



**Regional Energy Efficiency Database:  
Program Year 2012 Annual Report  
Northeast Energy Efficiency Partnerships  
August 2014**



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## ACKNOWLEDGEMENTS

The Regional Energy Efficiency Database (REED) was developed by Peregrine Energy Group and is managed by the Regional Evaluation, Measurement and Verification (EM&V) Forum, a project of Northeast Energy Efficiency Partnerships (NEEP). REED and this Annual Report were funded by the United States Department of Energy / Lawrence Berkeley National Laboratory and the Regional Evaluation Measurement & Verification (EM&V) Forum states. NEEP thanks the [REED Subcommittee members](#) for guiding REED's development and contributing to and reviewing this report.

Development of the REED Program Year 2012 Annual Report was led by Cecily McChalicher of the NEEP EM&V Forum team. The following NEEP staff members reviewed the report and provided feedback, inputs, and edits as warranted: Josh Craft, David Lis, Julie Michals, Claire Miziolek, and Elizabeth Titus. Layout and formatting was provided by Alicia Dunn.

This report, which reflects the opinions and judgments of the NEEP staff, was developed in consultation with the REED Subcommittee and does not necessarily reflect the opinions and judgments of NEEP board members, NEEP Sponsors, or project participants and funders.

## BACKGROUND

### About NEEP

NEEP was founded in 1996 as a non-profit whose mission is to serve the Northeast and Mid-Atlantic to accelerate energy efficiency in the building sector through public policy, program strategies and education. Our vision is that the region will fully embrace energy efficiency as a cornerstone of sustainable energy policy to help achieve a cleaner environment and a more reliable and affordable energy system.

### About the Regional EM&V Forum

Launched in 2008, the EM&V Forum (ADD LINK) is a project of NEEP whose purpose is to support 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, for the policy and regulatory purposes provided in the NECPUC and MACRUC resolutions (ADD LINKS) passed in 2008 and 2012.

### About REED

REED is a product of and managed by the EM&V Forum. Its reporting structure is based on the EM&V Forum's [Common Statewide Energy Efficiency Reporting Guidelines](#) (ADD LINK), adopted by the Forum's Steering Committee in 2010.

## I. EXECUTIVE SUMMARY



REED States Highlighted in Blue

The Regional Energy Efficiency Database (REED) provides energy efficiency program data covering the following Northeast and Mid-Atlantic states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, Vermont, and the District of Columbia. Using a common, consistent dashboard, interested stakeholders can readily access, compare and aggregate information about the performance of the regions' electric and gas energy efficiency programs, including annual and lifetime energy and demand savings, expenditures and cost of saved energy, avoided air emissions and job impacts.

REED's key purpose is to build greater consistency in energy efficiency and other demand side resource reporting practices across the region to support the growing resource as a viable strategy to help meet:

1. State and regional system energy and demand goals/needs;
2. State air quality and greenhouse gas compliance plans to US EPA; and
3. State and regional economic development goals in terms of job impacts.

REED also allows users to benchmark or compare reported data across states to help identify where program performance may differ from state to state, and to help identify program best practices. *To this end, an important note to users when comparing state data is that consistency in reporting across the states (and even within some states) is a work in progress, as important differences in definitions and reporting categories persist.* This report aims to identify where such differences are most prevalent, the underlying reasons thereof, and makes recommendations for how the region can move towards greater consistency.

REED currently includes data for program years 2011 and 2012. This REED Program Year 2012 Annual Report provides a high-level overview of the impacts of 2012 energy efficiency programs at the state and regional level, and compares 2012 impacts to 2011. The report also provides a more detailed study of several electric and natural gas program types that achieved the highest level of net annual energy savings across the region. Throughout the

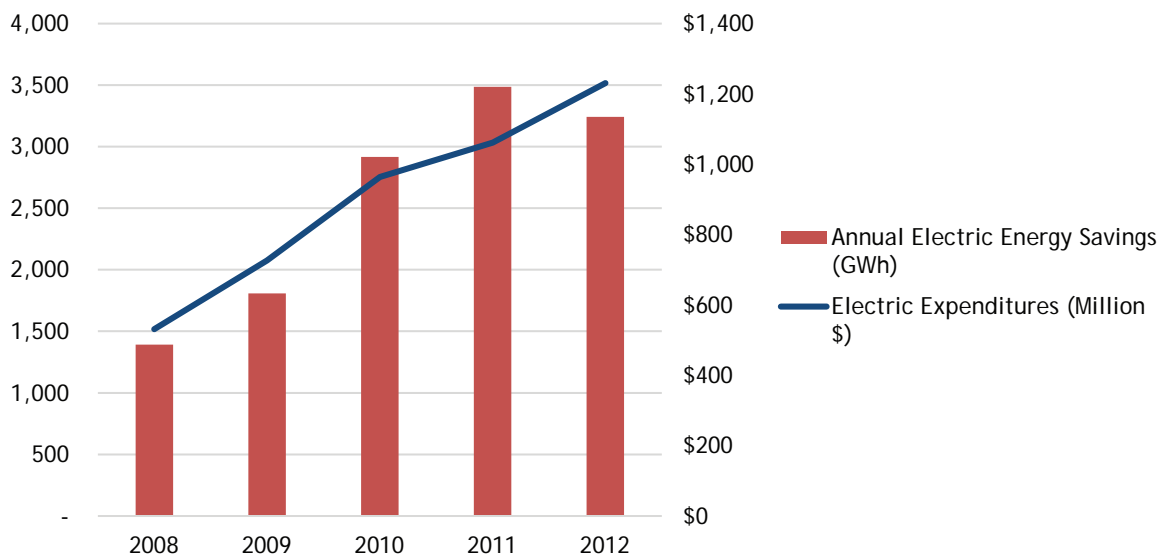
report, key differences in energy efficiency program results across states are highlighted, and some insights are provided into why these differences occurred.

## 2012 PROGRAM YEAR HIGHLIGHTS AND OBSERVATIONS

**STATES REPORT MORE THAN 3,240 GWH OF ANNUAL NET ENERGY SAVINGS FROM THEIR ELECTRIC EFFICIENCY PROGRAMS FOR 2012, AND NEARLY 490 MW AND 280 MW OF SUMMER AND WINTER PEAK SAVINGS, RESPECTIVELY.**

The region’s annual net energy savings for 2012 are considerably higher than in years 2008 to 2010, but slightly lower than 2011 results driven by lower savings results reported in New York, among other states.<sup>1</sup> Where states have multi-year goal cycles, reported savings in early years may be conservative relative to the latter part of the cycle where there is typically more aggressive spending to meet the goals, then followed by a reduction in spending the subsequent year as the program administrator begins another multi-year goal cycle.

Figure ES-1: 2008 to 2012 Annual Net Electric Savings and Expenditures<sup>2</sup>



**2012 net summer peak demand savings was down 36 percent from 2011 levels, while net winter peak demand savings increased slightly from 2011 levels.** The New England

1 See recommendation 1 regarding net savings on page 12

2 While REED data collection began with Program Year 2011, NEEP has collected 2008-2010 data for comparison purposes. NEEP cannot confirm that the 2008-2010 data is fully comparable with the 2011-2012 data given the absence of consistent reporting templates and parameters and supporting definitions prior to 2011. See Appendix B for source information for 2008-2010 data.



states experienced an increase in both summer and winter peak demand savings. While New York provided the highest peak demand savings (over 200 MWs), its reported 2012 impact was lower than 2011, as a result of lower spending levels in 2012. Maryland also saw a reduction in demand savings due to the utilities nearing a saturation point for their demand response. As a result of lower reported demand savings in 2012 relative to 2011 for these two large states, the overall peak to energy ratio (MW/MWh) was lower for the region, although largely consistent for the New England states from 2011 to 2012. NEEP will monitor changes to peak to energy ratio and associated changes in program focus and design (e.g., impact of greater focus on behavioral programs which currently do not report demand savings), as policymakers increasingly look to energy efficiency to meet capacity constraints and rising winter peak demand.

Electric program expenditures continued their consistent upward trend from previous years, rising from \$1.06 billion in 2011 to just over \$1.2 billion in 2012, and more than doubling 2008 investments.

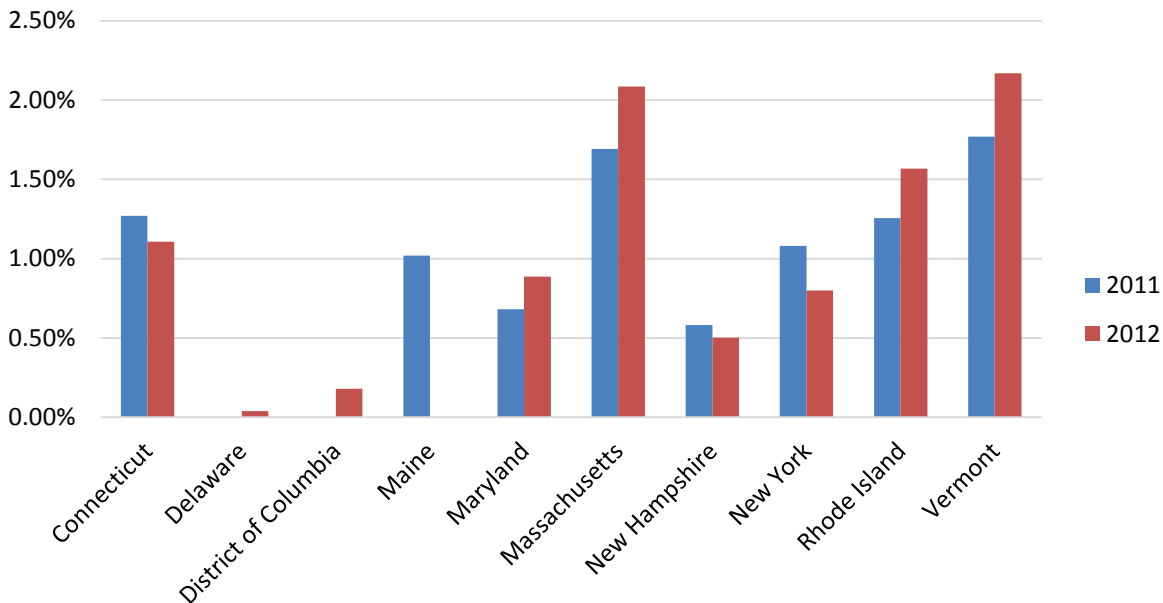
*The cost of saved energy is markedly lower than the comparable cost of electricity supply in the REED region, which is estimated to be about 10 cents per kWh. In all REED jurisdictions except for Vermont, the cost of saved electricity rose slightly from 2011 to 2012, indicative of changes to program strategies as states focus on targeting deeper and broader savings in homes and businesses.*

*The REED jurisdictions' 2012 levelized cost of saved electricity ranged from 1.9 to 7.7 cents per kWh, with six of eight jurisdictions at less than 5 cents per kWh.* While REED uses a consistent discount rate for all states to calculate a levelized cost of saved energy, providing for an apples-to-apples comparison across states, the assumed average measure life is another factor that dramatically influences the cost of saved energy (e.g., longer lasting energy efficiency measures deliver more substantial energy savings compared to shorter-lived measures).

#### **REGION SEES 2012 STATE ELECTRIC SAVINGS EXCEEDING 2 PERCENT OF ANNUAL RETAIL SALES - OR 20 percent REDUCTION IN SALES OVER 10 YEARS AND GROWING...**

Vermont achieved net annual electric savings of 2.17 percent of retail sales, with Massachusetts following close behind at 2.09 percent, levels previously unreached. Rhode Island savings jumped to nearly 1.6 percent of retail sales, and aims to reach over 3 percent of annual sales while Maryland made a strong gain to close in on savings of 1 percent of retail sales, thanks in part to increased program expenditures in those states. These states all have robust electric energy savings goals that necessitate continually improving performance in future years.

**Figure ES-2: 2011 and 2012 Electric Efficiency Program Savings as Percent of Retail Sales<sup>3</sup>**



*Increased investment in gas efficiency programs is particular relevant and important in New England and New York given recent year and anticipated winter peak price spikes, and efforts to target combined electric and gas efficiency programs during winter peak periods can help to mitigate price increases for customers.*

**GREATER INVESTMENT IN GAS EFFICIENCY PROGRAMS LEADS TO SIGNIFICANT INCREASE IN SAVINGS: 49.6 TO 53.4 MILLION THERMS FROM 2011 TO 2012.** This growth was facilitated by a 35 percent increase in natural gas energy efficiency program expenditures in many REED jurisdictions, from \$199.8 million in 2011 to \$270.6 million in 2012.

For natural gas energy efficiency, Massachusetts edged out Vermont with 2012 natural gas energy savings of 0.97 percent of retail sales, compared to Vermont's 0.93 percent. Massachusetts' jump from 0.6 percent of retail sales in 2011 to nearly 1 percent in 2012 indicates that the state is achieving savings

levels in line with its 2012 gas savings targets.<sup>4</sup> Other states with significant increases in savings compared to retail sales were New Hampshire and Vermont, which doubled their 2011 figures to exceed 0.8 percent of sales in New Hampshire and nearly 0.7 percent in Rhode Island.

<sup>3</sup> This is a comparison of 2011 and 2012 electric efficiency program savings data as reported by the 9 REED jurisdictions with retail electric sales for each year, as listed by the U.S. Energy Information Agency. The data for retail sales can be obtained from EIA File 861, available online at <http://www.eia.gov/electricity/data/eia861/>.

<sup>4</sup> See the Massachusetts 2010-2012 Energy Efficiency Plans for further detail on their gas savings goals. Information the 2010-2012 natural gas savings plans is available online at <http://ma-eeac.org/Three%20Year%20Plans.html>.



The 2012 cost of saved natural gas had a much broader range across jurisdictions than the cost of saved electricity, from a low of \$0.02 to a high of \$0.54 cents per therm. In many jurisdictions, the cost of saved natural gas dropped from 2011 to 2012. The broader range in cost of saved natural gas across the states largely reflects the different scale of investment of these programs and associated economies of scale.

### PROGRAM SPENDING & SAVINGS - KEY RESULTS AND OBSERVATIONS

*Cost Categories:* States reported their expenditures into the following REED cost categories: Customer rebates/incentives; administration; marketing; shareholder/performance incentives; research & evaluation; and other. Customer rebates and incentives continued to comprise the majority of both electric and natural gas program spending in all jurisdictions (between 55-86 percent), followed by ‘administration’ and/or ‘other’. Figure ES-3 below compares the cost categories by state, however, caution is advised in comparing the ‘Administration’, ‘Marketing’ and ‘Other,’ given lack of clarity across the states on what is included in these specific categories. It is advised that users combine these categories to compare the state overall program admin/implementation, marketing, and other costs, as provided in Figure ES-4 below, until further understanding of the key elements within these categories.

*While a goal of REED is to create greater consistency of reported EE data and impacts to allow for apples-to-apples comparison and aggregation of data, important differences in how expenditures are reported in the REED categories remain, largely due to definitions and embedded categories in program administrator/state tracking and reporting systems. Direct comparisons of state by state information on cost categories should take note of this inconsistency. Greater transparency and understanding of what is included in the cost categories is needed, and which NEEP is actively addressing with the states. We also note that performance incentives level differences may vary based upon whether or not program administrators are permitted to recovery lost base revenue (e.g., revenue decoupling).*



Figure ES-3: Cost Categories as Percent of Overall Expenditures by State, 2012

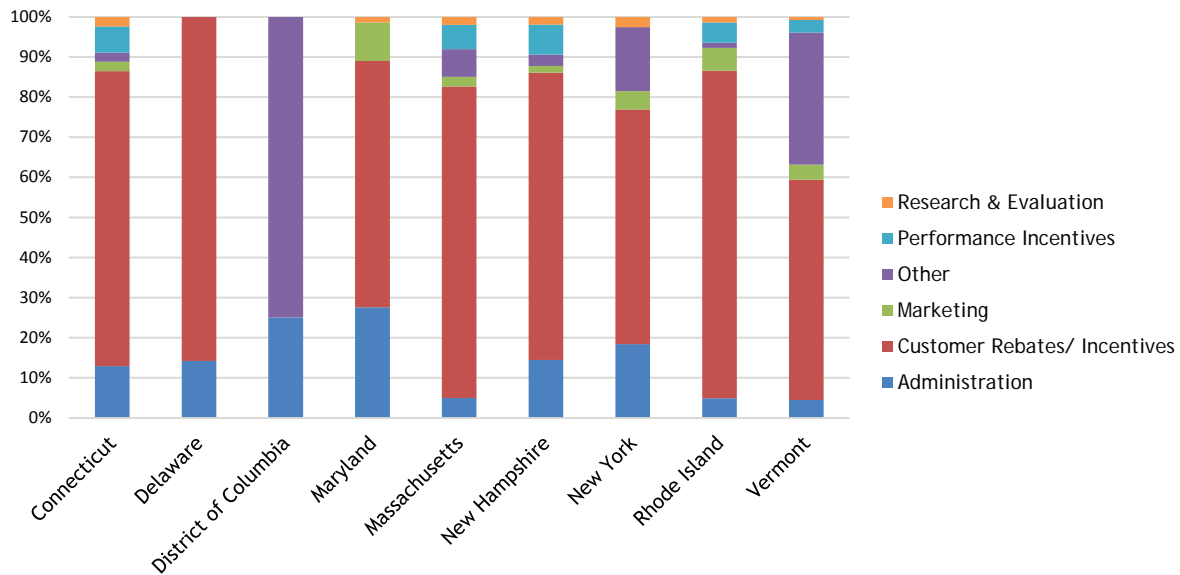
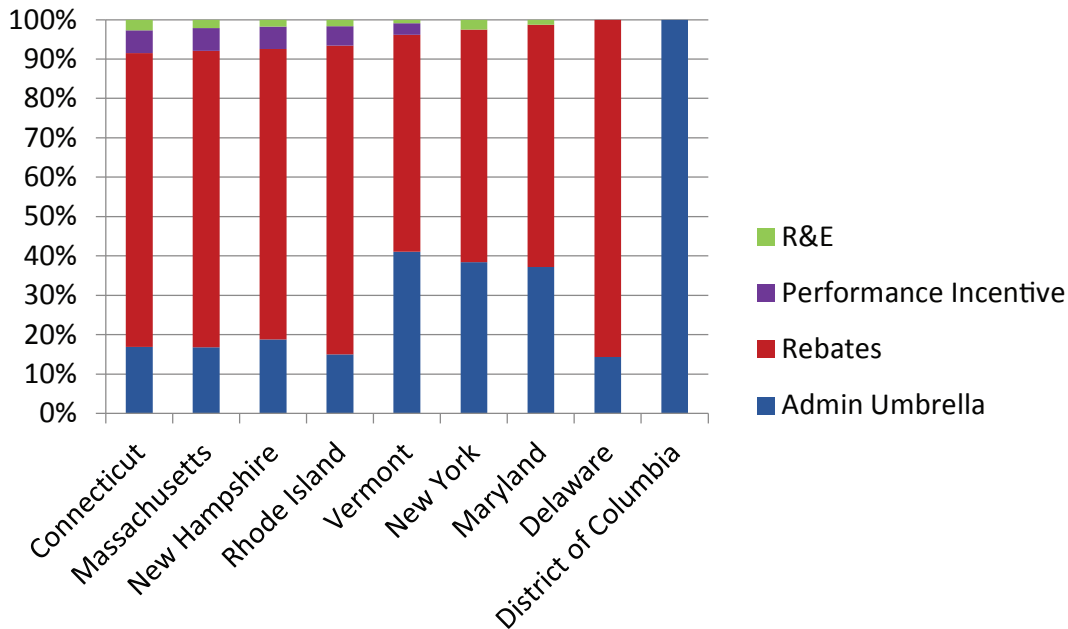


