency potential exists in New England beyond the ISO's forecasts.

[31] The term "at meter" means that the energy savings potential is calculated relative to customer usage. In contrast, savings can be calculated "at generation," sometimes written "at gen," which means that the savings are calculated relative to what comes directly out of the power plant and onto the grid. These values are different because energy is lost through the inherent inefficiencies in transmission and distribution infrastructure between the power plant and the customer meter. These losses, referred to as "line losses," are, on average, roughly 8% in New England. Therefore, saving 100 kWh at a customer's home reduces generation needs by 108 kWh. Hornby, Rick, et. al. Avoided Energy Supply Costs in New England: 2009 Report. Prepared for: Avoided-Energy-Supply-Component (AESC) Study Group; Cambridge, MA. 21 August 2009.

[32] Project proponents submit bids to the FCM in terms of peak MW, which ISO converts into MWh based on assumed capacity factors ranging from 65 to 78 percent depending on month. For the purposes of this analysis, we used a uniform capacity factor of 70 percent to estimate the MWh reduction from efficiency resources participating in the FCM.

Graph 2: Efficiency Can Redefine the Region's Electric Load



The graph above demonstrates how efficiency can redefine the region's electric load growth. The ISO-NE forecast currently only accounts for efficiency bid into the Forward Capacity Market, a small percentage. The bottom line shows what this study estimates is possible by capturing all cost-effective efficiency.

Efficiency Potential Estimates

Combining the previously-developed savings estimates with the ISO-NE forecast data generates the results shown in Table 2, which demonstrates savings potentials for each state and the region overall. As noted in the Executive Summary, this report depicts potential without attempting to predict the path states will take to achieve a ramp-up in savings. Ramp-ups are important to ensure successful programs and the savings they attain. States must balance the cost to ramp up programs and political and economic realities with desired progress toward long-term goals. That is to say, ramping up too slowly in early years will mean deferring efficiency initiatives that make it more challenging for states and PAs to meet ultimate savings targets.

Table 2: Cumulative Electric Savings Potential by State

State	Annual Cumulative Savings Potential (GWh)								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Connecticut	872	1,744	2,616	3,488	4,360	5,232	6,104	6,976	7,849
Maine	311	622	932	1,243	1,554	1,865	2,175	2,486	2,797
Massachusetts	1,677	3,354	5,031	6,708	8,385	10,062	11,739	13,416	15,093
New Hampshire	329	659	988	1,318	1,647	1,977	2,306	2,636	2,965
Rhode Island	179	359	538	718	897	1,077	1,256	1,436	1,615
Vermont	164	328	492	656	820	985	1,149	1,313	1,477
New England	3,533	7,066	10,599	14,131	17,664	21,197	24,730	28,263	31,796

Case Study: How RI Is Setting Goals Based on Its Efficiency Potential Study

"The Phase II Opportunity Report identified an average annual technical potential of 3.4% of (electric) load, an economic potential of 2.9%, and an average annual achievable potential of 2.7% of load for electric efficiency resources in the state. As a result of this potential identified by KEMA's Report and in accordance with R.I.G.L.§ 39-1-27.7.1(f), which refers to the (Energy Efficiency and Resource Management Council) EERMC's use of the report for this purpose, the Council recommends annual efficiency savings targets that will achieve a steady increase to this identified potential, recommending targets in 2012, 2013, and 2014 that are 1.7%, 2.1%, and 2.5% of load, respectively. These targets are needed to build groundwork for the procurement and programmatic strategies that will enable the investment in the amount of efficiency identified in Phase II Opportunity Report by 2015."

Excerpt from a September 2010 proposal by the EERMC to the state's Public Utilities Commission, pg. 3. http://www.ripuc.org/eventsactions/docket/4202-EERMC-EST-Filing%289-1-10%29.pdf

Identifying the Savings Potential by End-Use

New England can cost-effectively acquire this achievable energy potential through a variety of program strategies and adoption of new technologies, as appropriate. By relying on best practices and moderately aggressive but sustained efforts, growth in electricity sales can not only be reduced, but could actually be reversed as shown in Graph 1 of this report.

Our review of the efficiency studies indicates that significant energy efficiency reservoirs are located in each state and in all sectors of the region's economy. Significant energy resources exist in lighting, appliances, and heating, ventilation and air conditioning (HVAC) systems. Other savings by major end-uses include water heating, industrial processes, and refrigeration. The following pie charts illustrate the breakdown of the regional potential in each sector by end use.