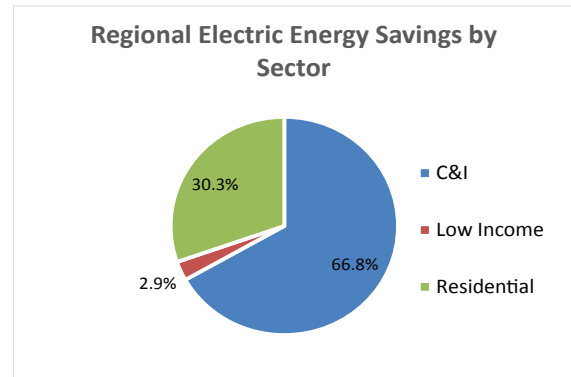
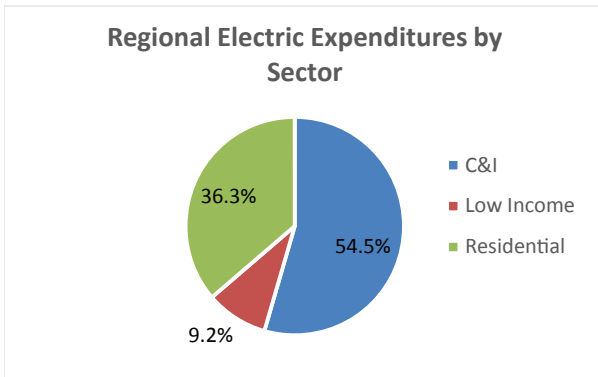
Figure ES-4: 2012 Implementation/Administrative Costs vs. Other Expenditures by State, 2012



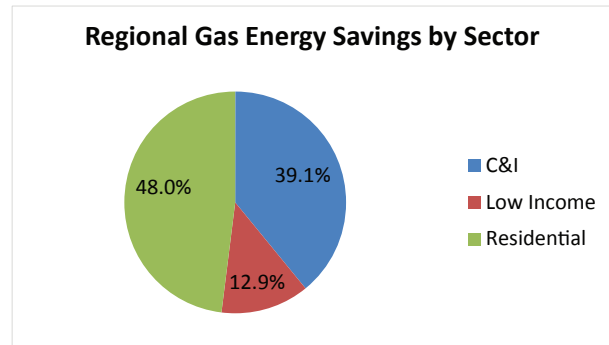
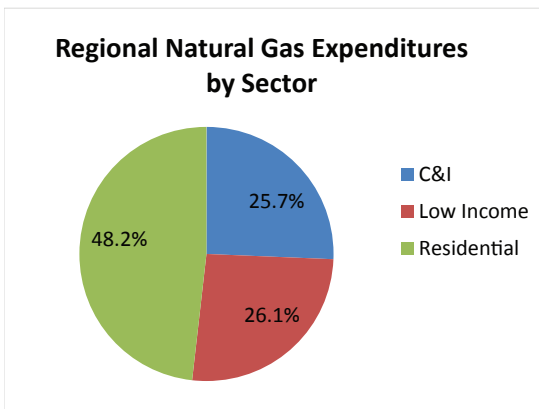
*Spending and Savings by Customer Sector:* For electric programs, the C&I sector dominates the savings category, producing almost two-thirds of the savings across the region in line with the sector electric load. For natural gas programs, however, residential programs contribute the highest level of savings (over 60 percent). Additionally, low-income programs represent a much higher portion of expenditures for natural gas programs than for electric programs, with over a quarter of the total.



Figures ES-5 & 6: Regional Electric Expenditures and Savings by Sector, 2012



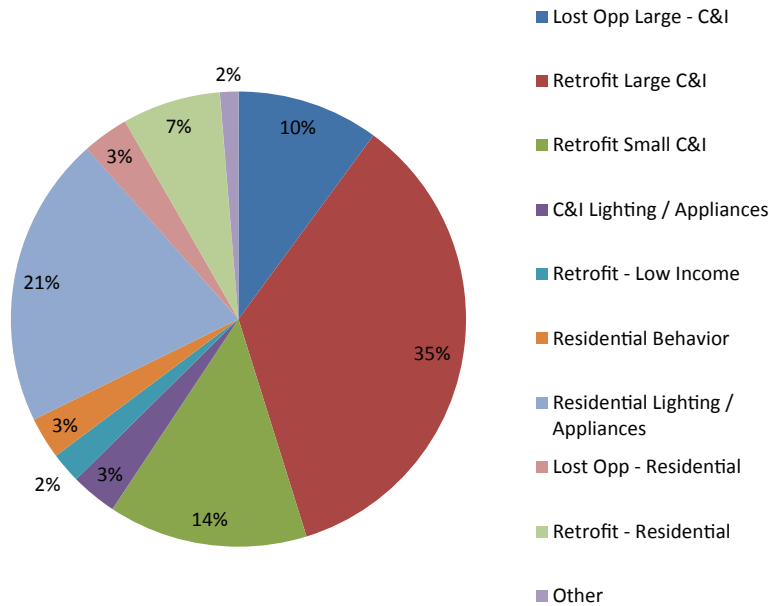
Figures ES-7 & 8: Regional Natural Gas Expenditures and Savings by Sector, 2012



*Spending and Savings by Major Program Types:* Several energy efficiency program types represent major portions of annual electric and natural gas energy savings. This report takes a more detailed look at the three electric and three natural gas program types that achieved the highest level of net annual energy savings:

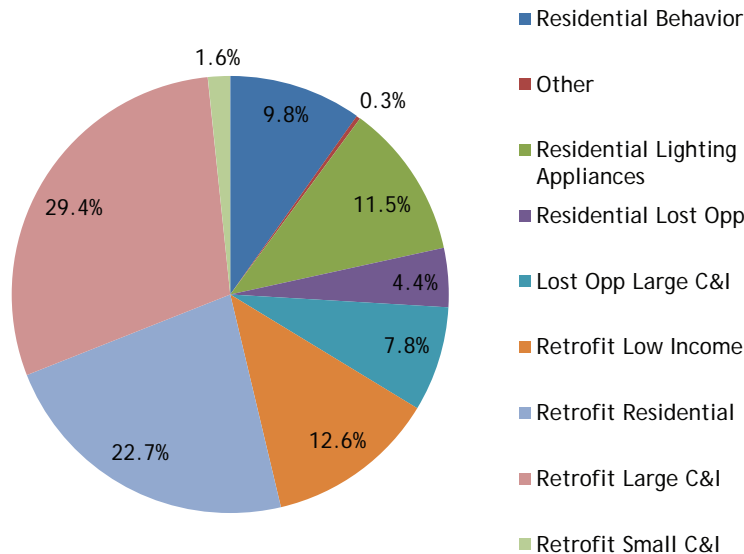
- Electric Program Types: residential lighting and appliances; large C&I retrofit; and small C&I retrofit (70 percent of annual electric energy savings collectively)

Figures ES-9: Regional Electric Savings by Program Type, 2012



Natural Gas Program Types: Large C&I retrofit; low income retrofit; and residential retrofit; (63 percent of annual natural gas energy savings collectively).

Figures ES-10: Regional Gas Savings by Program Type, 2012



For each of these program types, this report shows the differences across states with respect to net annual energy savings, expenditures, cost per kWh or therm, and average measure life.



*In light of U.S. EPA's Clean Air Act 111(d) regulations on existing power plants, the role of energy efficiency is a critical strategy to meeting state and regional carbon reduction goals, and REED, in coordination with RGGI, Inc. can help to monitor progress towards the RGGI states efforts to meet a regional cap consistent with the EPA requirements.*

**THE FORUM STATES' EE PROGRAMS RESULT IN SIGNIFICANT AVOIDED EMISSIONS, HELPING STATES MEET AIR QUALITY AND CARBON REDUCTION GOALS.** 2012 avoided air emissions from electric energy efficiency programs in the REED jurisdictions totaled over 3.5 billion pounds of CO<sub>2</sub>, 2.7 million pounds of NO<sub>x</sub>, and 7 million pounds of SO<sub>2</sub>. Over the average lifetime of the portfolio of measures of about 10 years, the emission reductions are substantial. This is roughly the equivalent of the emissions caused by the electricity use of 220,000 homes in a year.<sup>5</sup>

Like 2011, REED's 2012 calculated emissions reductions are based on regional average annual emissions rates but REED's methodology for calculating avoided air emissions may likely change for program year 2013 data collection to use marginal emissions rates, depending on the outcome of ongoing work by NESCAUM, the state air agencies, and the regional system operators in addressing a workable methodology.

**ONLY A FEW STATES REPORT JOB IMPACTS FROM EE INVESTMENTS, WITH VARYING METHODS AND TIME FRAMES.** 2012 job creation impacts from energy efficiency programs were reported by Delaware, District of Columbia, Rhode Island, and Vermont. Other states did not provide jobs data because they did not have data applicable to program year 2012 or did not feel comfortable providing jobs data given the lack of a consistent, credible job calculation methodology across states. To address the latter issue, NEEP is supporting a study that is being conducted by ACEEE in 2014 and 2015 to review methodologies in use across the country and propose an exemplary methodology. NEEP, with the input of EM&V Forum participants, will potentially recommend the use of ACEEE's exemplary methodology for reporting job impacts going forward.

For more information on state electric program energy efficiency policies and savings goals, please see NEEP's [2013 Regional Roundup](#).

## RECOMMENDATIONS

This report includes several recommendations for future EM&V Forum REED-related work that will provide for increased consistency in reported data across states and help strengthen the credibility of energy efficiency as a resource for inclusion in state, regional and national policies and markets. These activities include:

1. ***Develop greater consistency in state definitions and application of gross versus***

<sup>5</sup> This is derived for the U.S. Environmental Protection Agency's (EPA) Emissions calculator available online at <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

**net savings.** The varying ways that states report savings can make direct comparisons between state savings levels difficult. Furthermore, it can be difficult to make direct comparisons between states' net savings impacts due to variations in the evaluation methods used and components included in net savings evaluations (free-ridership, spillover, long-term market effects.) The EM&V Forum is currently working with Forum stakeholders to provide guidance on greater transparency around reporting and documentation of evaluation methods as well as developing regional guidance focused on applications of net savings.

2. ***Incorporate a more detailed energy efficiency program typology*** into REED to help resolve issues with allocating programs to the more limited set of program type categories that are currently used in REED. REED should incorporate LBNL's proposed energy efficiency program typology<sup>6</sup> to help resolve issues with allocating programs to the more limited set of program type categories that are currently used in REED. Using a broader program typology that better fits each program will increase the comparability of energy efficiency program results across states in the REED region and beyond. NEEP should continue to work with LBNL, CEE, ACEEE and others to track and encourage the use of the LBNL program type categories for formal state reporting purposes.
3. ***Add a State Energy Efficiency Resource Directory to REED*** with comprehensive information about and links to relevant sources of energy efficiency information. Develop a State Energy Efficiency Resource Directory in REED that contains information about and links to relevant sources of energy efficiency state plans, forecasts, and other data. Such a Resource Directory will help support the work of a range of energy efficiency stakeholders, including state agencies, US EPA and US DOE, and system planners.
4. ***Provide for greater transparency in EM&V practices*** used to inform reported program results in REED by finalizing the EM&V Forum's current EM&V Methods project to develop standardized EM&V methods reporting forms for use in each REED jurisdiction. The forms will be presented to the EM&V Forum's Steering Committee for adoption later in 2014. The information collected using these forms should be incorporated into REED's Energy Efficiency Resource Directory to allow for understanding of and access to supporting EM&V information.
5. ***More thoroughly examine measure life assumptions*** currently used in each state and potentially conducting additional measure life and persistence studies in the region. The Forum should more thoroughly examine where and why states are using different measure life assumptions, and how these differences affect reported lifetime savings and the cost of saved energy. The Forum should also consider conducting additional measure life and persistence studies in the region that would promote

<sup>6</sup> Lawrence Berkeley National Laboratory. Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology. August 28, 2013. See: <http://emp.lbl.gov/sites/all/files/lbnl-6370e.pdf>.



greater consistency in measure life assumptions across the states, and encourage states to use the same measure life assumptions in the TRMs.

6. ***Review Baseline Assumptions.*** The Forum should study differences in baseline assumptions across the REED states and how these assumptions affect reported program results. Such an analysis can help to inform Forum research, with focus on priority measures, as identified by Forum participants and NEEP recommendations based on REED data review.
7. ***Select and encourage the use of a common methodology to calculate job impacts*** from energy efficiency programs. NEEP should select and support a common methodology to calculate job impacts from energy efficiency programs and encourage use of this methodology for calculating job impacts in each state. As a first step, NEEP is supporting the ACEEE job impacts study being conducted in 2014 to 2015. Upon study completion, NEEP should review with Forum states whether ACEEE's methodology is acceptable, and if so, should recommend its use for energy efficiency jobs reporting throughout the REED region.

## II. INTRODUCTION

The [Regional Energy Efficiency Database \(REED\)](#), launched in 2013, provides a common dashboard for energy efficiency stakeholders to access energy efficiency program data and supporting information from Northeast and Mid-Atlantic states. REED is a product of and managed by the [Regional Evaluation Measurement & Verification \(EM&V\) Forum](#), a project of [Northeast Energy Efficiency Partnerships \(NEEP\)](#). REED users can generate reports at the region, state, sector and program type levels and download underlying program-specific energy efficiency data that can be used to analyze, compare or aggregate the impacts of state energy efficiency programs.

REED's goal is to provide transparent and increasingly consistent data on energy efficiency impacts across the region. With policymakers increasingly looking to energy efficiency investments as a highly cost-effective strategy to meet energy, economic and environmental policy goals, REED is a valuable resource to support this objective. Energy efficiency stakeholders who use REED can better understand the impact of energy efficiency programs across the region and have greater confidence in the credibility of energy efficiency as a resource.

REED is based on the Regional EM&V Forum's [Common Statewide Energy Efficiency Reporting Guidelines](#), developed in 2009 to 2010 in recognition that states in the region have different reporting practices that made it difficult to compare and aggregate energy efficiency data. REED provides reported program impacts but does not specifically address the different EM&V practices that states use to inform reported program results. The EM&V Forum is separately addressing this area in 2014 as part of its work to increase transparency in EM&V methods.

REED currently includes program year 2011 electric and natural gas ratepayer funded energy efficiency program data for eight states,<sup>7</sup> and program year 2012 data from nine jurisdictions.<sup>8</sup> Annual energy efficiency data for program year 2013 from the jurisdictions that provided 2012 data will be added to REED in fall 2014.

REED focuses on ratepayer funded energy efficiency programs. Since some of these programs are supported or co-funded in part by other sources, some of REED's 2012 program expenditures are from Regional Greenhouse Gas Initiative (RGGI) Allowance Proceeds, Wholesale Capacity Market Revenues, and state-specific funding mechanisms.<sup>9</sup> See the 2012 Program Funding Report at [www.neep-reed.org](http://www.neep-reed.org) for a state-by-state breakdown of funding sources. REED may expand in the future to include discrete reporting of all energy efficiency activities in a state (e.g. all Weatherization Assistance Program impacts, all state public building efficiency projects, etc.) and examine program expenditures compared to program budgets.

<sup>7</sup> Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

<sup>8</sup> Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

<sup>9</sup> Connecticut used funding obtained as part of its Class III Renewable Portfolio Standard (RPS) to fund its 2012 energy efficiency programs.



REED includes the following data and information:

- Annual and Lifetime Energy Savings
- Summer and Winter Peak Demand Savings
- Peak to Energy Ratios
- Avoided Carbon Dioxide (CO<sub>2</sub>), Sulfur Dioxide (SO<sub>2</sub>) and Nitrogen Oxides (NO<sub>x</sub>) Emissions
- Energy Savings Compared to Retail Sales
- Total Program Expenditures
- Expenditure Categories as a Percent of Total Expenditures
- Job Creation Impacts
- Cost of Saved Energy
- Program Funding Sources
- Supporting Information for Reported Energy Efficiency Program Impacts

This Report provides a high-level overview of the impacts of 2012 energy efficiency programs at the state and regional level, as well as a more detailed study of several electric and natural gas program types that achieved the highest level of net annual energy savings across the region. In order to develop this report, NEEP analyzed REED data for program years 2011 and 2012 and researched state policies and practices. Energy efficiency stakeholders throughout the REED region reviewed and provided comment on the report prior to its publication. It should be noted that while this report analyzes and provides insight into some reasons for differences in energy efficiency program results across states, additional work is needed to more fully explain many key differences.

REED's 2012 energy efficiency data was submitted by each participating state as of January 2014, and in some cases was compiled by NEEP. The data does not reflect any adjustments that may have been made to 2012 program results after January 2014. REED's 2011 data was submitted by each state, and in some cases compiled by NEEP, as of January 2013 and does not reflect any adjustments that may have been made to 2011 program results after this time.<sup>10</sup>

REED data is correct to the best of NEEP's knowledge, but NEEP has not independently verified the accuracy of the data. Please see the Disclaimer at [www.neep-reed.org](http://www.neep-reed.org) for more information about the terms of use of the REED data.

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<sup>10</sup> Several minor data corrections were made in 2013 to the program year 2011 data as a result of the quality control process.

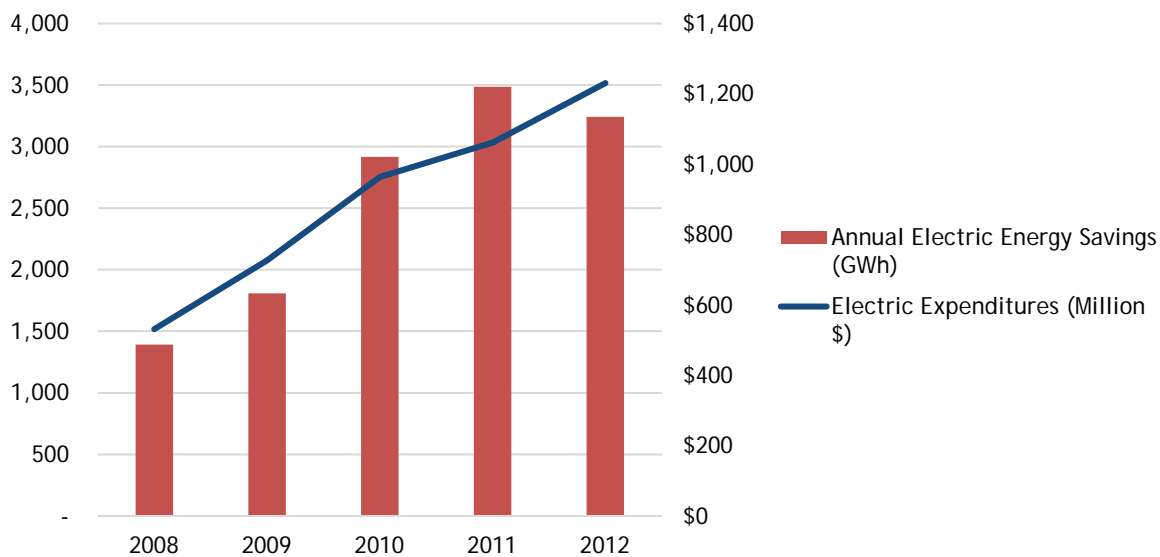


### III. TOTAL ELECTRIC PROGRAM SAVINGS AND EXPENDITURES

#### A. Total Annual Electric Energy Savings and Expenditures

Figure 1 shows that the REED jurisdictions' 2012 electric energy efficiency programs achieved net annual energy savings<sup>11</sup> greater than 3,240 GWh, considerably higher than 2008 to 2010 results, and slightly lower than 2011 results.<sup>12</sup> While 2012 annual energy savings constituted 93 percent of the 2011 total, it was still more than a 230 percent increase from 2008. Program funding continued its consistent upward trend from previous years, rising from \$1.06 billion in 2011 to just over \$1.2 billion in 2012, and more than doubling 2008 investments.

**Figure 1: Total Net Annual Electric Energy Savings (GWh) and Expenditures (Million \$)**



We note that the jurisdictions included in REED varied slightly from 2011 to 2012. The 2011 REED data includes eight states (Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont), while the 2012 REED data includes nine jurisdictions (Connecticut, Delaware, District of Columbia, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont). The 2011 and 2012 results presented in this report are for the jurisdictions that provided data to REED in each year. If we were to include just the states that provided data in both 2011 and 2012 (excluding Maine, Delaware and District of Columbia from the analysis), 2012 net annual energy savings would be 96 percent of 2011 levels.

<sup>11</sup> Annual Energy Savings reflects changes in energy use caused in the reporting calendar year by new program participants in existing energy efficiency programs and all participants in new energy efficiency programs (i.e. programs begun during the calendar reporting year). Reported Annual Energy Savings are annualized. The annual energy savings data in this report are meter level net savings data.

<sup>12</sup> While REED data collection began with Program Year 2011, NEEP has collected 2008-2010 data for comparison purposes. NEEP cannot confirm that the 2008-2010 data is fully comparable with the 2011-2012 data given the absence of consistent reporting templates and parameters and supporting definitions prior to 2011. See Appendix B for source information for 2008-2010 data.



*The total 2012 annual electric energy savings in the REED states is equivalent to powering nearly 300,000 homes for one year.<sup>13</sup>*

Table 1 shows New York achieved the highest level of 2012 annual energy savings at 1,106 GWh, with Massachusetts following closely behind at 980 GWh. When considering the year to year difference from 2011 to 2012, several states achieved impressive energy savings gains, with Maryland achieving a nearly 30 percent increase in annual energy savings, and

Vermont, Massachusetts and Rhode Island all achieving year to year increases between 20 percent to 25 percent. Massachusetts and Rhode Island also had substantially higher program expenditures in 2012 compared to 2011 (increasing 41 percent in Massachusetts and 34 percent in Rhode Island), while Vermont spent just 94 percent of its 2011 outlay in 2012 to achieve an increase in annual energy savings (see Table 2).

Where states have multi-year goal cycles, reported savings in early years may be conservative relative to the latter part of the cycle where there is typically more aggressive spending to meet the goals, then followed by a reduction in spending the subsequent year as the program administrator begins another multi-year goal cycle.

**Table 1: Total Net Annual Electric Energy Savings (MWh)**

State	2011	2012	% Change from 2011 to 2012
Connecticut	376,920	302,660	(20%)
Delaware		4,480	
District of Columbia		19,880	
Maine	119,160		
Maryland	417,620	536,960	29%
Massachusetts	797,990	980,110	23%
New Hampshire	57,810	53,970	(7%)
New York	1,522,000	1,105,860	(27%)
Rhode Island	96,010	119,670	25%
Vermont	98,060	117,650	20%
TOTAL	3,485,570	3,241,240	(7%)

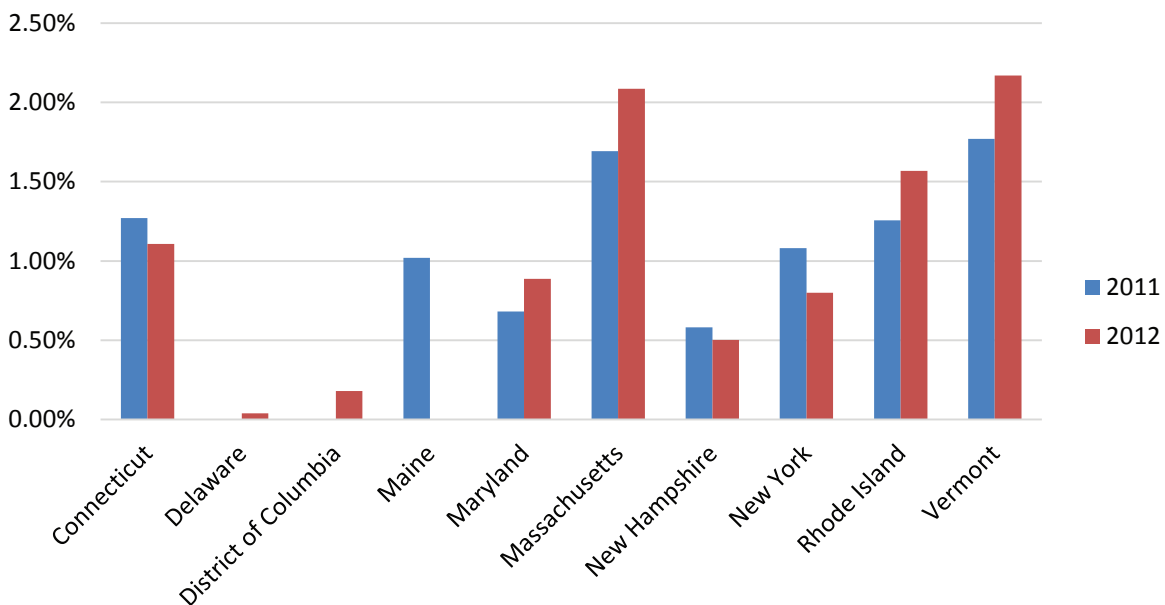
Three states, Connecticut, New Hampshire, and New York, saw year over year decreases in savings. The decline in New York’s annual energy savings in large part explains the overall dip in regional savings from 2011 to 2012 given that it represents a large percent of overall regional savings (44 percent in 2011 and 34 percent in 2012). In 2012, the decline in New York’s savings was due in part to a decrease in program expenditures. Furthermore, a portion of New York program administrators’ 2012 expenditures were used for longer-term projects

<sup>13</sup> According to the U.S. Energy Information Agency (US EIA), the average 2012 annual electricity consumption for a U.S. residential utility customer was 10,837 kWh. See: <http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3>.

that did not realize energy savings in the calendar year.<sup>14</sup> Negative annual energy savings from the New York State Energy Research and Development Authority’s (NYSERDA) Market Support Program also had a marked impact on New York’s 2012 annual energy savings figure.<sup>15</sup>

When considering 2012 savings compared to retail electric sales, Vermont and Massachusetts surpassed 2 percent, a level previously unreached in the region. Figure 2 shows that Vermont and Massachusetts achieved savings of 2.2 percent and 2.1 percent of retail sales, respectively. These impressive figures were close to meeting these states’ aggressive electric energy savings targets of 2.2 percent in Vermont and 2.4 percent in Massachusetts, as outlined in the Vermont Public Service Board’s Order re: Energy Efficiency Utility Electric Budgets for Demand Resources Plan,<sup>16</sup> and the Massachusetts Joint Statewide Three Year Energy Efficiency Plans (2010-2012 and 2013-2015). For 2013-2015, Massachusetts has an even higher goal of 2.5 percent per year. Rhode Island made an impressive jump to savings of nearly 1.6 percent of retail sales in 2012, up from 1.26 percent in 2011. Rhode Island’s energy savings targets will also continue to grow in future years, as program administrator National Grid has proposed a savings target of 3.2 percent of electricity sales in its 2014 Energy Efficiency Plan. This would be the highest annual saving goal in the nation. Maryland also made a strong gain from 2011 results to close in on savings of 1 percent of sales in 2012. Annual energy savings in both Rhode Island and Maryland were buoyed by strong increases in program expenditures.

**Figure 2: Annual Electric Energy Savings Compared to Retail Sales**



14 American Council for an Energy Efficient Economy. Energy Efficiency Resource Standards: A New Progress Report on State Experience. April 2014. See: <http://aceee.org/sites/default/files/publications/researchreports/u1403.pdf>.

15 Savings for the New York Energy SmartSM Products component of the Market and Community Support Program were reduced to account for the retirement of many lighting measures. NEEP is inquiring with NYSERDA on more context of this result.

16 VT Public Service Board Docket EEU-2010-06, Order Entered 8/1/2011. See: <http://aceee.org/files/EEU-2010-06%20DRP.pdf>.



The 2011 to 2012 year to year differences in savings compared to retail sales largely track the differences in annual savings for each state, as retail sales held constant or dropped slightly from 2011 to 2012.<sup>17</sup> The exception is New Hampshire, where retail sales increased by about 8 percent from 2011 to 2012.

For more information on state electric program energy efficiency policies and savings goals, please see NEEP's [2013 Regional Roundup](#).

Table 2 shows that Massachusetts overtook New York as the state with the highest program expenditures in 2012, increasing its expenditures by 41 percent over its 2011 outlay to just over \$400 million. New York held the second spot by spending \$362 million in 2012, an 11 percent drop from 2011 expenditures, mostly due to spending reductions for the NYSERDA SBC3 programs. Most states saw an increase in spending from 2011 to 2012, with Maryland's 65 percent increase representing the sharpest jump in the region. Delaware spent the least on its programs, as that state does not have utility administered energy efficiency programs and ran one electric energy efficiency program in 2012. The District of Columbia spent the second lowest amount on its energy efficiency program portfolio. However, spending on the District's energy efficiency programs is relatively robust given the jurisdiction has a small population and launched their programs quite recently in 2011.

For 2012 energy efficiency program budgets, see the Consortium for Energy Efficiency's [2012 State of the Efficiency Program Industry Budgets, Expenditures and Impacts](#).

**Table 2: Electric Energy Efficiency Program Expenditures (Millions)**

State	2011	2012	% Change from 2011 to 2012
Connecticut	\$119.4	\$121.8	2%
Delaware		\$0.8	
District of Columbia		\$13.8	
Maine	\$22.8		
Maryland	\$138.7	\$229.4	65%
Massachusetts	\$283.9	\$400.6	41%
New Hampshire	\$18.7	\$18.7	0%
New York	\$404.2	\$361.7	(11%)
Rhode Island	\$36.5	\$48.9	34%
Vermont	\$37.3	\$35.1	(6%)
TOTAL	\$1,061.5	\$1,230.8	16%

<sup>17</sup> Retail sales data is from the US Energy Information Administration (EIA) via EIA File 861. See: <http://www.eia.gov/electricity/data/state/>.

## B. Summer and Winter Peak Demand Savings

REED includes summer and winter peak demand savings data for electric energy efficiency programs.<sup>18</sup> Energy efficiency programs' impact on peak demand is becoming more important in the REED region, as PJM Interconnection, a regional transmission organization (RTO), and Independent System Operator (ISO)-New England, now allow energy efficiency resources to bid into the forward capacity markets and earn revenues.

The objective of a Forward Capacity Market (FCM) is to purchase sufficient capacity for reliable system operation for a future year at competitive prices where all resources, both new and existing, can participate.<sup>19</sup>

Peak demand reductions from energy efficiency programs can reduce or postpone the need for investments in new generation, transmission and distribution (T&D) systems. These avoided capacity costs and T&D costs are an important value of energy efficiency programs. Avoided capacity costs are estimated by ISO/RTOs based on peak demand savings.

ISO-New England develops an Energy Efficiency Forecast each year that estimates reductions in energy and demand from ratepayer-funded energy-efficiency programs in the New England control area by region and state. The energy efficiency program data used for the Energy Efficiency Forecast is the same data that is used in REED. The most recent final forecast covers the years 2016-2022, and is based on average production costs, peak-to-energy ratios, and the projected budgets of state regulated utility energy efficiency programs.<sup>20</sup> The final Energy Efficiency Forecast is incorporated into ISO-New England's Regional System Plan. ISO-New England's Energy Efficiency Forecasts show that the avoided capacity costs of energy efficiency programs are increasingly significant. In fact, [ISO-New England's 2013 Regional System Plan](#) shows that energy efficiency will help defer regional transmission projects on the order of \$420 million.

Table 3 shows 2011 and 2012 net summer peak demand savings for each REED jurisdiction.<sup>21</sup> Overall, 2012 net summer peak demand savings was down 36 percent from 2011 levels.

It is important to note that REED's peak demand savings figures for Maryland include demand savings from demand response programs, not just energy efficiency programs. This is because the surcharges for the Maryland energy efficiency and demand response programs were

<sup>18</sup> The New England states and Delaware report both summer and winter peak demand savings to REED. District of Columbia, Maryland and New York report only summer peak demand savings.

<sup>19</sup> Independent System Operator New England. See: [http://iso-ne.com/markets/othrmkts\\_data/fcm/index.html](http://iso-ne.com/markets/othrmkts_data/fcm/index.html)

<sup>20</sup> ISO New England's 2018-2023 Energy Efficiency Forecast is currently under development and is expected to be completed in late spring/early summer of this year.

<sup>21</sup> Each jurisdiction's definition of peak demand varies. Examples include: demand coincident with utility system peak load, demand coincident with ISO/RTO summer or winter peak, or according to performance hours defined by wholesale capacity markets.



merged together in 2011 to form the EmPOWER Maryland surcharge. The New York figure includes a PSEG-Long Island residential demand response program, as the program is included in that program administrator's energy efficiency program portfolio.<sup>22</sup>

**Table 3: Net Summer Peak Demand Savings (MW)**

State	2011	2012	% Change from 2011 to 2012
Connecticut	42.4	39.6	(7%)
Delaware		2.6	
District of Columbia		3.2	
Maine	14.7		
Maryland	130.3	63.7	(51%)
Massachusetts	103.4	126.6	22%
New Hampshire	9.9	7.9	(20%)
New York	434.9	206.6	(52%)
Rhode Island	13.7	19.5	43%
Vermont	13.6	16.2	19%
TOTAL	762.7	485.9	(36%)

New York achieved the highest level of 2012 summer peak demand savings, at 207 MW. New York has greater potential for summer demand savings than many other jurisdictions in the REED region given its warmer climate zone and higher use of A/C in summer peak hours (in particular New York City area). Even though its 2012 demand savings were the highest in the region, New York's summer demand savings were substantially lower than its 2011 results. Summer peak demand savings from PSEG-Long Island's programs increased slightly from 2011 results, but demand savings for many of New York's Energy Efficiency Portfolio Standard (EEPS) programs and NYSERDA's SBC3 programs were lower in 2012.