Chart 1: Residential Savings Potential by End-Use

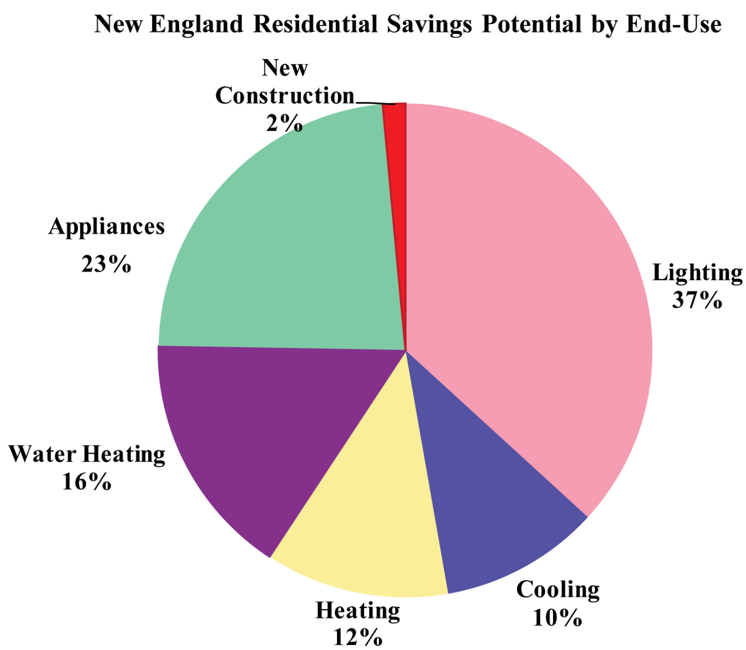


Chart 2: Commercial Savings Potential by End-Use

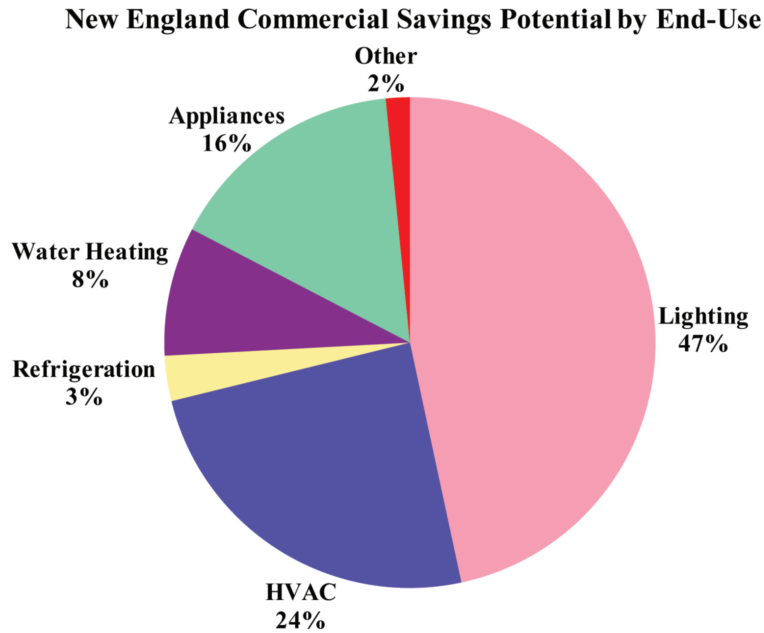
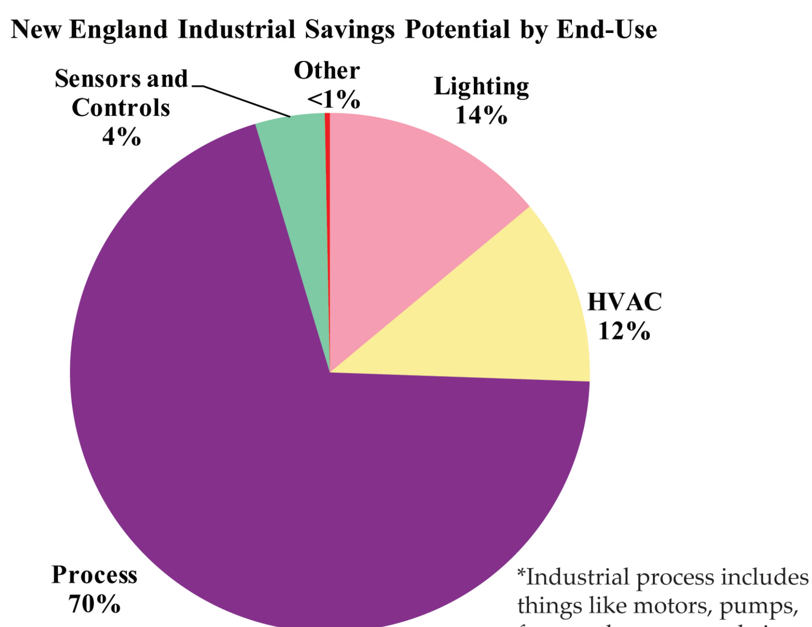


Chart 2: Industrial Savings Potential by End-Use



Examining the Efficiency "Supply Curve" by Measure

How It Was Calculated

The state-level potential studies used for this analysis did not provide detailed measure-level data from which to develop a supply-curve for energy efficiency. In lieu of this data, we calculated weighted average levelized measure costs by sector and end-use from a recently completed program-potential study for the state of Vermont.[33] The levelized cost for each measure, in dollars per discounted lifetime kWh saved, is based on the measure cost, annual savings, and measure life.

The average levelized cost of all measures within each end-use was then calculated, weighted by forecast program savings in the second year of program implementation. Using data from each state's study, we developed an energy efficiency supply curve to assess the magnitude of the potential savings by major end use and its cost per kWh.

What It Means

The supply curve provided in Graph 3 depicts the average levelized cost per kWh saved for each major end-use (y-axis), as well as the absolute amount of energy saved (x-axis). The wider the bar, the more savings attributed to that end use measure; the taller the bar, the more expensive the savings. The relative area of each box represents the total investment needed to capture the potential savings in each end-use.

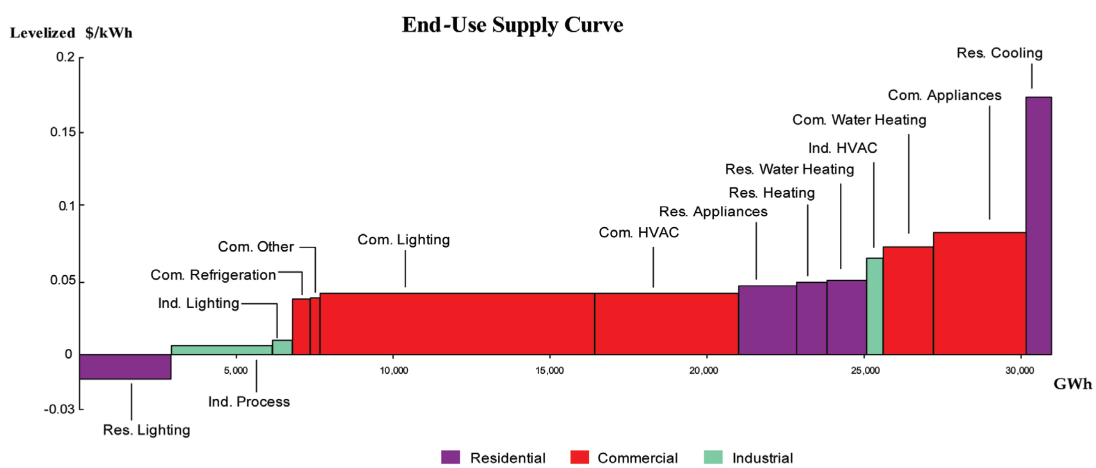
> Measure life refers to the length of time in which savings can be counted from an energy-consuming device or system, such as a motor, insulation or a light bulb. When an efficiency measure is installed, it continues to deliver savings and other benefits for an extended period of time.

As Graph 3 demonstrates, commercial lighting and HVAC represent a substantial portion of the overall achievable potential at a levelized cost of less than 5 cents per kWh. Note that the negative levelized cost for residential lighting measures implies that these measures are less expensive over their lifetime than the baseline measure, largely due the much longer life of compact fluorescent lamps. This assumes incandescent bulbs are the baseline of analysis. A new federal lighting efficiency standard will affect this assump-

[33] Efficiency Vermont, Green Energy Economics Group Inc., Optimal Energy Inc. Forecast 20: Electricity Savings in Vermont from 20 Years of Continued End-Use Efficiency Investment. Prepared for: The Vermont Public Service Board and The Vermont Systems Planning Committee of Burlington, Vermont. December 2009.

tion beginning in 2012.[34] Another significant consideration for assessing savings potential in the future will be plug load. The dramatic increase in home electronics and gadgets is driving up home electric use, and also presents large reservoirs for savings through devices such as advanced power strips[35] as well as behavioral changes. The opportunity for residential plug-load savings is estimated to be at least 10 percent of total use, with one study suggesting that plug-load electric consumption could be halved. This "miscellaneous electric load" now accounts for more than 25 percent of consumption in a typical home.[36]

Graph 3: Where the Savings Lie - Efficiency Potential by Sector and End-Use



This supply curve graph depicts the current average levelized cost per kWh saved for each major end-use, as well as the absolute amount of energy saved. The wider the bar, the more savings attributed to that end use measure; the taller the bar, the more expensive the savings. The relative area of each box represents the total investment needed to capture the potential savings in each end-use. There is always a lack of certainty in predicting future costs, and baselines may change.