Maryland, which had the second highest level of demand savings in 2011, also had much lower levels in 2012. This is due in part to the Maryland utilities nearing a saturation point for their demand response program. Demand savings increased substantially in several New England states from 2011 to 2012, with Vermont, Massachusetts, and Rhode Island experiencing gains of 19 percent to 43 percent.

In 2013, REED incorporated a new report that shows the ratio of peak demand savings to net annual energy savings for each state. Peak-to-energy ratios highlight the relative emphasis of demand savings compared to energy savings in a state's program portfolio. This is an important metric of program performance for entities like ISO-New England, which uses peak-to-energy ratios as a component of its Energy Efficiency Forecast. Overall, ISO-New England has found that peak-to-energy ratios have decreased slightly in recent years, resulting in smaller

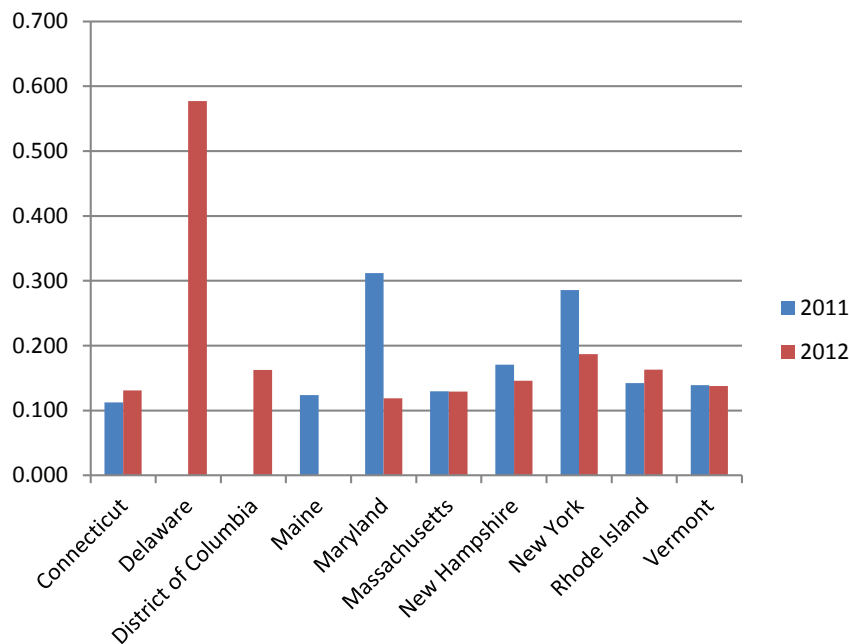
<sup>22</sup> In future annual REED reports, NEEP will provide more detailed information on the demand response program costs and savings. Interested readers are encouraged to look at the underlying demand savings data in REED to find detailed information on individual demand response programs.

demand reductions from equivalent energy reductions.<sup>23</sup>

Figure 3 shows net summer peak-to-energy ratios for the REED jurisdictions. In 2012, peak-to-energy ratios mostly fell in a relatively narrow band of 0.12 in Maryland to 0.19 in New York. Delaware is a high outlier at 0.58 because it ran one energy efficiency program in 2012, and that program had a particularly high impact on peak demand. Several states experienced slight declines in peak-to-energy ratios from 2011 to 2012, with Maryland and New York experiencing more significant declines due to the year-to-year changes in demand savings in those states.

Maryland’s peak-to-energy ratio results are unique because REED includes demand response-specific programs due to EmPOWER Maryland’s joint energy efficiency and demand response funding structure. Since demand response and energy efficiency programs do not necessarily track one another, there can be greater fluctuations in calendar year peak-to-energy ratios than for states that include only energy efficiency programs. Maryland’s peak-to-energy ratio results in 2011 to 2012 were particularly different, as energy savings increased by 30 percent from 2011 to 2012, coupled with 50 percent less demand savings in 2012.

**Figure 3: Peak-to-Energy Ratios for Net Summer Peak Demand Savings (MW/GWh)**



Increasingly, policymakers are becoming concerned with winter peak demand issues as well. When considering 2012 winter peak demand savings, Massachusetts achieved the highest level at 166 MW, followed by Connecticut at 58 MW, as shown in Table 4. Overall, net winter peak demand savings were up 6 percent from 2011 levels.

<sup>23</sup> ISO-New England Final 2013 Energy Efficiency Forecast 2016-2022. See: [http://www.iso-ne.com/committees/comm\\_wkgrps/otr/energy\\_effncy\\_frct/2013frct/iso\\_ne\\_final\\_ee\\_forecast\\_2016\\_2022.pdf](http://www.iso-ne.com/committees/comm_wkgrps/otr/energy_effncy_frct/2013frct/iso_ne_final_ee_forecast_2016_2022.pdf).



Table 4: Net Winter Peak Demand Savings (MW)

State	2011	2012	% Change from 2011 to 2012
Connecticut	72.5	57.6	(20%)
Delaware		2.6	
District of Columbia			
Maine	34		
Maryland			
Massachusetts	113.4	165.9	46%
New Hampshire	10	8.9	(11%)
New York			
Rhode Island	13	19.4	49%
Vermont	18.3	23.2	27%
<b>TOTAL</b>	<b>261.2</b>	<b>277.6</b>	<b>6%</b>

Three New England states realized substantial increases in winter peak demand savings from 2011 to 2012, with Rhode Island and Massachusetts experiencing increases of nearly 50 percent, and Vermont gaining over 25 percent. These increases exceed the year to year gains in summer demand savings and annual energy savings for each of these three states. Connecticut and New Hampshire experienced declines in winter peak demand savings that mirror their 2011 to 2012 declines in annual energy savings.

### C. Cost of Saved Energy

*The levelized cost of saved energy for 2012 programs averaged less than 5 cents per kWh, lower than the comparable cost of electric supply in New England, at 10.47 cents per kWh.<sup>24</sup>*

Energy efficiency programs' cost of saved energy is a particularly important metric given the increased investment in energy efficiency resources in recent years. Policymakers in the REED region need to be sure that their state's substantial investment in energy efficiency provides economic benefits for electric and natural gas ratepayers in comparison with supply-side resources.

REED provides state-level lifetime cost per kWh or therm and levelized cost per kWh or therm. The lifetime cost of saved energy is a simple calculation that does not discount costs to a net present value, using the following equations:

- Lifetime Cost of Electric Energy Savings = Total Program Expenses / Lifetime Net kWh Savings
- Lifetime Cost of Natural Gas Energy Savings = Total Program Expenses / Lifetime Net Therm Savings

<sup>24</sup> Comparable cost of electric supply as provided in the Avoided Energy Costs in New England: 2013 Report by Synapse Energy Economics, Inc. See Page 1-6: <http://www.synapse-energy.com/Downloads/SynapseReport.2013-07.AESC.AESC-2013.13-029-Report.pdf>.



The levelized cost of saved energy (CSE) is the cost of acquiring energy savings that accrue over the economic lifetime of the actions taken through an energy efficiency portfolio, amortized and discounted back to the year in which the initial investment was made. This value allows for a more accurate comparison with the cost of supply-side resources. Including a discount rate raises the levelized CSE over the lifetime CSE because it discounts future benefits.<sup>25</sup> The levelized CSE is calculated in REED using the following equations:

- Levelized Cost of Electric Energy Savings = Total Program Costs<sup>26</sup> x CRF / Incremental Annual Net kWh Savings
- Levelized Cost of Gas Energy Savings = Total Program Costs x CRF / Incremental Annual Net Therm Savings

Where: Capital Recovery Factor (CRF) =  $i (1 + i)^n / (1 + i)^n - 1$

i = real discount rate

n = weighted average measure life for portfolio of programs

The choice of discount rate has a significant impact on the levelized CSE values. For program years 2011 and 2012, REED jurisdictions all agreed to use a real discount rate of 2.46 percent for REED's state-level levelized CSE calculation. This is the same discount rate used in the [Avoided Energy Supply Costs in New England: 2011 Report](#) and is based on February 2011 nominal rates of return for 30-year Treasury Bonds and the forecast long-term inflation rate (2.00 percent).<sup>27</sup>

For formal reporting purposes like state-specific Annual Reports, however, a range of discount rates is used across the states to calculate levelized CSE. Some states in the REED region, such as Connecticut and New York, use relatively high discount rates of 5.5 percent to 7.5 percent based on a utility's weighted average cost of capital (WACC). This reflects the perception that energy efficiency has similar risk levels as supply-side energy resources. Other jurisdictions, such as Massachusetts, Rhode Island and the District of Columbia, use relatively low discount rates of less than 1 percent to 3 percent based on the 10-year United States Treasury rate.<sup>28</sup> These rates were established with the understanding that energy efficiency has risk benefits when compared to supply-side resources. Using a WACC-based discount rate of 6 percent to calculate the CSE for a particular program will result in a substantially higher levelized CSE than if a long-term US Treasury rate of 3 percent were used to calculate the CSE for that same program.

<sup>25</sup> Lawrence Berkeley National Laboratory. The Program Administrator Cost of Energy Saved for Utility Customer-Funded Energy Efficiency Programs. March 2014. See: <http://emp.lbl.gov/sites/all/files/cost-of-saved-energy-for-ee-programs.pdf>.

<sup>26</sup> Program costs include program administrator costs but not participant costs, as not all states participating in REED collect participant cost data.

<sup>27</sup> Synapse Energy Economics. Avoided Energy Supply Costs in New England: 2011 Report. August 11, 2011. See: <http://www.synapse-energy.com/Downloads/SynapseReport.2011-07.AESC.AESC-Study-2011.11-014.pdf>.

<sup>28</sup> Synapse Energy Economics. Energy Efficiency Cost-Effectiveness Screening in the Northeast and Mid-Atlantic States. October 2, 2013. See: [http://www.neep.org/Assets/uploads/files/emv/emv-rfp/emv-products/EMV\\_Forum\\_C-E-Testing\\_Report\\_Synapse\\_2013%2010%2002%20Final.pdf](http://www.neep.org/Assets/uploads/files/emv/emv-rfp/emv-products/EMV_Forum_C-E-Testing_Report_Synapse_2013%2010%2002%20Final.pdf).



REED’s use of a consistent discount rate for all states means that in many cases REED’s CSE does not match the CSE in formal state-specific Annual Reports and other publications. This is an issue that the EM&V Forum plans to address with its Steering Committee in future years.

Average measure life is another factor that dramatically influences the cost of saved energy. Longer lasting energy efficiency measures deliver more substantial energy savings compared to shorter-lived measures. We note that assumptions about measure life and program lifetime savings differ across the REED states. For more information, see Section VIII below, which provides a comparison of the state-level average measure life for several electric and natural gas program types, including information for some program types about how differences in average measure life are influenced by each state’s Technical Reference Manual (TRM).

Table 5 shows the 2012 state-level levelized CSE, lifetime CSE and average measure life for each REED jurisdiction’s electric energy efficiency programs. The same state-level metrics for natural gas programs are provided in Section V below.

**Table 5: Electric Program Cost of Saved Energy (\$/kWh) and Average Measure Life (Years)**

State <sup>27</sup>	Levelized Cost of Saved Energy	Lifetime Cost of Saved Energy	Average Measure Life
Connecticut	\$0.046	\$0.040	10.05
Delaware	\$0.019	\$0.016	10.87
District of Columbia	\$0.077	\$0.068	9.7
Maryland	\$0.052	\$0.046	9.3
Massachusetts	\$0.043	\$0.037	10.94
New Hampshire	\$0.033	\$0.028	12.36
Rhode Island	\$0.044	\$0.038	10.77
Vermont	\$0.031	\$0.027	11.23

The levelized cost of saved electricity in the region were generally between \$0.03 and \$0.05 per kWh. This compares to a price of electricity in the region of between \$0.09 and \$0.10 per kWh.<sup>30</sup> The District of Columbia had the highest state-level levelized and lifetime CSE for electric programs, at \$0.077 per kWh and \$0.068 per kWh, respectively. This was due in part to the District’s relatively low average measure life of 9.7 years, lower than all other REED jurisdictions but Maryland. DC also has several spend goals that increase program costs, including requirements to utilize only Certified Business Enterprises certified by DC, produce green jobs, and allocate 30 percent of the contract budget to low-income spending. Maryland’s relatively high levelized cost of saved energy was driven by its demand response specific programs. Excluding those programs, Maryland’s levelized CSE would be in the middle range

<sup>29</sup> New York is not included in Table 5 because it did not provide lifetime energy savings for its electric energy efficiency programs.

<sup>30</sup> See, for example, Synapse Energy Economics, “The Avoided Energy Supply Cost Study for New England,” 2013 Report, prepared for the Avoided Energy Supply Component Study Group, p. 1-6, available online at <http://www.synapse-energy.com/Downloads/SynapseReport.2013-07.AESC.AESC-2013.13-029-Report.pdf>.

of REED jurisdictions at \$0.037 per kWh.

Delaware had the lowest state-level levelized and lifetime CSE, at \$0.019 per kWh and \$0.016 per kWh, respectively. This is partly attributable to Delaware’s relatively high average measure life. Another major factor is that Delaware administers only one energy efficiency program. This program awards competitive grants for large commercial sector energy efficiency projects based on five key criteria, the most significant of which is energy savings. Furthermore, grants are capped at 30 percent of the project cost, not to exceed \$500,000.<sup>31</sup> These program characteristics ensure high per project levels of energy savings, while limiting costs.

Table 6 shows the year to year difference in state-level levelized CSE from 2011 to 2012. The CSE in all states with the exception of Vermont increased from 2011 to 2012.

**Table 6: Levelized Cost of Saved Energy (\$/kWh)**

State	2011	2012	% Change from 2011 to 2012
Connecticut	\$0.043	\$0.046	7%
Delaware		\$0.019	
District of Columbia		\$0.077	
Maine	\$0.025		
Maryland	\$0.038	\$0.052	37%
Massachusetts	\$0.032	\$0.043	34%
New Hampshire	\$0.032	\$0.033	3%
Rhode Island	\$0.039	\$0.044	13%
Vermont	\$0.039	\$0.031	(21%)

The states with the biggest year to year increases, Maryland and Massachusetts, at 37 percent and 34 percent respectively, also experienced a large increase in program expenditures from 2011 to 2012. Some of this change was driven by the higher savings targets and the greater portion of new savings coming from the highest cost per unit residential customer sector. The jump in Maryland’s levelized CSE was particularly influenced by demand response programs. Excluding Maryland’s demand response programs, its levelized CSE would have increased by only 15 percent from 2011 to 2012. Vermont was able to increase its savings while spending less in 2012 than it did in 2011, resulting in a 20 percent reduction in its cost of saved energy.

<sup>31</sup> Delaware Department of Natural Resources and Environmental Control. Delaware Energy Efficiency Investment Fund Energy Efficiency Projects Solicitation. December 10, 2013. See: [http://www.dnrec.delaware.gov/energy/Documents/Energy%20Efficiency%20Investment%20Fund/EEIF%20EE%20Projects%20Solicitation\\_12.10.12.pdf](http://www.dnrec.delaware.gov/energy/Documents/Energy%20Efficiency%20Investment%20Fund/EEIF%20EE%20Projects%20Solicitation_12.10.12.pdf).



## IV. TOTAL NATURAL GAS PROGRAM SAVINGS AND EXPENDITURES

### A. Total Annual Natural Gas Energy Savings and Expenditures

*The total regional 2012 annual natural gas energy savings is equivalent to annual greenhouse gas emissions from over 101,000 tons of waste sent to the landfill.<sup>32</sup>*

In 2012, natural gas energy efficiency programs realized impressive gains in annual energy savings in the REED jurisdictions, increasing from 49.6 million therms in 2011 to 53.4 million therms in 2012. This growth in energy savings was facilitated by a 35 percent increase in natural gas energy efficiency program expenditures, rising from \$199.8 million in 2011 to \$270.6 million in 2012.

Figure 4 shows the growth in annual energy savings from the REED jurisdictions' natural gas energy efficiency programs from 2010<sup>33</sup> to 2012, an increase of 20 percent.

Figure 4: Total Net Annual Natural Gas Energy Savings (Million Therms)

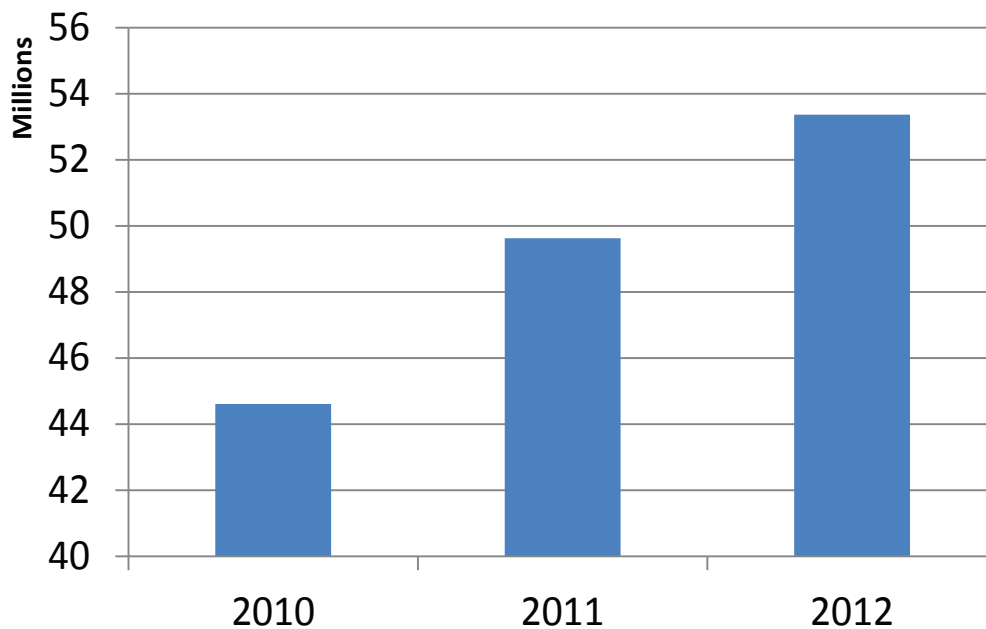


Table 7 shows Massachusetts achieved the highest level of 2012 annual natural gas energy savings at 22.6 million therms, followed by New York at 18.8 million therms.<sup>34</sup> This is a reversal

<sup>32</sup> According to the Greenhouse Gas Equivalency Calculator. See: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.

<sup>33</sup> While REED data collection began with Program Year 2011, NEEP has collected 2010 data for comparison purposes. NEEP cannot confirm that the 2010 data is fully comparable with the 2011-2012 data given the absence of consistent reporting templates and parameters and supporting definitions prior to 2011. See Appendix B for source information for 2010 data.

<sup>34</sup> It is important to note that access to gas as a source of heating is uneven across the region, which may impact the mix of programs and level of savings achieved for each jurisdiction.

of the 2011 order, which saw New York achieving the highest level of savings, followed by Massachusetts. Massachusetts increased its 2012 annual savings levels nearly 50 percent, supported by a 34 percent increase in program expenditures (see Table 8).

**Table 7: Net Annual Natural Gas Energy Savings (Therms)**

State	2011	2012	% Change from 2011 to 2012
Connecticut	3,216,540	3,720,910	16%
Delaware		1,714,790	
District of Columbia		46,510	
Maine	258,920		
Maryland	979,580	1,612,880	65%
Massachusetts	15,181,170	22,627,170	49%
New Hampshire	938,440	1,768,590	88%
New York	26,744,100	18,833,380	(30%)
Rhode Island	1,196,140	2,298,120	92%
Vermont	1,110,810	746,150	(33%)
Total	49,625,700	53,368,480	8%

Several other states also achieved impressive increases in annual natural gas energy savings. Savings in Maryland increased 65 percent from 2011 to 2012, while savings in New Hampshire and Rhode Island nearly doubled, largely due to increases in program expenditures.

Net annual energy savings dropped in both New York and Vermont from 2011 to 2012. Vermont's 2011 performance was a very high outlier compared to other states, so it's not surprising to see Vermont's 2012 results fall more into line with other states.

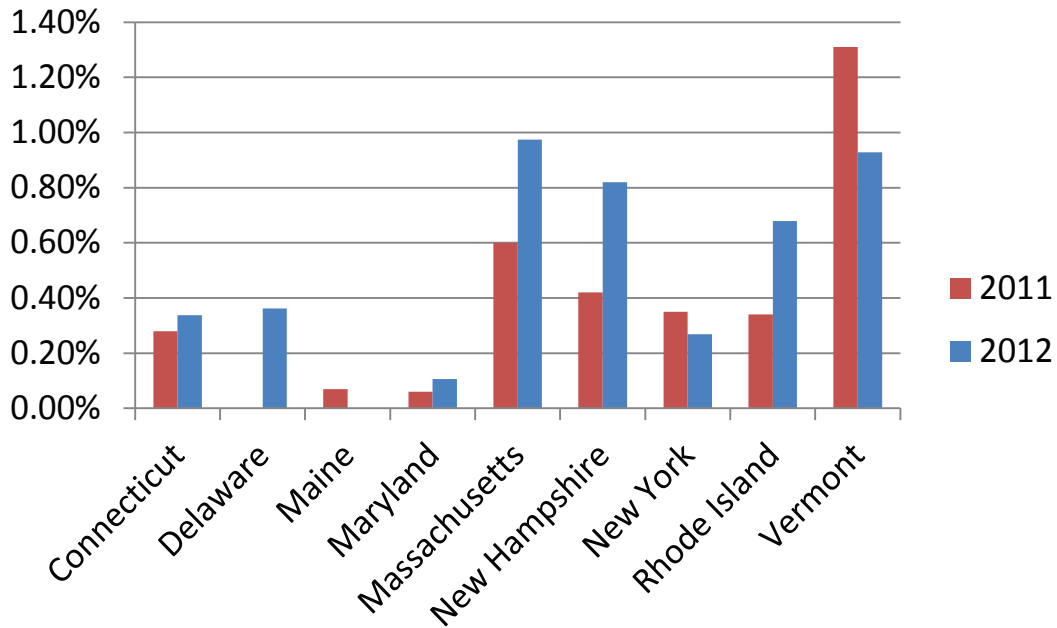
Figure 5 shows that natural gas savings compared to retail sales were lower overall than for electric programs.<sup>35</sup> The difference in savings compared to retail sales in each state from 2011 to 2012 largely follows the difference in annual energy savings. 2012 retail sales were just about 5 percent lower than 2011 sales in most states. The exception was Delaware, which experienced a greater than 15 percent increase in sales from 2011 to 2012.<sup>36</sup>

<sup>35</sup> District of Columbia is not included in Figure 5 because NEEP was not able to obtain comparable 2012 natural gas retail sales figures.

<sup>36</sup> Retail sales data is from the US Energy Information Administration's (EIA) state natural gas sales data. See: <http://www.eia.gov/dnav/ng>.



Figure 5: Annual Natural Gas Energy Savings Compared to Retail Sales

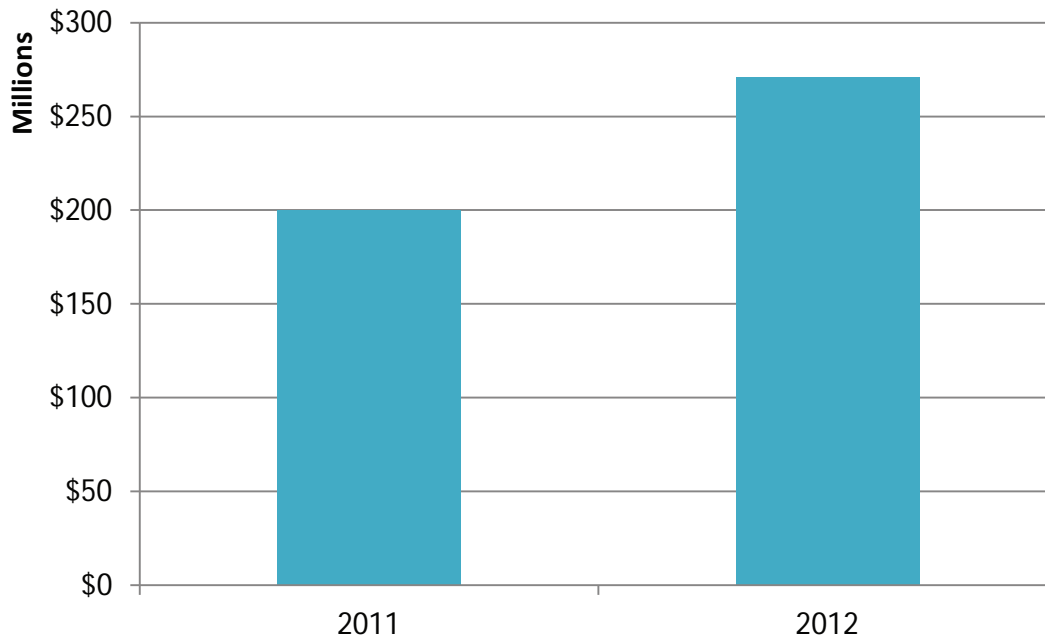


Massachusetts edged out Vermont for the top spot in savings compared to retail sales, with 2012 annual energy savings of 0.97 percent of retail sales, compared to Vermont’s 0.93 percent. The [2013-2015 Massachusetts plan](#) calls for natural gas savings of 1.1 percent of retail sales starting in 2013 and increasing in subsequent years, which will necessitate continued ramp-up of Massachusetts’ natural gas programs. Massachusetts’ jump from 0.6 percent of retail sales in 2011 to nearly 1 percent in 2012 indicates that the state is well on its way to meeting future years’ goals. Other states with large increases in savings compared to retail sales were New Hampshire and Vermont, which doubled their 2011 figures to exceed 0.8 percent of sales in New Hampshire and nearly 0.7 percent in Rhode Island.

For more information on state natural gas program energy efficiency policies and savings goals, please see NEEP’s [2013 Regional Roundup](#).

Figure 6 shows that in 2012, the REED jurisdictions spent \$270.6 million on natural gas energy efficiency programs, an increase of 35 percent from the 2011 outlay of \$199.8 million.

**Figure 6: Total Natural Gas Program Expenditures (Million \$)**



At the state level, natural gas program spending generally increased from 2011 to 2012, as shown in Table 8. Rhode Island experienced a particularly dramatic increase in natural gas program spending from 2011 to 2012. Expenditures rose from \$4.8 million in 2011 to more than \$13.3 million in 2012, guided by Rhode Island’s [2012-2014 Least Cost Procurement Plan](#), which outlines aggressive energy savings goals that require robust investment in state energy efficiency programs.

Massachusetts also continued its ramp-up of natural gas energy efficiency program expenditures in pursuit of the high energy savings goals outlined in the [2010-2012 Massachusetts Joint Statewide Three-Year Gas Energy Efficiency Plan](#). Large increases in Massachusetts program spending were needed to help meet the plan’s aggressive savings targets.

**Table 8: Total Natural Gas Program Expenditures (Millions)**

State	2011	2012	% Change from 2011 to 2012
Connecticut	\$19,379,816	\$17,401,210	(10%)
Delaware		\$589,213	
Maine	\$830,517		
Massachusetts	\$105,831,426	\$142,216,833	34%
New Hampshire	\$4,625,556	\$7,415,476	60%
New York	\$62,481,447	\$87,615,442	40%
Rhode Island	\$4,757,208	\$13,332,520	180%

<sup>37</sup> District of Columbia and Maryland are not included in Table 8 because they did not provide natural gas program expenditures. Maryland’s programs target electricity savings, not natural gas savings. Thus, all expenditures are counted as electric program expenditures.



State	2011	2012	% Change from 2011 to 2012
Vermont	\$1,860,889	\$1,997,676	7%
TOTAL	\$199,766,859	\$270,568,370	35%

## B. Cost of Saved Energy

Table 9 shows the 2012 state-level levelized CSE, lifetime CSE, and average measure life for each REED jurisdiction’s natural gas energy efficiency programs. The CSE across states for natural gas programs had a much broader range than for electric programs, from \$0.02 to \$0.54 per therm.

**Table 9: Natural Gas Program Cost of Saved Energy (\$/therm) and Average Measure Life (Years)**

State <sup>36</sup>	Levelized Cost of Saved Energy	Lifetime Cost of Saved Energy	Average Measure Life
Connecticut	\$0.38	\$0.32	14.67
Delaware	\$0.02	\$0.02	19.66
Massachusetts	\$0.54	\$0.46	13.77
New Hampshire	\$0.35	\$0.29	14.31
Rhode Island	\$0.48	\$0.40	14.36
Vermont	\$0.18	\$0.14	18.86

Massachusetts had the highest CSE for natural gas programs, at a levelized cost of \$0.54 per therm, with Rhode Island following close behind at \$0.48 per therm. This is largely due to the recent increase in natural gas program spending in these states.

Average measure life is fairly consistent at around 14 years across the majority of states, while the two states with the lowest cost of saved energy, Vermont and Delaware, have much higher average measure lives of 19 to 20 years. Delaware’s CSE of \$0.02 per therm sticks out as incredibly low-cost compared to other states. This is because Delaware ran only one natural gas program that had two large commercial Combined Heat and Power projects apply for funding. These projects resulted in significant natural gas energy savings by leveraging limited grant funding. The first project was a power plant project that included a coal to natural gas combined cycle conversion that increased the plant’s efficiency by about 30 percent. The second was an industrial manufacturer that completed a natural gas to landfill gas fuel conversion project, as well as system upgrades to re-use the waste heat generated in the plant.

Table 10 shows the year to year difference in state-level levelized CSE from 2011 to 2012. The CSE fell in Connecticut and Massachusetts, while it increased substantially in Rhode Island and Vermont. The increase in Rhode Island was due to the sharp rise in natural gas program spending. The increase in Vermont is a reflection of the state’s extremely low CSE in 2011. Even with a 47 percent increase in the cost of saved energy from 2011 to 2012, Vermont’s 2012

<sup>38</sup> District of Columbia, Maryland and New York are not included in Table 9 because they did not provide both 2012 natural gas program expenditures and lifetime savings figures.



programs remained highly cost-effective compared to other states. Vermont’s 2012 figure of \$0.18 per therm is the second lowest of all REED jurisdictions, with a 17 cent gap between Vermont and the next lowest state, New Hampshire.

**Table 10: Levelized Cost of Saved Energy (\$/Therm)**

State <sup>37</sup>	2011	2012	Year to Year Difference
Connecticut	\$0.48	\$0.38	80%
Delaware		\$0.02	
Maine	\$0.20		
Massachusetts	\$0.61	\$0.54	90%
New Hampshire	\$0.36	\$0.35	99%
Rhode Island	\$0.35	\$0.48	139%
Vermont	\$0.12	\$0.18	147%

## V. DETAIL ON ELECTRIC AND NATURAL GAS PROGRAM EXPENDITURES

This section provides a breakdown of how 2012 electric and natural gas energy efficiency program expenditures were allocated to the six REED expenditure categories, and how this allocation may have shifted between 2011 and 2012 for each state. It also provides 2012 per capita program expenditures by state.

### A. Expenditures by Key Categories

REED utilizes six expenditure categories with the following definitions:

- **Administration:** Program administration and costs associated with implementation of programs, including direct installation costs, and program implementation contractor services. This does not include program marketing costs (defined below).
- **Customer Rebates and Incentives:** Direct financial rebates and incentives paid to customers to support investment in energy efficiency (i.e., incremental cost of higher efficiency equipment, or portion thereof). Financial rebates do not include direct installation.
- **Marketing:** Costs to program administrators associated with marketing, e.g., increasing customer awareness of programs.
- **Other:** Includes other cost or savings not identified or included in the other categories.
- **Performance Incentives:** Utility shareholder or program administrator financial incentives earned for achieving specific performance metrics.
- **Research and Evaluation:** Costs related to evaluation, measurement and verification (EM&V) activities, and research or studies to support EM&V activities.

<sup>39</sup> District of Columbia, Maryland and New York are not included in Table 10 because they did not provide both 2012 natural gas program expenditures and lifetime savings figures.



While a goal of REED is to create greater consistency of reported EE data and impacts to allow for apples-to-apples comparison and aggregation of data, important differences in how expenditures are reported in the REED categories remain, largely due to definitions and embedded categories in program administrator/state tracking and reporting systems. Comparison of state by state information in this section should keep this in mind.

Recognizing discrepancies in expenditure reporting practices persist across states, NEEP asked jurisdictions to allocate expenditures as best as they could to the REED expenditure categories, using the definitions above for each expenditure category (also provided in the [REED Glossary](#)). Due to possible inconsistencies across states, the REED Expenditures reports do not provide program or program type level expenditures data.

### 1. Electric Energy Efficiency Program Expenditures

Figure 7 shows the contribution of each REED expenditure category to total 2012 electric program expenditures by state. The section below provides more details about each REED electric program expenditure category.