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[34] The Energy Independence and Security Act of 2007 set new standards that will eventually phase out traditional incandescent lamps. More at: http://www.epa.gov/regulations/laws/eisa.html

[35] Advanced power strips can power down non-essential electronics while leaving others in stand-by mode, thereby reducing the so-called "phantom load" that comes from things like DVDs, stereos, or rechargeable devices.

[36] Roth, K., K. McKenney, R. Ponoum, and C. Paetsch. 2007. Residential Miscellaneous Electric Loads: Energy Consumption Characterization and Energy Savings Potential. Prepared for U.S. DOE by TIAX LLC. Washington, D.C.: U.S. Department of Energy.

Quantifying Total Resource Benefits and Costs

How it was Calculated

Cost-effectiveness screening requires an estimation of the cost to achieve the stated savings levels. For this analysis, we used program cost estimates reported in the various state potential studies. Where necessary, we adjusted costs to equivalent 2010 dollars. To determine the incremental cost of installed efficiency measures, we used sector-specific values for the percentage of incremental cost covered by program incentives as reported in the potential studies, where available. When these were unavailable, proxy values for percentage incremental cost coverage were taken from known programs operating in the state or from a neighboring state where program activity was similar.

Savings available to New Englanders when accounting for all avoided costs could be as much as $21.7 billion from all efficiency measures installed by 2018.

Benefit calculations rely on state-specific avoided costs for power taken from the 2009 Avoided-Energy-Supply-Component (AESC) report conducted for Vermont.[37] The AESC also provided some greenhouse gas savings factors, with others taken from Energy Information Agency (EIA) and Environmental Protection Agency (EPA) data sources.[38] Optimal used its proprietary Portfolio Screening Tool to transform the savings and costs inputs into final cost-effectiveness and emission reduction outputs. To estimate the total resource benefits that would accrue to New England from implementing programs to achieve the savings estimates above, we analyzed the annual stream of efficiency savings (net of program costs) relative to the avoided cost of supply resources across the region.

What it Means

As Table 3 indicates, acquiring 31,800 GWh of achievable efficiency potential by 2018 results in positive net societal benefits of $19.6 billion over the life of the efficiency measures. These benefits should be considered a conservative estimate, because we relied on avoided costs from the AESC, which do not include the benefits of avoided transmission and distribution costs. Including these avoided costs in our benefit calculation would add between $1.3 and $2.1 billion in present value benefits for New

[37] Ibid.

[38] U.S. DOE Energy Information Administration. Updated State and Regional Level Greenhouse Gas Emissions Factors for Electricity. (2002). http://www.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/e-supdoc.pdf

England.[39] In other words, the savings available to New Englanders when accounting for all avoided costs could be as much as $21.7 billion net present value from all measures installed by 2018. The savings would be generated over the life of the measures.

Table 3: Benefit-Cost Ratios of Efficiency for New England by Sector

	Present Value of Benefits (Million $)	Present Value of Costs (Million $)	Present Value of Net Benefits (Million $)	Benefit-Cost Ratio
New England Total	$31,968	$12,409	$19,559	2.6
Residential	$9,138	$4,762	$4,376	1.9
Commercial	$18,390	$5,430	$12,960	3.4
Industrial	$4,440	$2,216	$2,224	2.0

Associated Benefits of All Cost-Effective Efficiency

By meeting energy needs through efficiency, states reduce the need for siting and constructing costly and contentious new generation and transmission projects, curb emissions that contribute to air pollution and global warming, help residents and businesses save energy, put money back in people's pockets to spend on other goods and services, and create local jobs in the clean energy sector. Following is a description of the major economic and environmental benefits associated with investing in all cost-effective efficiency as described in this report.

Economic Benefits

Per Table 3, this report demonstrates that if $12.4 billion of ratepayer contributions and program dollars were cost-effectively invested in energy efficiency across New England by 2018, the investment would yield tremendous economic benefits to the region, including over $19.6 billion in net benefits over the life of the efficiency measures.

[39] The authors of the AESC collected transmission and distribution costs from several utilities and found totals ranging from approximately $54 to $92/kW-year, with one exception at $190/kW-year.

Investments in energy efficiency will yield even greater economic benefits in the form of an expanded economy and new jobs in the clean energy sector. Based on the results of an Environment Northeast macroeconomic study that modeled the implementation of similar, but not identical, levels of all cost-effective energy efficiency, it is estimated that investing in this level of efficiency would ultimately increase gross state product (GSP) by $54.6 billion and increase employment by 421,906 job years throughout the region. (A job year equals one job that lasts one year).[40]

Environmental Benefits

In addition to the monetary benefits, efficiency will reduce the harmful environmental impacts associated with current generation resources, which are largely fossil-fuel based in the New England region. Every GWh generated from fossil fuels produces approximately 490 tons of CO_2, 0.27 tons of SO_2 and 0.16 tons of NO_x. Achieving annual efficiency savings of 31,800 GWh by 2018 would reduce harmful pollutants by the amounts shown in Table 4. The estimated CO_2 emission reductions are equivalent to the annual emissions from nearly 3 million passenger vehicles[41].

Table 4: Potential Reductions in Greenhouse Gas Emissions, 2010-2018

	Annual Cumulative Emissions Reductions (Thousand Metric Tons)								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
CO_2	1,744	3,489	5,233	6,977	8,722	10,466	12,210	13,955	15,699
SO_2	0.9	1.9	2.8	3.8	4.7	5.7	6.6	7.6	8.5
NO_x	0.6	1.1	1.7	2.2	2.8	3.3	3.9	4.4	5.0

Locking in Savings: The Role of Codes and Standards

Potential studies typically assume that incentive programs that encourage investments in high-efficiency equipment and practices are the main pathway to energy savings. These savings can also be driven by legislative or regulatory action at the local, state or federal levels. This happens by setting minimum efficiency levels for appliances and equipment at time of manufacturing, distribution or sale, or by including energy specifications for construction materials, practices, and designs in building codes. In addition to the setting and enforcement of building energy codes, building energy rating and disclosure can also be a

[40] Howland, Jamie et al. Energy Efficiency: Engine of Economic Growth. Environment Northeast, 2009. http://env-ne.org/resources/open/p/id/964/resource/Energy%20Efficiency%20Engine%20of%20Economic%20Growth

[41] U.S.EPA. Green Power Equivalency Calculator Methodologies. http://www.epa.gov/grnpower/pubs/calcmeth.htm. 2010.

valuable tool to realize energy savings. These savings can only be realized if states continually upgrade their building energy codes and, as importantly, ensure effective compliance.

Of the potential studies reviewed for this report, only the Connecticut analysis specifically addressed the potential savings from building energy codes and equipment standards. For comparability with the other states in this analysis, we removed these savings from the Connecticut savings estimates. Because we could not fully quantify the impacts of these policies, the savings estimates reported herein should be considered conservative. The magnitude of potential savings from codes and standards can be inferred from other analyses, however. For example, ISO-NE estimates that federal appliance efficiency standards will reduce annual consumption in New England by almost 2,300 GWh in 2018. To the extent that the potential studies completed in 2007 and 2009 included savings from higher efficiency appliances than are now mandated by federal standards, some or all of these savings may already be captured in our estimates.

NEEP has also estimated the potential savings that would result if states adopted additional appliance standards beyond those currently promulgated at the federal level. The package of measures includes five categories of products, with most of the savings coming from televisions and portable light fixtures. Adopting efficient standards for these products in the New England states would reduce energy use by nearly 1,000 GWh annually by 2020. Read more about the potential of this standards package here.[42]

To assess the potential impact of building energy codes, we reviewed studies prepared by the U.S. Department of Energy (DOE).[43] These studies report the effects of adopting the 2009 International Energy Conservation Code in residential and commercial construction as annual dollar savings rather than energy savings. Furthermore, greater than half of the savings result from reductions in heating energy use, which do not typically result in electric savings in the New England states. Therefore, we are unable to accurately estimate potential savings from residential building codes using these DOE studies. However, the savings potential from codes can also be assumed to be significant. In its March 2009 white paper outlining a "Model Progressive Building Energy Codes Policy for Northeast States,"[44] NEEP estimated that the potential annual energy savings for New England by 2019 as a result of improving the 2011 International Energy Conservation Code by 30 percent over current standards would be 18.79 trillion BTUs.

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[42] Memo on New Appliance Efficiency Standards Opportunities for Northeast States. NEEP, 2010. http://neep.org/uploads/policy/NEEPASAP-GeneralStandardsMemoMar2010.pdf

[43] Impacts of Standard 90.1-2007 for Commercial Buildings at State Level, and Impacts of the 2009 IECC for Residential Buildings at State Level. Both Prepared by Pacific Northwest National Laboratory for the U.S. Department of Energy Building Energy Codes Program. September 2009.

[44] http://neep.org/uploads/SOAPResources/id187/neep_building_energy_codes_policy_march%202009.pdf

Although building officials in some New England jurisdictions have done a good job of enforcing energy codes, energy efficiency tends to be prioritized behind fire and safety code enforcement, and training is often underfunded and not prioritized. While there is currently no good assessment of the percentage of buildings at or above the energy code, some estimates are that even in the more aggressive communities, compliance may only be as high as 50 percent.

For commercial construction, the DOE study mentioned above reports savings in electric use from adoption of ANSI/ASHRAE/IESNA1 Standard 90.1-2007[45] for three building types. For non-residential commercial buildings in the New England states, these savings range from two to four percent with the exception of Maine, where the study estimates savings exceeding 11 percent. Savings in multi-family buildings and "semi-heated" warehouses are less than two percent in all states. Because we did not have complete measure-level data for the potential studies on which we based our results, we cannot determine the full extent to which these savings may already be accounted for in our estimates.

Potential studies typically do not include substantial savings from shell measures (insulation, air sealing, etc.), and the New Hampshire study specifically excluded the potential for savings from new construction (both commercial and residential). We estimate potential savings from commercial building codes likely amount to an additional one percent in most New England states, or approximately 1,500 GWh in 2018.

Regardless of the magnitude of potential savings from higher-efficiency building codes, codes must be enforced to generate actual savings. In practice, code enforcement varies widely across jurisdictions. Training in building code performance and verification among building professionals and code inspectors is a key to realizing energy savings in new buildings. Yet code represents only the least efficient building allowed by law – NEEP encourages states and communities to adopt a "stretch" energy code, which requires buildings to be at least 20 percent more efficient than base code. Such a code was adopted by the state of Massachusetts in 2009 as a local option. To date, 45 communities across the state had adopted this more efficient energy code for both residential and commercial construction and renovation.

[45] ANSI/ASHRAE/IESNA1 Standard 90.1-2007 - This is a collaborative standard of three leading code bodies: The American National Standards Institute, the American Society of Heating, Refrigerating and Air-Conditioning Engineers and the Illuminating Engineering Society of North America.

Conclusion

Steadfast commitments to efficiency by the New England states have resulted in significant energy savings across all sectors of New England's economy and made the region a leader in energy efficiency.[46] However, as *From Potential to Action* reveals, large reservoirs of efficiency remain untapped despite a long tradition of providing energy consumers with efficiency solutions. States can realize these savings by continuing to focus on best practices, aggressively pursuing early retirement/retrofit opportunities, and adopting proven and new efficiency technologies and strategies in their energy efficiency programs.

In our 2005 study of the Economically-Achievable Energy Efficiency Potential in New England, we made 10 recommendations to New England policymakers. Several of these have been adopted or implicitly pursued as a result of other policy actions. Following are new or evolving recommendations for policymakers on pathways to help the region realize the tremendous potential of energy efficiency.

[46] ACEEE. The 2009 State Energy Efficiency Scorecard. October 2009, Report Number E097.

Recommendations for Policymakers: Strategies to Move from Potential to Action

NEEP has identified a set of key elements that can help advance energy efficiency policies and their implementation. While we have seen examples of strategies that work across the Northeast, Mid-Atlantic, and beyond, no one state incorporates all of these as best practices. Even in the so-called "leading" states, there is still much room for improvement, as new ideas are tried and the kinks are worked out. Following are descriptions of what NEEP sees as strategies that, when implemented collectively, have the potential to catapult states forward in their efficiency efforts. We have provided select illustrations of where these strategies have led to success—a list that is neither definitive nor static. As thinking evolves and programs are tested, there is constant dialogue among policymakers, program administrators (PAs), regulators and stakeholders in states' efforts to maximize the potential of energy efficiency.

1. Enact policies to capture all cost-effective efficiency

All cost-effective efficiency, sometimes referred to as least-cost procurement, is the notion that utility companies should buy the most cost-effective energy resources for their customers, regardless of whether those resources are supply resources, such as traditional fossil-fuel or nuclear electric generation, or demand resources, such as energy efficiency. Because the least expensive and cleanest way to meet customer energy resource need is through energy efficiency – which, on average, costs about half to one-third as much as new power generation[47] – enacting policies that make efficiency the first order resource not only helps to meet energy needs, but fosters economic development and ensures a cleaner, healthier environment.

Leadership in Action: New England State Legislatures

In recent years, the New England states have enacted several pieces of landmark legislation that recognize the value of energy efficiency and create frameworks for delivering that value to electric and gas consumers. The Comprehensive Energy Conservation, Efficiency, and Affordability Act (Rhode Island, 2006)[48]; Public Act 07-242: An Act Concerning Electricity and Energy Efficiency (Connecticut, 2007);[49] the Green Communities Act[50] (Massachusetts, 2008); and LD 1485, An Act Regarding Maine's Energy Future

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[47] The average regional cost of efficiency is 4.1 cents per kWh, while new supply is about 8.2 cents per kWh.