Figure 7a: Electric Energy Efficiency Program Expenditure Categories

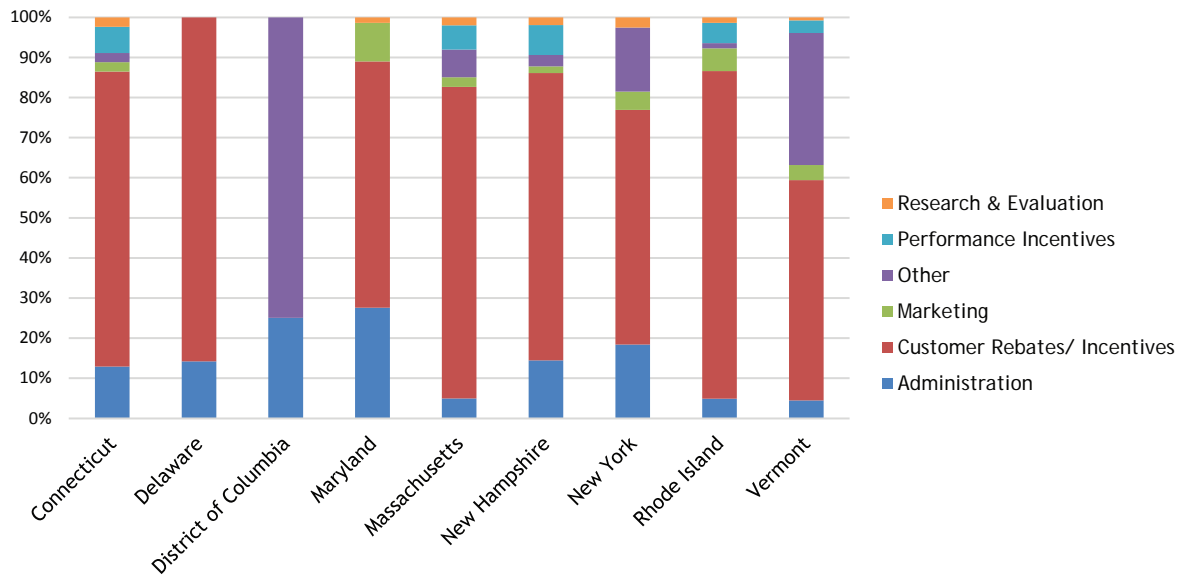
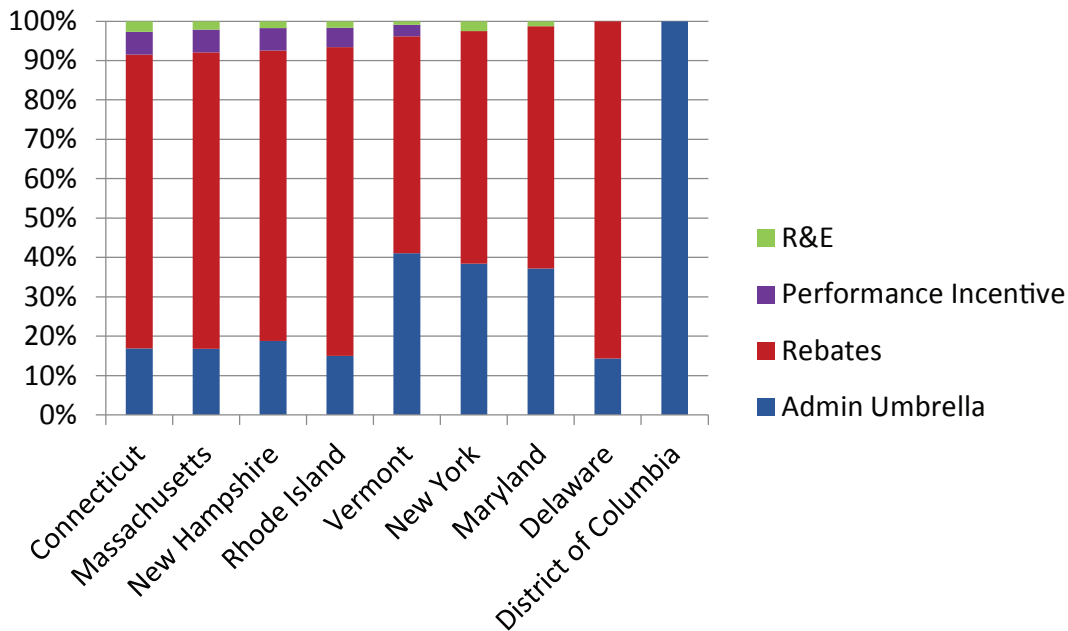


Figure 7a compares the cost categories by state, however, caution is advised in comparing the 'Administration', 'Marketing' and 'Other,' given lack of clarity across the states on what is included in these specific categories. It is advised that users combine these categories to compare the state overall program admin/implementation, marketing, and other costs, as provided in Figure 7b below, until further understanding of the key elements within these categories.

**Figure 7b: Electric Energy Efficiency Program Expenditure Categories  
(with Admin, Marketing and Other combined as Admin Umbrella)**



### Customer Rebates and Incentives

Customer Rebates and Incentives expenditures comprised the majority of electric program expenditures in all states. Expenditures in this category ranged from 55 percent of spending in Vermont to 86 percent of all spending in Delaware. It is important to note that some New York customer rebates and incentives were allocated to the ‘Other’ expenditure category. As such, New York’s investment in customer rebates and incentives is understated. See the New York ‘Other’ category below for more information.

The percent of total program spending allocated to this category held mostly steady from 2011 to 2012 for all states, with slight increases of 1 percent to 8 percent of program expenditures across the states.

### Administration

Electric program Administration expenditures across the states ranged from about 5 percent in Massachusetts, Rhode Island and Vermont to 28 percent in Maryland. Administration expenditures were relatively high in Maryland due in part to its inclusion of demand response programs, which are particularly costly to administer. For comparative purposes, note that Maryland’s Administrative costs reflect inclusion of demand response programs in their portfolio of programs. Absent the DR programs, administration costs would be a lower level (24 percent instead of 28 percent) of total expenditures. Maryland Administration expenditures are comprised of utility administration; operations and maintenance (including the installation cost of demand response devices and outside services costs such as the payments made



to contractors or the program implementers); and capital costs (including the cost of demand response devices).

The percent of total program spending allocated to this category held mostly steady from 2011 to 2012, with most states spending between +/- 2 percent of 2011 levels. The exception was Vermont, where Administration expenditures dropped by 8 percent. This is because some spending that was categorized as Administration in 2011 was included in the Other category in 2012.

### Performance Incentives

Five of the nine REED jurisdictions (Connecticut, Massachusetts, New Hampshire, Rhode Island, and Vermont) provided electric energy efficiency program administrators with performance incentives to offer an opportunity to earn a return on their energy efficiency investments. These performance incentives ranged from 3.1 percent of program expenditures in Vermont to 7.5 percent in New Hampshire. The level of award differs between the states in part because a number of states have revenue decoupling mechanisms in place to align utility financial incentives with greater levels of energy savings. New Hampshire, for example, does not have revenue decoupling so may have a higher performance incentive than other states.

The percent of total program spending allocated to this category held mostly steady from 2011 to 2012, with most states spending +/- 1 percent of 2011 levels. This category increased more substantially for Connecticut, moving from 3.8 percent of 2011 expenditures to 6.6 percent of 2012 expenditures.

### Research and Evaluation

The Research and Evaluation category represents the smallest amount of expenditures, ranging from about 1 percent in Vermont to just over 2.5 percent in New York. As the table below shows, the portion of total electric spending for research and evaluation fell in many states over the last year, with the exception of Connecticut.

**Table 9: R&E as Portion of Overall Electric Expenditures, 2011 & 2012**

State	2011 % of Total Electric Expenditure	2011 Electric Expenditure (\$)	2012 % of Total Electric Expenditure	2012 Electric Expenditure (\$)
Connecticut	0.49%	\$587,917	2.34%	\$2,852,013
Maryland	3.54%	\$4,909,935	1.38%	\$3,164,424
Massachusetts	2.85%	\$8,077,054	2.00%	\$8,021,780
New Hampshire	5.27%	\$983,566	1.92%	\$359,607
New York	2.52%	\$10,172,456	2.56%	\$9,262,791
Rhode Island	1.38%	\$503,613	1.38%	\$674,536
Vermont	2.93%	\$1,094,216	0.78%	\$273,255

Evaluation of program savings and impacts are recognized as key to demonstrating and supporting the value of the growing investments in energy efficiency programs across the REED region. Energy efficiency program regulators and administrators want to know that these investments are reliably producing energy and demand savings. In a number of states, multi-year plans reflect a commitment to greater focus on evaluation, as demonstrated in Massachusetts' [2013 to 2015](#) plan which calls for more extensive investment in EM&V, with an evaluation budget of nearly \$70 million, or about 4.5 percent of the total energy efficiency program budget.

Looking beyond the REED region at evaluation spending across the United States, CEE's [2013 Annual Industry Report](#) showed total EM&V spending was 3 percent of total 2012 program expenditures for program administrators throughout the country that responded to CEE's annual survey. This is generally consistent with the level of evaluation expenditures reported in the REED jurisdictions.

## Marketing

Marketing expenditures had a fairly broad range across the REED jurisdictions, from a low of 1.7 percent in New Hampshire to a high of 9.6 percent in Maryland. The percent of total program spending allocated to this category was consistent across most states from 2011 to 2012, with five of the seven states that submitted expenditures for this category in both years spending between +/- 1 percent of their 2011 expenditures in 2012. The exceptions were Maryland and Vermont, which both reduced their Marketing expenditures from 2011 to 2012.

## Other

The Other expenditure category includes expenditures that fall outside the other five REED expenditure categories. Expenditures in this category ranged from zero to 75 percent. Each state used the Other category for different purposes, as described below and on the [REED State Info](#) and Notes page.

- Connecticut: 2.3 percent of expenditures.
- Delaware: Did not use the Other category.
- District of Columbia: Expenditures for District of Columbia programs could not be broken down into the REED expenditure categories. As such, all program-specific expenditures were allocated to the electric program Other category. District of Columbia portfolio level administration, compliance, workforce development and information technology (IT) expenditures were designated as Administration expenditures.
- Maryland: Did not use the Other category.
- Massachusetts: 6.9 percent of expenditures.
- New Hampshire: 2.8 percent of expenditures.
- New York: 16 percent of expenditures. This is comprised of NYSERDA SBC3 Market-



ing, Implementation, and Customer Rebate/Incentives expenditures, NY EEPS program Trade Ally Training and New York State Cost Recovery Fee expenditures, and LIPA Labor and Overhead.

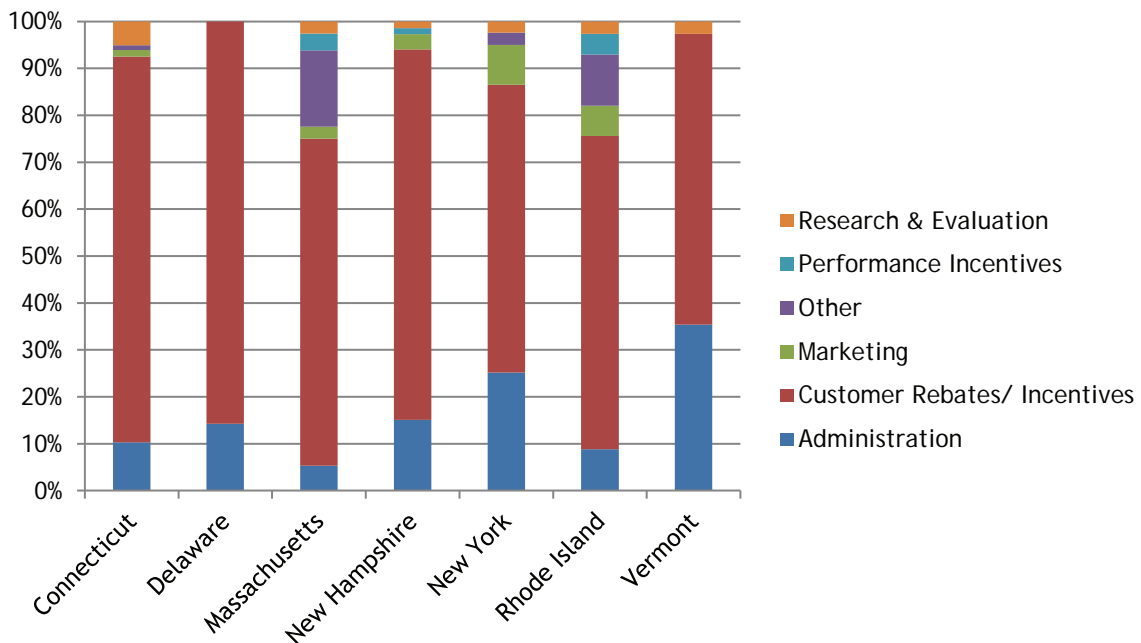
- Rhode Island: 1.3 percent of expenditures. This is comprised of Rhode Island Energy Efficiency and Resource Management Council (EERMC) expenditures.
- Vermont: 32.9 percent of expenditures.

NEEP will continue to work with states to better define the key elements within the various cost categories and build consistency in reporting in order to better identify and understand where program design and implementation strategies are most cost-effective.

## 2. Natural Gas Energy Efficiency Program Expenditures

Figure 8 shows the contribution of each REED expenditure category to total 2012 natural gas program expenditures by state.<sup>40</sup> The section below provides more details about each REED natural gas program expenditure category.

**Figure 8: Natural Gas Energy Efficiency Program Expenditure Categories**



### Research and Evaluation

Natural gas program Research and Evaluation expenditures ranged from a low of 1.4 percent of expenditures in New Hampshire to 5.1 percent of expenditures in Connecticut. The other jurisdictions that reported natural gas program expenditures allocated between 2 percent to 3 percent of expenditures to this category.

<sup>40</sup> Maryland and the District of Columbia did not provide separate 2012 natural gas program expenditures.

For most states, Evaluation expenditures increased from 2011 to 2012. The most notable increases were in Vermont, which moved from 0.15 percent of expenditures in 2011 to 2.6 percent in 2012, and Connecticut, which moved to 5.1 percent in 2012 from 2.1 percent in 2011. In Vermont, 2011 research and evaluation expenditures were limited because Vermont regulators did not require Vermont Gas to have a formal EM&V plan. In 2012, Vermont Gas worked with the Vermont Public Service Department and GDS on the process of implementing a formal evaluation of two of its residential energy efficiency programs, which increased its annual evaluation expenditures.

### Performance Incentives

Three of the seven jurisdictions that submitted natural gas program expenditures, Massachusetts, New Hampshire, and Rhode Island, provided Performance Incentives for their natural gas programs, ranging from 1.3 percent to 4.4 percent of expenditures. The percent of total program spending allocated to this category decreased for all three states from 2011 to 2012. Connecticut, Delaware, New York and Vermont did not provide Performance Incentives. In Connecticut, gas companies were not allowed to earn performance incentives prior to 2013; future years' REED data may include Connecticut performance incentives.

### Other

The Other category was used less for natural gas programs than it was for electric programs, with three of the seven states that submitted natural gas program expenditures designating no expenditures to the Other category. Massachusetts and Rhode Island designated their sales, technical assistance, and training funds to the Other category. This represented about 16 percent of Massachusetts' and 11 percent of Rhode Island's total expenditures. Connecticut and New York allocated a very small amount of expenditures, 1 percent and 2.6 percent, respectively, to the Other category. This is largely in keeping with the amounts allocated to the Other category in 2011.

### Marketing

Marketing expenditures ranged from zero to 8.5 percent of total program expenditures in each state. New York had the highest percent of marketing expenditures, at 8.5 percent, with Rhode Island following at 6.4 percent. 2012 Marketing expenditures were within +/- 1 percent of 2011 Marketing expenditures for all states but Rhode Island, which drastically increased its Marketing expenditures from just over \$100,000 (2.3 percent of expenditures) to over \$850,000 (6.4 percent of expenditures). This was due to the aggressive ramp-up of Rhode Island's programs from 2011 to 2012.

### Customer Rebates and Incentives

Like electric programs, Customer Rebates and Incentives expenditures comprised the majority of natural gas program expenditures in all states, ranging from 61 percent of spending in New York to 86 percent of all expenditures in Delaware.



The percent of total program spending allocated to this category increased for most states from 2011 to 2012, with the most substantial increase in New Hampshire where it jumped from 57 percent of expenditures in 2011 to 79 percent in 2012. The increase in New Hampshire's Customer Rebates and Incentives was coupled with a drop in Administration expenditures in that state.

### Administration

Like the electric programs, there was also significant variation in natural gas program Administration expenditures across the REED jurisdictions, ranging from 5 percent to 35 percent. New York and Vermont had relatively high Administration expenditures at 25 percent and 35 percent respectively, though New York's Administration expenditures fell from a high of 38 percent in 2011. At the low end, only 5 percent of Massachusetts' program expenditures were for Administration, and Connecticut and Rhode Island also spent a relatively low percentage on Administration, at around 10 percent. Connecticut, Massachusetts and Rhode Island had low Administration costs for both their electric and natural gas programs.

The percent of total program spending allocated to this category decreased for most states from 2011 to 2012, falling most substantially in New Hampshire and New York.

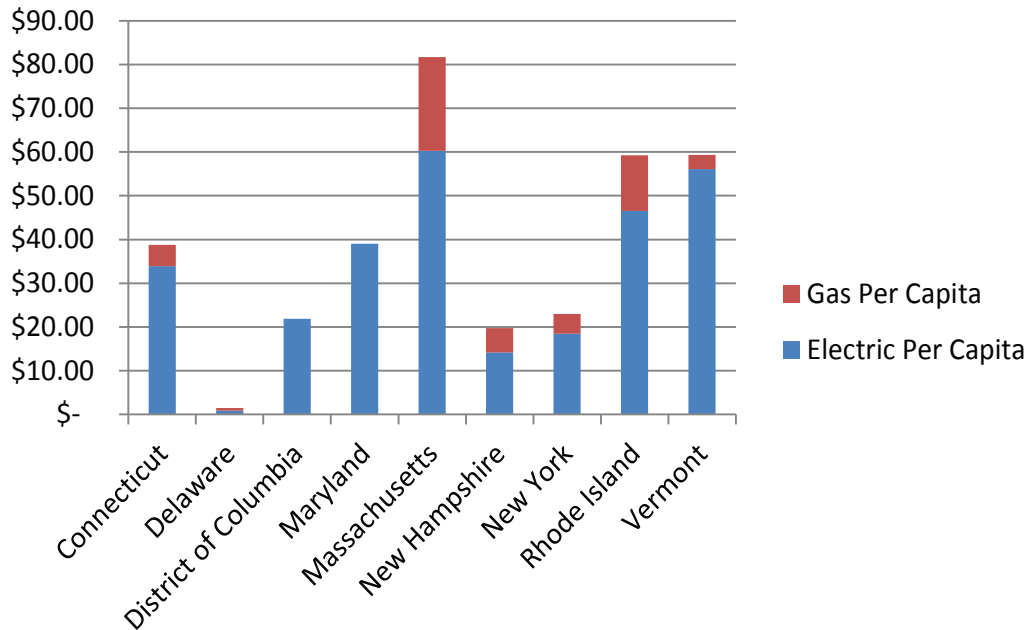
### B. Per Capita Expenditures

Considering energy efficiency program expenditures on a per capita basis (dollar investment per person) normalizes the investment by each state. This helps to provide a fair comparison of investment in efficiency programs across states that complements the 2012 state-level data on total expenditures and expenditures by category.

Figure 9 shows 2012 electric per capita expenditures, natural gas per capita expenditures and total energy efficiency program per capita expenditures in each state.