[48] http://www.rilin.state.ri.us/BillText/BillText06/SenateText06/S2903Baa.pdf

[49] http://www.cga.ct.gov/2007/act/pa/2007pa-00242-r00hb-07432-pa.htm

[50] http://www.mass.gov/legis/laws/seslaw08/sl080169.htm

(Maine, 2009)[51] all require that each state capture all cost-effective energy efficiency before meeting resource needs with more costly fossil fuel generation. Massachusetts, in particular, has been a trailblazer in ramping up efficiency with the goal of capturing all cost effective efficiency. Read about how the Bay State views efficiency as a "first fuel" on the state's website.[52] Per Act 61,[53] Vermont's energy strategy has essentially been one of capturing all cost-effective efficiency, and the state boasts the highest per-capita spending on efficiency in the nation. New Hampshire has embarked on a review of all energy efficiency and clean energy programs and policies under Senate Bill 323, with the ultimate goal of creating a policy framework to capture all cost-effective efficiency. The key is to translate these legislative initiatives into meaningful regulation and programs that work on the ground. Several of the elements below speak to that point.

2. Establish funding for all-fuel efficiency programs

Policies should also strive to include all-fuels and a whole-building or "systems" approach to energy efficiency. Figuring out how to fund efficiency in buildings heated with fuels other than natural gas is an on-going challenge for many states. New England is unique as a region in terms of the high percentage of homes that heat with oil and other fuels, with these residents typically "left out in the cold" from ratepayer-funded thermal efficiency programs that have traditionally only served natural gas customers. One method that has received some traction in recent months has been the concept of enacting a small charge at the wholesale distribution level to fund efficiency programs for unregulated fuels such as heating oil and propane. This idea is particularly relevant in states like Maine, Massachusetts, Connecticut and Vermont where increased coordination among electric and natural gas efficiency programs has been advanced, but where oil heated homes and buildings are necessarily excluded from ratepayer funded opportunities. One exception has been when federal dollars have been designated for low-income assistance or other weatherization projects. While Recovery Act funding has been a boon to such strategies, many states are still seeking sustainable solutions to providing holistic efficiency programs, regardless of heating fuel.

Leadership in Action: Vermont

Few states have a long-term funding mechanism for all-fuel efficiency programs. Vermont, with only 12 percent of homes heated with natural gas,[54] appears to be the furthest along in providing solutions in thermal efficiency for those who heat with

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[51] http://mainelegislature.org/legis/bills/bills_124th/billtexts/HP103801.asp

[52] Energy Efficiency: Our First Fuel. Mass. Department of Energy Resources, 2010. http://www.mass.gov/Eoeea/docs/doer/Energy_Efficiency/MA%20EE%20story%202-1-10.pdf

[53] http://www.leg.state.vt.us/docs/legdoc.cfm?URL=/docs/2006/acts/ACT061.htm

[54] http://apps1.eere.energy.gov/states/residential.cfm/state=VT

oil, propane or other fuels. The state legislature and state Public Service Board (PSB) have authorized that all of the revenue from the Regional Greenhouse Gas Initiative (RGGI) and all net revenues from what VEIC[55] has bid into the Forward Capacity Market (FCM) be combined into unregulated fuels activities to provide integrated electric and thermal efficiency programs for residential customers, regardless of heating fuel.

Efficiency Vermont launched a significant pilot program in 2009, the Vermont Community Energy Mobilization (VCEM). The five-month pilot relied on community volunteers to increase awareness about home energy savings opportunities and achieve electrical and thermal energy savings through (1) the direct installation of home energy saving products, and (2) referral to the Home Performance with ENERGY STAR® service for major home retrofits. Efficiency Vermont partnered with local energy committees and other community groups to implement this program at the community level. Trained community volunteers installed energy saving measures, conducted walk-through assessments of home energy saving opportunities, and held "kitchen table discussions" about energy saving opportunities and resources.

VCEM resulted in 660 homes in 54 towns receiving a home energy visit and 243 volunteers conducting the home visits. A total of approximately 8,000 energy saving products were installed, including compact fluorescent light bulbs, pipe insulation, insulated tank wraps, low-flow showerheads, faucet aerators and programmable thermostats. This resulted in an estimated total of approximately 330,000 kWh and 2,000 million MMBtus saved in the first year.[56] Despite the state's notable progress in providing thermal efficiency programs, VEIC notes that the revenues coming from the FCM and RGGI pale in comparison to what is needed to seriously retrofit Vermont's building stock.

3. Demonstrate strong executive leadership

It is vitally important that those "at the top" understand the value proposition of efficiency and become champions of harnessing its potential. For governors, this means appointing experts to their administrations, issuing executive orders that capture the potential of energy efficiency in, for example, state buildings or procurement practices, supporting legislative and regulatory processes or initiatives that fully value efficiency, and working collaboratively with other states on common efficiency goals and objectives.

[55] VEIC is the Vermont Energy Investment Corporation, the contractor operating the Efficiency Vermont programs since inception.

[56] http://www.efficiencyvermont.com/pages/Residential/Home_Heating/VermontCommunityEnergyMobiliza/

Leadership in Action: Deval Patrick, Governor of Massachusetts

In 2009, Governor Patrick was honored with the Alliance to Save Energy's Charles H. Percy Award for exemplary leadership in the development and implementation of policies promoting energy efficiency, clean technology, climate protection, and green jobs. Since taking office in 2007, Governor Patrick has worked with legislative leaders to pass five landmark pieces of legislation: Green Communities Act, Clean Energy Act, Clean Energy Biofuels Act, Green Jobs Act, Global Warming Solutions Act, among others. It was also Governor Patrick who called for a "stretch" energy code appendix to the state building code, which is the first of its kind in the nation; initiated a Zero Net Energy Buildings Task Force; and issued a 2007 Leading By Example Executive Order that directs state agencies to reduce their energy use and greenhouse gas emissions 20 percent by Fiscal Year 2012 and 35 percent by 2020.[57] Such policies have made Massachusetts a national leader in promoting energy efficiency and renewable energy, and will help to both control energy costs and ensure energy security.

4. Link efficiency to multiple policy goals: Energy, Economic, Environmental

By meeting energy needs through efficiency, states reduce the need for siting and constructing costly and contentious new generation and transmission projects, curb emissions that contribute to air pollution and global warming, help residents and businesses save energy, put money back in people's pockets, enhances gross state product and create local jobs in the clean energy sector. Efficiency proves that environmental protection and economic gain are not mutually-exclusive. When implemented at significant levels, efficiency can temper wholesale electricity prices, thus saving consumers money whether or not they have directly participated in these programs. From an environmental perspective, cutting energy use translates into a lower demand for energy generation, and a reduction in harmful emissions. This includes carbon, which, unlike other types of pollution, cannot be scrubbed out at the smokestack.

Leadership in Action: The Regional Greenhouse Gas Initiative

Energy efficiency is a cornerstone of the Regional Greenhouse Gas Initiative, the multi-state pact that has resulted in the nation's first carbon cap-and-trade system. In modeling the impacts of RGGI, the states recognized that the most cost-effective way of administering the system would be to invest the proceeds from the carbon auctions in energy efficiency. This not only reduces ratepayer costs, but also has the greatest overall impact of reducing future carbon emissions.

[57] From the Alliance to Save Energy's website: http://ase.org/content/article/detail/5687

Leadership in Action: New Hampshire Climate Action Plan

New Hampshire is one of several states that have developed legislation or a plan to curb greenhouse gas emissions from buildings and vehicles. In New Hampshire's plan,[58] energy efficiency is cited as the number one strategy to fight climate change. The state's Energy Efficiency and Sustainable Energy Board is one group that is working to drive efficiency as a climate solution. According to the plan's overview, New Hampshire's Climate Action Plan presents an opportunity to:

- **Spur economic growth through investment in the state's economy of monies** currently spent on energy imports.
- **Create jobs and economic growth** through development of in-state sources of energy from renewable and low emitting resources, and green technology development and deployment by New Hampshire businesses.
- **Avoid the significant costs of responding to a changing climate** to the state's infrastructure, economy, and the health of our citizens.

While New Hampshire faces much hard work to bring its plan to fruition, the plan presents a potential model for how to link climate change action to concrete energy efficiency measures.

5. Support the development and implementation of common EM&V protocols

The development of common regional protocols for the evaluation, measurement and verification of energy savings is a vital link to valuing the benefits of energy efficiency. The New England states are all part of the same wholesale electric market, as well as the Forward Capacity Market that values energy efficiency alongside other capacity resources. However, one reason ISO-New England has cited for not fully accounting for energy efficiency in its energy forecasts is the varying methodologies for measuring energy efficiency savings at the state level.

[58] New Hampshire Climate Action Plan, March 2009. http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/nh_climate_action_plan.htm

Leadership in Action: Northeast and Mid-Atlantic States – EM&V Forum

The Regional Evaluation, Measurement, & Verification (EM&V) Forum is a project facilitated by NEEP to help states develop common tools and language to determine the impacts of energy efficiency. The Forum supports the development and use of consistent protocols to evaluate, measure, verify, and report the savings, costs, and emission impacts of energy efficiency and other demand-side resources. The Forum's work is supported by public utilities commissioners in New England and the Mid-Atlantic, and is funded by federal, state, and private foundation sources as well as efficiency program administrators. Current projects include a mix of protocol development, research & evaluation, and education and information access projects and activities.[59]

6. Integrate efficiency into long-range state and regional energy and air quality planning

For energy resources to be available in the future, states and the region need to plan for them today. Building and accounting for efficiency capacity similar to supply-side resources will help control energy prices and reduce the need for costly and contentious transmission and delivery projects. States, program administrators and the independent system operators that manage the electric grid, need to plan for efficiency to help meet, and even reduce, the region's energy demands. ISO-NE, NIYSO and PJM should work with state regulators and stakeholders to develop a framework to appropriately value the impacts of energy efficiency in the region's electric forecast. On the state level, efficiency should be planned for in such a way that fosters longer-term contracts and allows for sustained transformation of markets and practices that capture full energy efficiency benefits. Such long-term planning will also encourage and enhance business opportunities for energy services companies and other clean energy businesses. But states also need to play an active role in driving such regional transmission processes, by urging the ISO to include energy efficiency in transmission expansion planning and energy forecasting.

Leadership in Action: Efficiency Maine Trust

Maine recently approved the first Triennial Plan of the Efficiency Maine Trust. The Trust has drawn from Maine's own experiences together with some of the best practices in the region. This is evident in terms of program design as well as coordination of programs with policies such as building codes and appliance standards. The Trust plans to address all-fuel, whole-building strategies and provide custom outreach to the medium and large business and institutional clients to meet its aggressive 10-year energy savings goals.

[59] More Regional EM&V Forum information and products are available on NEEP's website: http://neep.org/emv-forum/about-emv-forum.

Leadership in Action: Regional EM&V Forum

The EM&V Forum has planned for 2011 a project to develop guidelines for incorporating energy efficiency into system planning. The project is expected to include participation from the three ISO/RTOs in the region, and will involve Forum participants including utility and air regulatory staff, program administrators and the Forum Steering Committee, comprised of public utility commissioners from across the Forum region (New England, New York, Maryland, Delaware and District of Columbia).

7. Ensure adequate, stable, long-term funding for efficiency programs

Safeguarding and increasing efficiency program funding is vital to program success and achievement of policy goals. This can be done by treating efficiency more like a supply-side resource in the utility rates, as well as by creating legislative protections against the taking of ratepayer funds for unrelated or inappropriate uses, such as balancing state budgets. Similarly, strengthening the RGGI accord or ensuring that any new carbon trading mechanism includes mandatory minimum levels of proceeds to be invested in energy efficiency is another important mechanism to ensure that efficiency programs remain adequately funded.

Long-term, secure and adequate funding is critical for a number of reasons, including:

- Allowing end-users to plan and commit to big, multiyear efficiency projects;
- Giving system planners confidence that the resource will be there to help meet regional demand;
- Instilling confidence to people in the buildings and clean energy sectors that funding will persist in the future and the state is a fertile place to grow their business; and,
- Keeping intact the systems and institutional memory with the program administrators that is vital to good program delivery, technical knowledge, and measurement and verification.

Leadership in Action: Vermont Public Service Board & Efficiency Vermont

The Vermont Public Service Board has a forward-looking vision of delivering impactful, cost-effective and comprehensive energy efficiency opportunities to the state's residents and businesses. As a result, Vermont has seen a reverse in load growth in the last decade and is achieving some of the deepest energy savings in North America. In 2008, efficiency accounted for 2.5 percent of electric requirements. To build on the tremendous success of Efficiency Vermont, the state has ordered the Energy Efficiency Utility model to be amended to allow for 12-year Orders of Appointment. This change will allow the current program providers to continue delivering their exemplary programs and afford them much longer planning horizons. With confidence in their long-term appointment, the program providers will be better able to focus on the long-term needs of their customers and help their customers plan for the future as well.

Leadership in Action: Massachusetts

At time of writing, the nation is faced with a lingering economic downturn. This has affected state budgets adversely, with a number of states in the Northeast making the difficult, and in NEEP's opinion, short-sighted decision to divert clean energy funds to plug budget deficits. This is not the case in Massachusetts where leaders have avoided raiding RGGI or ratepayer efficiency funds. This is partly due to strong commitment by the governor and his administration, a broad stakeholder advisory board that has bought into the value proposition of efficiency to meet public policy goals, and the steadfast work of program administrators who have jointly committed to 2.4 percent savings in electric sales and 1.15 percent of gas sales over three years. The Green Communities Act and the Global Warming Solutions Act have created the framework for efficiency to be valued as a first fuel, and have demonstrated its importance in creating jobs and meeting climate change goals.