**Figure 9: Energy Efficiency Program Per Capita Expenditures**



When considering 2012 total per capita investment in both electric and natural gas ratepayer funded energy efficiency programs, Massachusetts invested the most at just over \$80 per person, followed by Rhode Island and Vermont at just under \$60. While Massachusetts also held the top spot in 2011 at around \$60, its 2012 per capita investment grew substantially. Massachusetts, Rhode Island and Vermont’s strong per capita investment in energy efficiency programs was a driving factor in those states’ high percentage of energy savings compared to retail energy sales.

Delaware had by far the lowest 2012 total per capita investment at less than \$2 per person, which is not surprising given that state offered only one electric and one natural gas program since. New Hampshire, New York, and District of Columbia also had relatively low total per capita expenditures, at around \$20 per person.

Looking at 2012 electric energy efficiency program per capita expenditures alone, expenditures ranged from less than \$1 per person in Delaware to just over \$60 in Massachusetts. Massachusetts overtook Vermont in the top spot, as Vermont’s electric program expenditures fell from a high of \$60 per person in 2011 to \$56 in 2012. Massachusetts’ leading per capita investment in electric programs resulted in the second highest electric energy savings compared to retail sales, as previously discussed, with Vermont maintaining its top spot in savings compared to sales despite the slight reduction in per capita spending.

On the natural gas side, Massachusetts invested the most of all states on a per capita basis at just over \$20, maintaining its top spot and resulting in highest level of natural gas energy savings compared to retail sales. Like they did in 2011, Vermont’s natural gas programs continued to stick out as very effective in 2012, with only a \$3.20 investment per capita leading to natural gas energy savings close to 1 percent of retail sales.



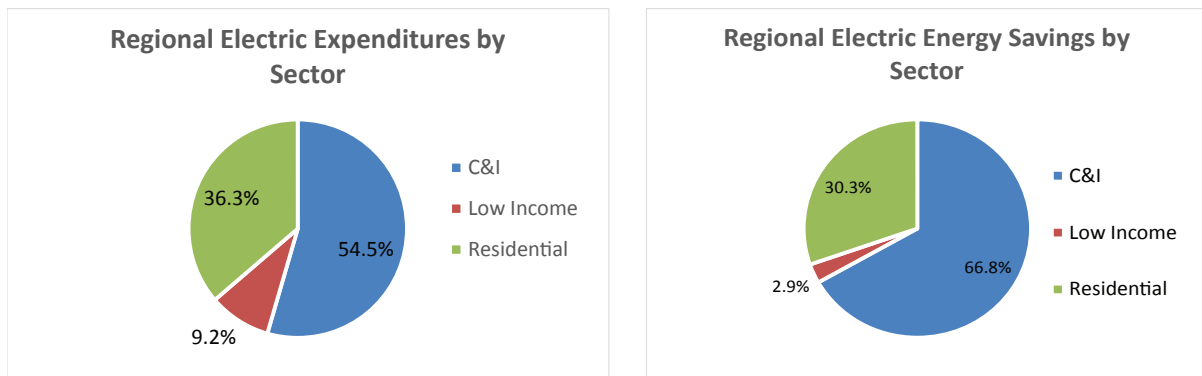
## VI. ANNUAL ENERGY SAVINGS AND EXPENDITURES BY SECTOR

This section shows the relative level of 2012 annual energy savings and spending in each sector: residential, commercial and industrial (C&I) and low income. It begins with a sector-level breakdown at the regional level and then provides state-level savings and expenditures results by sector. A sector-level analysis is helpful to show which sectors are particularly productive in realizing electric and natural gas savings compared to their relative cost. It also demonstrates how each state is allocating its resources and achieving savings across sectors.

### A. Electric Annual Energy Savings and Expenditures

The C&I sector produced 67 percent of the REED region's 2012 annual electric energy savings, with the residential sector producing 30 percent and 3 percent coming from the low income sector (see Figure 10). Compared to 2011 energy savings by sector, the percentage of 2012 low income sector savings increased very slightly from 2.5 percent, while savings in the C&I sector increased from 59 percent to 67 percent and residential sector savings dropped from 38 percent to 30 percent.

Figure 10: Electric Annual Energy Expenditures and Savings by Sector



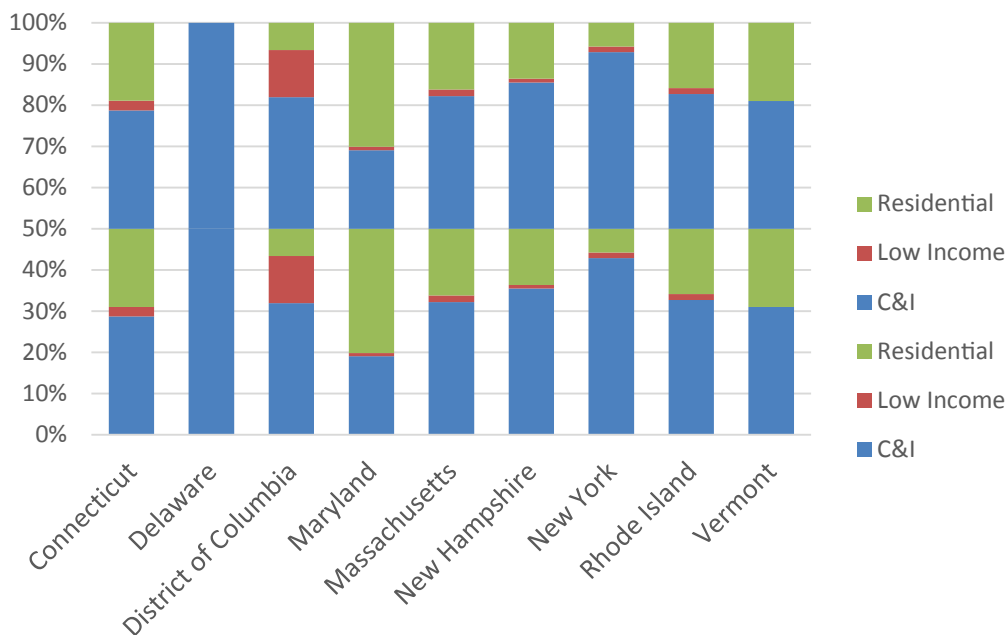
When considering 2012 regional electric program expenditures by sector, 55 percent of expenditures went to the C&I sector, with 36 percent spent in the residential sector and slightly over 9 percent in the low income sector. 2012 expenditures by sector almost exactly match 2011 expenditures by sector.

The discrepancy between expenditures and savings (9 percent of expenditures to only 3 percent of savings) in the low income sector can be attributed in part to state requirements, such as those in Connecticut and Massachusetts, to allocate energy efficiency program funds to customer classes in proportion to these customers' contributions to those funds. Furthermore, some states have mandates to fund low income programs at a certain level. In Massachusetts, at least 10 percent of the funding for electric energy efficiency programs

and at least 20 percent of the funding for gas energy efficiency programs must be spent on low-income residential demand-side management and education programs.<sup>41</sup> This means that funds are being spent on low-income programs that often do not deliver the same level of energy savings as programs in other sectors. Low income programs have substantial non-energy benefits, such as fewer arrearages and disconnections, improved home comfort and safety.

While C&I sector expenditures and savings tracked closely in 2011 (56 percent of expenditures produced 59 percent of savings), this was not the case in 2012, where 55 percent of expenditures produced 67 percent of savings. C&I programs were able to produce a bigger bang for their buck, while residential sector savings were not able to keep up with that sector’s relative level of expenditures. This shift was accentuated by Maine’s non-participation in REED in 2012, as Maine realized 74 percent of its 2011 energy savings in the residential sector by devoting only 24 percent of expenditures to that sector. Delaware also played a role, as it only produced C&I sector savings and did so very cost-effectively.

**Figure 11: Electric Annual Energy Savings by Sector**



2012 C&I sector annual energy savings ranged from a low of 38 percent in Maryland to a high of 100 percent in Delaware.<sup>42</sup> New York’s C&I sector savings were also high at 86 percent. Several states experienced increases from 2011 to 2012 in the percentage of energy savings from the C&I sector, most notably in Connecticut, New York and Vermont, which all increased from 15 percent to 18 percent over 2011 levels.

<sup>41</sup> According to American Council for an Energy Efficient Economy’s (ACEEE) State Energy Efficiency Policy Database. See: <http://aceee.org/energy-efficiency-sector/state-policy/massachusetts/193/all/191>.

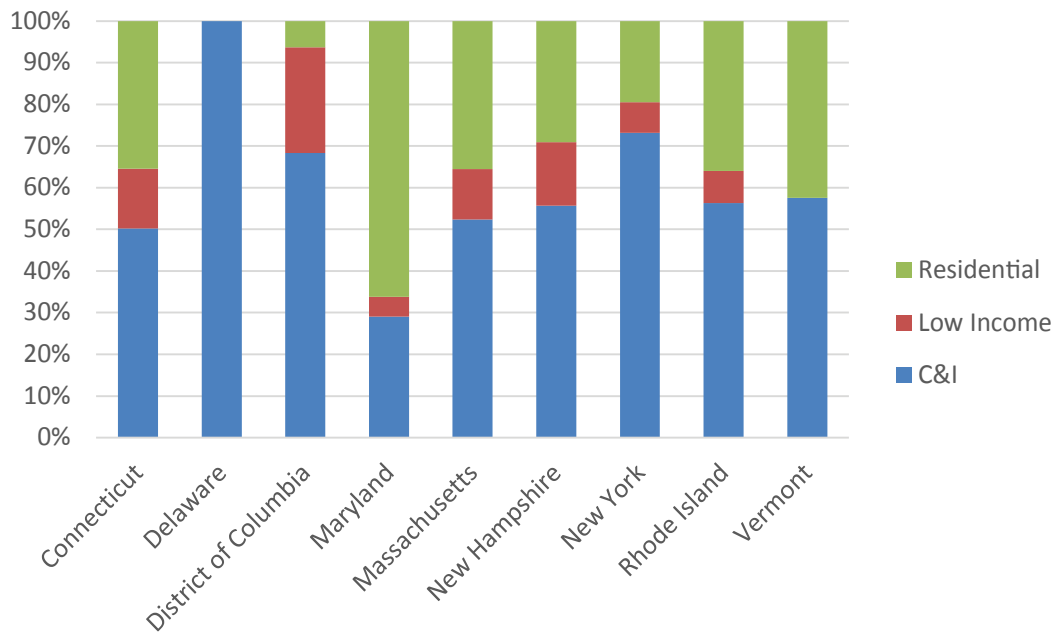
<sup>42</sup> Delaware ran only one 2012 electric energy efficiency program, which was in the C&I sector.



Of the states with low income sector annual energy savings, this sector comprised 2 percent to 3 percent of most states' annual energy savings, with a high outlier of 23 percent in District of Columbia. The District of Columbia realized such high levels of low income savings because it is required to allocate 30 percent of its energy efficiency budget to low-income spending. Delaware and Vermont did not report low income savings as they did not offer standalone low income energy efficiency programs. The percentage of energy savings from the low income sector was nearly unchanged from 2011 to 2012 for all states.

Of the states with residential sector annual energy savings, savings ranged from a low of 12 percent in New York to a high of 60 percent in Maryland. Residential sector savings in Connecticut, New York and Vermont fell substantially from 2011 levels, as savings in those states shifted to the C&I sector.

Figure 12: Electric Expenditures by Sector



C&I sector expenditures ranged from a low of 29 percent in Maryland to a high of 100 percent in Delaware.<sup>43</sup> New York's C&I sector expenditures were also high at 73 percent. C&I sector expenditures as a percent of total expenditures remained mostly constant in nearly all states from 2011 to 2012. The largest 2011 to 2012 difference was Vermont, where C&I sector expenditures dropped from 65 percent to 58 percent of total expenditures.

Of the states with low income sector expenditures, this sector ranged from a low of 5 percent in Maryland to a high of 25 percent in the District of Columbia. Low income expenditures in Connecticut, Massachusetts and New Hampshire all exceeded 10 percent of total expendi-

<sup>43</sup> Delaware ran only one electric energy efficiency program, which was in the C&I sector.

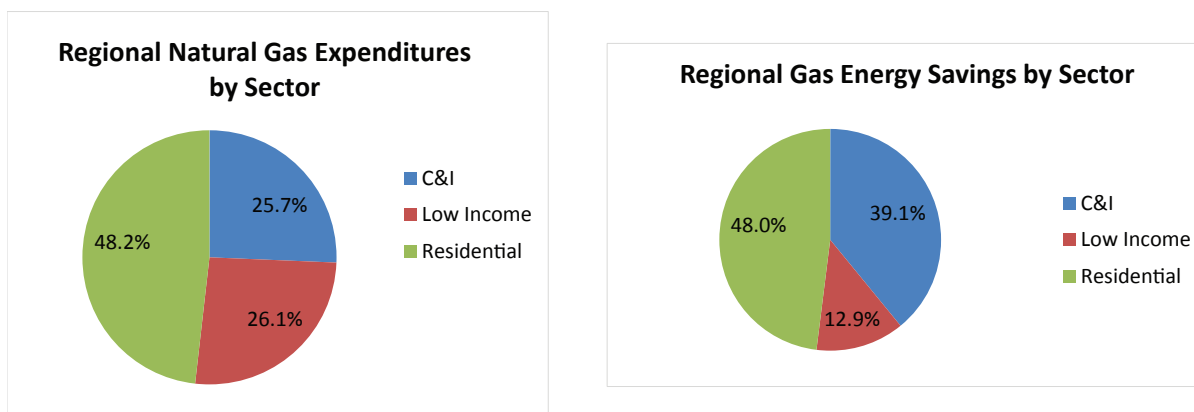
tures. Low income sector expenditures as a percent of total expenditures remained largely constant in all states from 2011 to 2012.

Residential sector expenditures ranged from a low of 6 percent in District of Columbia to a high of 66 percent in Maryland. DC residential expenditures were particularly low because most of their residential work is in the low income sector. Residential sector expenditures as a percent of total expenditures changed very little from 2011 to 2012 in most states. The most substantial year to year differences were in Maryland and Vermont, where residential sector expenditures increased 7 percent over 2011 levels, and in New York, where residential sector expenditures declined 6 percent from 2011 levels.

### B. Natural Gas Annual Energy Savings and Expenditures

Figure 13 shows the residential sector produced the largest amount of 2012 regional natural gas annual energy savings at 48 percent, with 39 percent coming from the C&I sector, and 16 percent from the low income sector. The 2012 sector-level breakdown is almost exactly the same as the 2011 results. Again in 2012, natural gas annual energy savings the low income sector played a much more prominent role than electric annual energy savings in the low income sector, which represented just 3 percent of savings (see Figure 10).

**Figure 13: Natural Gas Annual Energy Expenditures and Savings by Sector**



When considering 2012 regional natural gas program expenditures by sector, expenditures followed savings for the residential sector at 48 percent, but low income expenditures were considerably higher than resultant savings (26 percent of expenditures compared to 13 percent of savings). The C&I sector was able to achieve strong results, with 26 percent of spending producing 39 percent of savings.

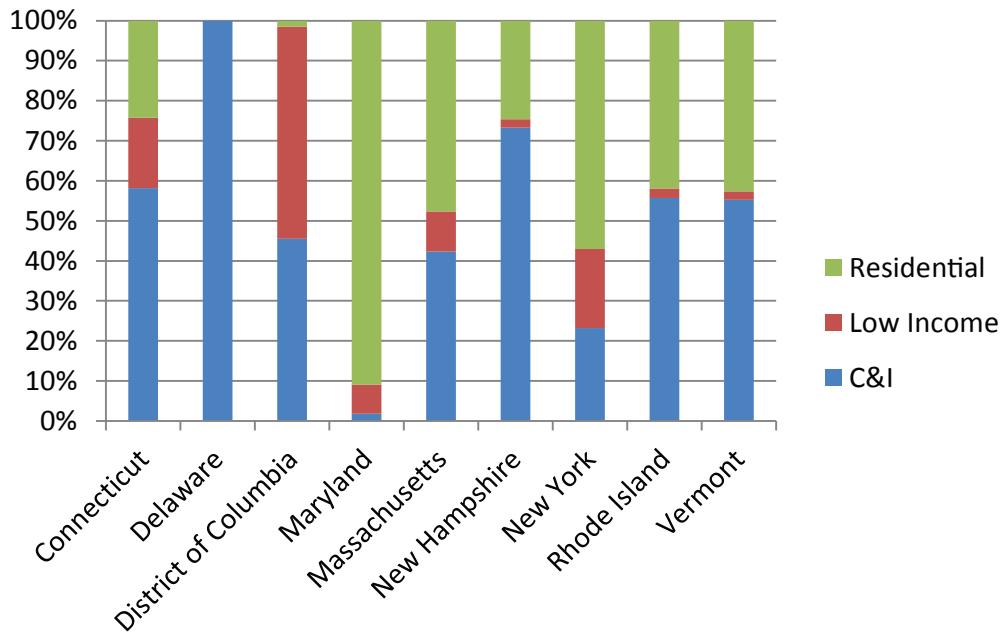
Interestingly, the discrepancy between low income savings and expenditures was a new development in 2012. For 2011, natural gas low income sector savings and expenditures both



comprised 16 percent of total savings and expenditures. Just as there are for electric programs, some states have requirements to fund low income natural gas energy efficiency programs at a particular level. In 2012, the regional outlay for low income natural gas programs more than doubled, from \$32 million to \$70 million, while savings did not keep pace. REED's 2013 data will help illustrate whether low income sector natural gas energy savings will continue to be relatively low, following the 2012 results, or if they will rebound to keep pace with the level of investment in the low income sector.

Figure 14 shows the percent of 2012 annual natural gas energy savings produced by each sector in each state.