Leadership in Action: Rhode Island

Despite a severe budget deficit in 2010, Rhode Island continued to boost its investment in energy efficiency investments to meet the goals of its three-year Least Cost Procurement plan, staving off the temptation to divert RGGI proceeds for unintended purposes. The Office of Energy Resources issued rules that allow for all its RGGI funds to go to National Grid's energy efficiency programs, including new financing options for customers. The state is also working on impressive savings goals similar to those in Massachusetts, though not finalized at time of writing. Additionally, Rhode Island recently enacted legislation which would allow for utilities to decouple rates[60] from volumetric sales in their regulatory filings.

8. Foster a supportive regulatory framework and effective program planning process

Successful programs depend on regulators giving program administrators the freedom to deliver savings through non-traditional methods, which is to say beyond "rebates." These include behavioral programs, programs for emerging markets (particularly with regard to consumer electronics) and participation in and attribution of savings from complementary policies like codes and standards. In NEEP's view, other elements of a supportive regulatory framework are to:

[60] http://ri.energynewsboard.com/2010/05/21/ri-assembly-oks-utility-revenue-decoupling-bill/

- **Develop rate structures** that provide incentives to achieve excellence in program delivery (shareholder incentives) and remove the disincentives to thriving efficiency programs by decoupling utility revenues from volumetric sales.[61]
- **Establish stakeholder advisory boards** such as those in place in Maine (Efficiency Maine Trust Board), Massachusetts (Energy Efficiency Advisory Council), Connecticut (Energy Efficiency Board) and Rhode Island (Energy Efficiency and Resources Management Council) that create a framework for review and support of efficiency programs and budgets by diverse parties, and typically include utility representatives as contributing but non-voting members.
- **Retain paid technical consultants** who bring experience and expertise to stakeholder boards, and also relieve volunteer members from time-consuming technical and administrative functions. It is important that the role of the consultants is in keeping with the spirit of the statutes that enabled these boards. Their charge is to react to the PAs proposed plans and provide guidance to state advisory councils in a public and transparent way.
- **Provide flexibility in program offerings and budgets** that allow PAs leeway in how to achieve savings at the portfolio level, and do so with multi-year budgets and goals.
- **Revisit approaches to cost-effectiveness screening** by moving beyond the typical Total Resource Cost Test (TRC) to gauge cost-effectiveness, and allowing programs that value non-traditional methods of gaining savings (e.g. behavior and market effects). Find ways to value associated program benefits such as saving water and fuel, improving health and safety and reducing emissions.
- **Encourage holistic programs** such as integrating electric and thermal efficiency and supporting program providers to take a systems or whole-building approach to energy savings, with the ultimate goal of net-zero buildings. These buildings are super-efficient, integrate onsite renewable energy generation and are typically much healthier for people and the environment. Thoughtful planning and design at the start of new building or retro-fit projects can prevent lost opportunities in the future.

Leadership in Action: Efficiency Vermont

Vermont is at the forefront of the nation on effective energy efficiency program implementation, integration with enabling policies such as marketing, education and financing opportunities, and per capita investments in efficiency. The flexibility which Efficiency Vermont is allowed to deliver savings is a major reason why the programs have been so successful and

[61] Revenue Decoupling Standards and Criteria, A Report to the Minnesota Public Utilities Commission. The Regulatory Assistance Project, June 2008. http://www.raponline.org/docs/RAP_Shirley_DecouplingRevenueRpt_2008_06_30.pdf

cost-effective – whether through geographically targeted efforts to reduce transmission constraints, integrative all-fuels services, or market transformation and behavioral efforts.

9. Advance complementary public policies

Together with a flexible regulatory environment, NEEP sees the pursuit and support of policies that leverage ratepayer funded programs as key to advancing and enhancing broader savings. These policies include building energy codes, energy rating for existing buildings, and appliance efficiency standards. Specifically, we encourage:

- **Dedicating greater resources and support to improve building energy code** enforcement and the adoption of "stretch" building energy codes that are at least 20 percent more efficient than baseline state energy code.[62]
- **Enacting policies requiring that all residential and commercial buildings be rated for energy performance**, and for such ratings to be disclosed at appropriate points in real estate transactions or at other points in a way that allows markets to value energy efficiency in homes and buildings.[63]
- **Adopting new appliance and equipment efficiency standards**, which cull the least efficient products out of the consumer market as technology advances.[64]
- **Developing methods for program administrators to attribute their work in advancing codes and standards** to their energy savings targets.

Leadership in Action: Massachusetts Stretch Code

In 2009 the Massachusetts Board of Building Regulations and Standards adopted the first ever Informative Appendix to the state building energy code. The Informative Appendix consists of a residential and commercial "stretch code" that is roughly 20 percent more energy efficient than the current state energy code. The stretch code provides municipalities the option of using the current statewide code or adopting the more stringent Informative Appendix. Adopting the Informative Appendix helps municipalities qualify for funding under requirements spelled out in the Green Communities Act. At time of writing, 45 communities[65] have adopted the stretch code. The Informative Appendix is an element of the Model Progressive Energy Codes Policy recently released by Northeast Energy Efficiency Partnerships (NEEP). The policy offers recommendations to adopt progressively more efficient building energy codes, improve the rate at which buildings and dwellings comply with the code and measure the actual energy performance of buildings

[62] NEEP Model Energy Code: http://neep.org/public-policy/building-energy-codes/model-policy

[63] NEEP Building Energy Rating white paper: http://neep.org/public-policy/building-energy-codes/building-energy-rating

[64] NEEP Appliance Standards Project: http://neep.org/public-policy/2/78/Appliance-Efficiency-Standards

[65] http://www.mass.gov/Eoeea/docs/doer/green_communities/grant_program/stretch_code_towns.pdf

and dwellings. It provides guidance to states in creating and adopting building policies that will lead to large-scale energy and carbon emissions savings across the Northeast.

Leadership in Action: California Codes and Standards Work

California was first in the nation to engage and reward utility companies to work on the development and promotion of stronger appliance efficiency standards and building energy codes. Beginning in the late 1990s, utilities began preparing codes and standards enhancement (CASE) initiatives. In 2006, the California Public Utilities Commission included savings from codes and standards in their savings targets for the utilities.[66] According to analysis, potential savings attributable to codes and standards programs range between 11 percent of statewide savings goals for natural gas and 22 percent of goals for electricity.[67] Savings are attributed through a methodology that accounts for what the market would have done on its own, as well as other factors. Program administrators are allowed to attribute up to 50 percent of verified net savings to their program efforts. A number of states, including Massachusetts and Connecticut, are looking at the California model to determine how to engage and incent the utilities to drive these complementary policies forward.

Leadership in Action: Maine Building Energy Rating Initiative

In 2009, the Maine state legislature enacted Chapter 134 LD 935, Resolve, Regarding Building Energy Efficiency and Carbon Performance Ratings. This resolve directed the Public Utilities Commission (PUC) to develop a standardized rating system for building energy efficiency and carbon performance, introduce its use in PUC-sponsored activities, and encourage its use by stakeholders. Throughout its first Triennial Plan period which began in July 2010, the Efficiency Maine Trust will focus on implementing the use of rating systems within its existing programs, and encouraging adoption and promotion of rating systems by other stakeholders. It will work with regional and national organizations on the refinement of rating systems to ensure that they are low-cost, accurate and consistent. Over time, the Trust will also work with legislators and stakeholders to support the implementation of appropriate rating and disclosure legislation.[68]

[66] Lee, Allen et al. "Utility Codes and Standards Programs: How Much Energy Do They Save?" Paper presented at the 2008 ACEEE Summer Study.

[67] Report for the Massachusetts New Homes with ENERGY STAR Program: Overview of California Codes and Standards Program. Nexus Market Research, December 2009.

[68] http://efficiencymainetrust.org/

Leadership in Action: Austin, Texas - Conservation Audit and Disclosure Ordinance

The Energy Conservation Audit and Disclosure (ECAD) ordinance took effect in Austin, Texas in June 2009. The ordinance requires that all single-family, multi-family and commercial buildings that purchase electricity from Austin Energy obtain an energy audit at the time of sale. The ECAD is notable for being the first rating or audit-based disclosure policy launched in the U.S., covering both residential and commercial buildings. It also includes an interesting mandatory upgrade component for multi-unit residential buildings.[69]

10. Develop and support outside financing mechanisms

Ratepayer funded efficiency programs will not be enough to capture all cost effective efficiency, and they are often not sufficient to encourage customers to invest in deeper, more holistic building energy projects. Customers, both commercial and residential, owners and renters, need new ways to leverage outside funding. This could be through utility-sponsored financing, such as some of the on-bill financing options currently being researched, through Property Assessed Clean Energy (PACE) loans,[70] special bank products for efficiency investments, federal and state tax credits, or by leveraging funds from the American Recovery and Reinvestment. States and program administrators are working together across the region to develop solutions to overcome the barriers to customer investments in building efficiency. As with any new financial product, the risks and roadblocks must be carefully considered by the administrator and its regulators, be it a bank, a utility program provider or a state agency. PAs and regulators will need to work together to develop common EM&V and project savings to provide data for financers to in order to support loans. At present, financers currently cite challenges including a lack of data available and variations in how data is presented by the various program administrators.

Leadership in Action: Maine and New Hampshire

All of the New England states are investigating ways that financing can help boost residential energy retrofits, with four of six states enacting PACE programs. Maine and New Hampshire deserve special recognition for leveraging their ARRA funds to promote residential energy retrofits through creative financing mechanisms. Both states were awarded significant funds from the Department of Energy's Retrofit Ramp-Up grant competition for their

[69] See NEEP's Building Energy Rating webpage and report, which includes more case studies on emerging U.S. policies: http://neep.org/public-policy/building-energy-codes/building-energy-rating

[70] The Federal Housing Financing Administration is currently wrestling with how to implement PACE loans without subjecting lenders to undue risk, as these loans are typically made a primary lien on the property. At time of writing, this has seriously curbed the potential of PACE to help make efficiency investment more feasible for property owners.

programs.[71] Maine is using its award to fund a statewide PACE program, to be administered by the Efficiency Maine Trust. New Hampshire is using its funds for its Beacon Communities Program, which will provide substantial efficiency investments and develop financing tools in three communities throughout the state. These innovative programs can help us to understand how to motivate residents and businesses to invest in energy efficiency.

[71] A full list of the Department of Energy's "Retrofit Ramp-Up" award winners can be found at http://www.energy.gov/news/documents/Retrofit_Ramp-Up_Project_List.pdf

Additional Resources on NEEP's Website

These policy suggestions and the examples of best practices from around the region are a work in progress. For more information, please visit NEEP's website. Specifically, we recommend the following resources:

- New England Energy Efficiency Potential Study Phase 1 Results – Memo from Optimal Energy. This document serves as the basis for Optimal's analysis.
  http://neep.org/public-policy/policy-outreach-and-analysis/potential-study

- Public Policy: includes links to our projects on Appliance Efficiency Standards, Building Energy Codes, High Performance Schools and Public Buildings, and Policy Outreach and Analysis.
  http://neep.org/public-policy

- Policy Outreach and Analysis: includes information and NEEP's position on a variety of policy mechanisms such as revenue decoupling, multi-fuel programs, and efficiency as a climate solution. You will also find state data, links and reports, NEEP's policy tracking briefs, our bi-monthly newsletter, Highlights, and a very helpful Policy Snapshot which compares efficiency funding mechanisms, savings levels and other data across the Northeast and Mid-Atlantic states.
  http://neep.org/public-policy/1/78/Policy-Outreach-Analysis.

- NEEP Glossary of Terms and Acronyms: a useful and comprehensive reference including definitions of terms commonly used in energy efficiency policy and program evaluation.
  http://neep.org/uploads/EMV%20Forum/EMV%20Products/EMV-F%20Glossary%20of%20Terms%20and%20Acronyms%20-%20Final%20March%202009.pdf

Other Resources

A number of public and private collaboratives have released guidance on maximizing energy efficiency through policy. These include:

- The National Action Plan for Energy Efficiency
  http://www.epa.gov/cleanenergy/energy-programs/suca/resources.html

- The Renewable Energy and Energy Efficiency Partnership's Compendium of Best Practices, 2010
  http://www.reeep.org/16672/compendium-of-best-practices.htm

- The Regulatory Assistance Project's Energy Efficiency Policy Toolkit, 2006
  http://www.raponline.org/docs/RAP_REEEP_CompendiumofBestPractices_2010_05_28.pdf

Primary Sources Used in this Study:

- *Vermont Electric Efficiency Potential Study,* GDS Associates, prepared for the Department of Public Service, January, 2007.

- *Potential for Energy Efficiency in Connecticut*, KEMA, prepared for the Connecticut Energy Conservation Management Board, May, 2009.

- *Additional Opportunities for Energy Efficiency in New Hampshire*, GDS Associates, prepared for the New Hampshire Public Utilities Commission, January, 2009.

- *Summary Report of Recently Completed Studies and Recommendation for Maine's Energy Efficiency Programs*, Summit Blue and ACEEE, prepared for the Maine Public Utilities Commission, January, 2010.

- *The Opportunity of Energy Efficiency that is Cheaper than Supply in Rhode Island*, KEMA, prepared for the Rhode Island Energy Efficiency and Resource Management Council, July 2008. (Phase II of the Report was released in August 2010).

- *Assessment of All Available Cost-Effective Electric and Gas Savings: Energy Efficiency and CHP*, submitted to the Massachusetts Energy Efficiency Advisory Council by its Consultants, July, 2009.

Northeast Energy Efficiency Partnerships
91 Hartwell Avenue Lexington, MA 02421
781-860-9177

www.neep.org