Figure 14: Natural Gas Annual Energy Savings by Sector



C&I sector annual energy savings ranged from a low of 2 percent in Maryland to a high of 100 percent in Delaware.<sup>44</sup> New York's 23 percent and New Hampshire's 73 percent were the second lowest and second highest results. Several states experienced substantial departures in 2012 from their 2011 results, with 10 percent to 12 percent increases over 2011 in the percentage of energy savings from the C&I sector in Connecticut and New Hampshire, coupled with 20 percent decreases in Rhode Island and Vermont. Delaware also produced exclusively C&I savings, which helped to increase the 2012 C&I sector totals. As a whole, savings in the C&I sector as a percent of total savings increased slightly from 35 percent in 2011 to 39 percent in 2012.

Of the states that produced low Income sector savings, this sector ranged from a low of 2

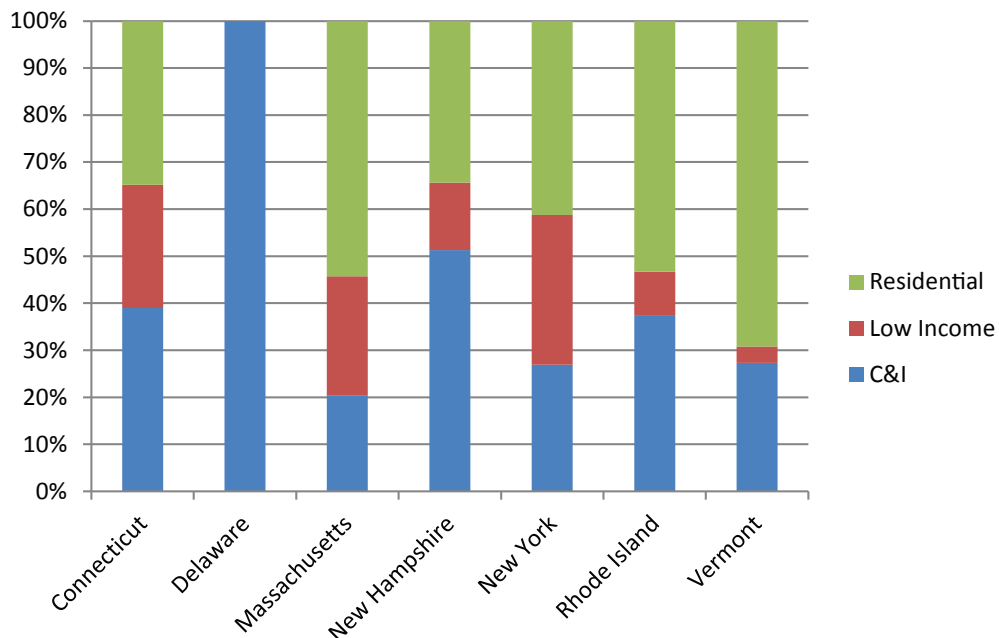
<sup>44</sup> Delaware ran only one 2012 natural gas energy efficiency program, which was in the C&I sector.

percent in New Hampshire and Vermont to a high of 53 percent in the District of Columbia. Annual energy savings in this sector also comprised a substantial portion of savings in Connecticut and New York, at 18 percent and 20 percent, respectively. Savings in this sector as a percent of total savings held steady in most states from 2011 to 2012, though savings were down in Connecticut and Maryland, falling from 29 percent to 17 percent in Connecticut and from 19 percent to 7 percent in Maryland. The drop in Maryland savings is likely due to the transition of the low income program from the utilities to the Maryland Department of Housing and Community Development. The addition of low income sector savings from the District of Columbia in 2012 provided a buoying effect against these declines, with savings from the low income sector dropping only slightly from 16 percent of total regional savings in 2011 to 13 percent in 2012.

Residential sector savings ranged from a low of 1.5 percent in the District of Columbia to a high of 91 percent in Maryland, with New York also delivering considerable residential sector savings at 57 percent. Savings in this sector as a percent of total savings rose in several states from 2011 to 2012, with Maryland moving from 80 percent to 91 percent of savings, and Rhode Island and Vermont going from around 20 percent to about 40 percent of savings. The addition of Delaware’s C&I sector 2012 results and Maine’s non-participation in REED (and thus the loss of that state’s strong residential sector savings), negated the effects of the increases in other states. Residential sector savings remained right around 50 percent of total regional savings in both 2011 and 2012.

Figure 15 shows the percent of 2012 natural gas program expenditures in each sector by state.<sup>45</sup>

**Figure 15: Natural Gas Program Expenditures by Sector**



<sup>45</sup> District of Columbia and Maryland did not submit separate 2012 natural gas program expenditures.



C&I sector expenditures ranged from a low of 21 percent in Massachusetts to a high of 100 percent in Delaware. Expenditures in this sector as a percent of total expenditures remained fairly consistent in each state from 2011 to 2012. The most notable change was New Hampshire, where expenditures in this sector grew from 38 percent to 51 percent. Expenditures in this sector dropped several percentage points in several states including Massachusetts, Rhode Island and Vermont. The overall impact was a slight decline in expenditures, from 29 percent in 2011 to 26 percent in 2012.

Of the states that had low income sector expenditures, this sector ranged from a low of 4 percent in Vermont to a high of 32 percent in New York. Other states that spent a large portion of their budgets on the low income sector were Connecticut and Massachusetts, at about 25 percent of total spending. Expenditures in this sector as a percent of total expenditures increased slightly in several states and significantly in New York, where it moved from just over 4 percent of total spending in 2011 to 32 percent of total spending in 2012. New York's results are particularly interesting given the percent of total New York savings produced by the low income sector. In 2011, just 4 percent of spending produced about 20 percent of savings, while in 2012, 32 percent of spending also produced about 20 percent of savings. Overall, the low income sector experienced a steep increase in program spending from 2011 to 2012.

Of the states with residential sector expenditures, that sector ranged from a low of 35 percent in Connecticut and New Hampshire to a high of 69 percent in Vermont. Expenditures in this sector as a percent of total expenditures dropped substantially in New York from 2011 to 2012, falling from 66 percent to 41 percent, with a more tempered drop in New Hampshire from 43 percent to 34 percent. These declines were partially offset by more moderate increases in Rhode Island and Vermont. The overall impact for this sector was a decline from 55 percent of total expenditures in 2011 to 48 percent in 2012.

## VII. ELECTRIC AND NATURAL GAS PROGRAM IMPACTS BY PROGRAM TYPE

The following section takes a closer look at the three electric program types and the three natural gas program types that provided the most 2012 net annual energy savings at the regional level.<sup>46</sup> For each program type, this section shows the differences across states with respect to net annual energy savings, expenditures, cost per kWh or therm, and average measure life and explains some of the drivers behind these differences.

Pull out to sidebar: There are other important reasons for differences in program impacts across states that this report does not address, such as differences in baseline assumptions across states. This report provides a starting point for analyzing program impacts across states. In the future, REED and its associated Annual Reports will delve deeper into how different state practices influence program results.

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<sup>46</sup> The program level data informing this section is available for download to Excel format on the REED website. See: [www.neep-reed.org](http://www.neep-reed.org).



REED’s current program type categories correspond with those used by ISO-NE for its most recent Energy Efficiency Forecast data collection effort. However, when interpreting the results of the program type level analysis, it is important to note that REED’s program type options do not neatly fit for all programs, as some programs cut across categories. States providing data to REED were asked to select the program type category that most closely fits each program, according to the program type definitions provided in the [REED Glossary](#). Since each state made its own judgment calls in allocating programs to each program type, we recognize that states may have categorized program types differently, which affects the results of the following program type level analysis.

To address the program type classification difficulties, NEEP is working closely with other organizations throughout the country that collect energy efficiency data to move towards using the same program type categories. As a big step forward in this process, NEEP may incorporate Lawrence Berkeley National Laboratory’s (LBNL) recently released energy efficiency program typology into the REED program year 2013 data collection process. LBNL’s typology includes 62 standardized, detailed energy efficiency program categories, as well as metrics and associated definitions for program characteristics, costs and impacts.<sup>47</sup> The Consortium for Energy Efficiency (CEE) worked with LBNL to use this typology in its 2013 State of the Efficiency Program Industry survey. The survey was fielded to energy efficiency program administrators across the US and Canada, and a substantial majority of respondents reported data using this typology. Adopting the LBNL typology for REED would facilitate more accurate analysis of program results across states and program types and help to ensure the appropriate interpretation of program-type level data by various stakeholders who assess the impacts of energy efficiency programs.

### A. Annual Electric Energy Savings by Program Type - Regional Overview

Figure 16 shows 2012 annual electric energy savings by program type. The following top three energy saving electric energy efficiency program types comprised 70 percent of the region’s 2012 annual energy savings. These were also the top three electric energy saving program types in 2011:

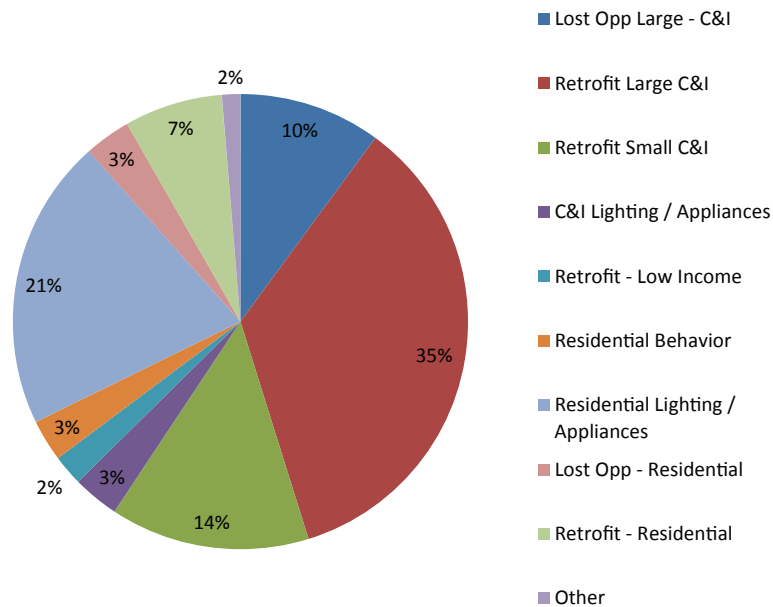
- Residential lighting and appliances - 20.7 percent
- C&I small retrofit (peak loads < 200-300 kW) - 14.1 percent
- C&I large retrofit (peak loads > 200-300 kW) - 35.1 percent

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<sup>47</sup> Lawrence Berkeley National Laboratory. Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology. August 28, 2013. See: <http://emp.lbl.gov/sites/all/files/lbnl-6370e.pdf>



Figure 16: Annual Electric Energy Savings by Program Type



The following program types contributing less than 1 percent of savings individually have been combined into the Other category and represent a total of 1.32 percent of savings: Residential Demand Response, C&I Education, Low Income Lighting and Appliances, Low Income Lost Opportunity, C&I Demand Response and C&I Small Lost Opportunity.

Five REED program types resulting in electric energy savings were offered by only one or two states. Of these program types, Residential Behavior achieved the highest level of annual energy savings. Again in 2012, Massachusetts and New York offered Residential Behavior programs. Annual energy savings from these programs represented 3 percent of annual electric energy savings in the region, up from 1.85 percent in 2011.

### B. The Top Three Energy Saving Electric Program Types - A Closer Look

This section takes a closer look at the three electric program types that achieved the highest level of net annual electric energy savings:

**Residential Lighting and Appliances:** This program type includes residential programs that incentivize customers to replace existing lighting and consumer products and appliances with more efficient products that provide the same function.

All states but Delaware reported annual energy savings from this program type, totaling 708,134 MWh (20.7 percent of total annual energy savings) as shown in Figure 17. This is down from 790,798 MWh in 2011, when it constituted 22.7 percent of the region's annual energy savings. Two states, Maryland (210,746 MWh) and Massachusetts (181,210 MWh), who were

also leaders in this program type in 2011, achieved the highest amount of annual energy savings. 2012 savings increased in both states, with a 15 percent increase in Maryland and a 46 percent jump in Massachusetts. Connecticut had a notable reduction in annual energy savings in this program type from 2011 to 2012, falling from 179,198 MWh to 93,924 MWh.

**Figure 17: Electric Residential Lighting and Appliances Annual Energy Savings**

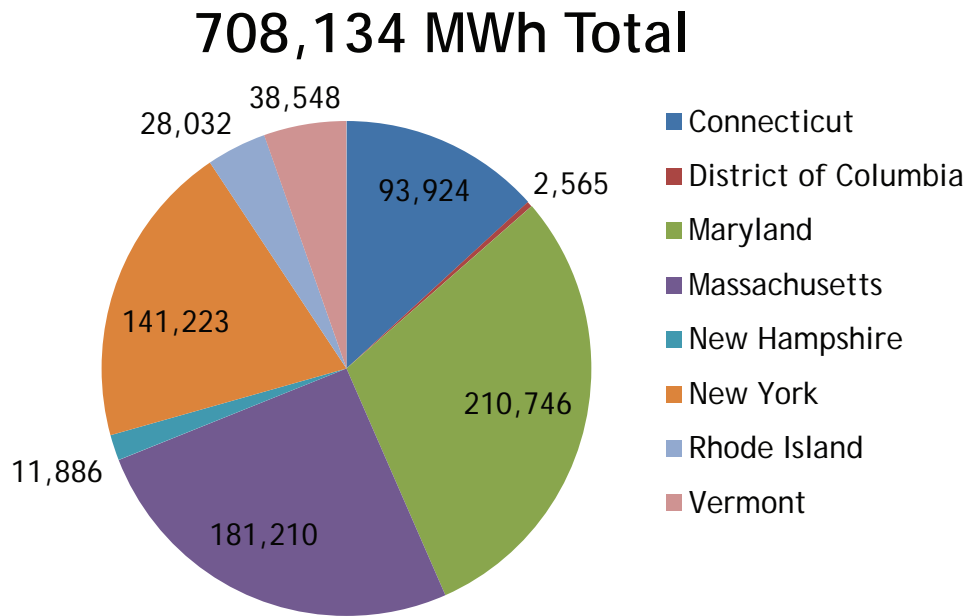


Table 11 shows that residential lighting and appliances programs accounted for a sizable portion of the annual energy savings achieved in most states. On the high end, these programs accounted for 39 percent of annual electric energy savings in Maryland. This program type also accounted for over 30 percent of annual energy savings in Connecticut and Vermont. On the low end, these programs delivered 13 percent of the annual energy savings in the District of Columbia and New York. The District of Columbia focused more on the low income sector than the residential sector, with its low income lighting and appliances program achieving a higher level of savings (3,096 MWh) than its residential lighting and appliances program (2,565 MWh). In New York, residential lighting and appliances was the most prominent residential program type, however a strong majority of New York’s annual energy savings came from the C&I sector. The percent of state savings from this program type dropped in all states except for Massachusetts and New York, where it rose slightly. This drop in most states is due in part to the 2012 implementation of the Energy Independence and Security Act (EISA)’s more stringent lighting standards. EISA requires all general-purpose light bulbs between 40 watts and 100 watts to be 30 percent more efficient than standard incandescent bulbs, effective in 2012 for 100 watt bulbs, in 2013 for 75 watt bulbs, and in 2014 for 60 watt bulbs. These requirements increase the baseline against which programs can claim energy savings, effectively reducing annual energy savings.



Like it did in 2011, this program type continued to deliver strong energy savings compared to the level of investment in these programs. Table 11 shows that for all states, the percent of annual energy savings achieved through these programs in 2012 was once again greater than the percent of expenditures devoted to these programs. The percent of expenditures used for these programs was largely consistent from 2011 to 2012, even though the percent of savings mostly fell.

Table 11 also shows the annual cost and levelized CSE for residential lighting and appliances programs in each state. The annual cost is calculated by dividing the sum of the annual expenditures by the sum of the annual energy savings for all of the efficiency programs within this program type. Annual costs do not fully account for the value of efficiency programs because they only consider first-year savings, while most energy efficiency measures save energy for multiple years. The levelized CSE is calculated using the equation provided above in Section IVC.

Annual costs fell into a relatively narrow range of \$0.12 per kWh in Connecticut to \$0.29 per kWh in Rhode Island, while the levelized cost across states was extremely consistent, with five of seven states at \$0.03 per kWh, and a high of \$0.05 per kWh in the District of Columbia. Connecticut and Maryland, two states with very low annual costs and levelized costs, also achieved a high percentage of their annual energy savings from this program type.

**Table 11: Electric Residential Lighting and Appliances Program Type**

State <sup>48</sup>	Annual Energy Savings as a % of Total State Savings	Annual Expenditures as a % of Total State Expenditures	Acquisition Cost (\$/kWh)	Levelized Cost of Saved Energy (\$/kWh)
Connecticut	31.0%	9.6%	\$0.12	\$0.03
District of Columbia	12.9%	3.7%	\$0.20	\$0.05
Maryland	39.2%	13.6%	\$0.15	\$0.03
Massachusetts	18.5%	11.1%	\$0.25	\$0.03
New Hampshire	22.0%	11.1%	\$0.17	\$0.03
New York	12.8%	5.3%	\$0.14	
Rhode Island	23.4%	16.6%	\$0.29	\$0.04
Vermont	32.8%	20.3%	\$0.19	\$0.03

Table 12 shows average measure life for residential lighting and appliances programs in each state, which is calculated by dividing total lifetime energy savings by total annual energy savings for all programs within that program type. Average measure life varied across states less than it did in 2011, when there was more than a twofold gap between the highest and lowest average measure life, but there was still a marked difference across states. At the low end, the District of Columbia’s average measure life was 4.5 years, while Massachusetts and Rhode

<sup>48</sup> New York is not included in in the levelized cost of saved energy portion of Table 11 since it did not submit lifetime energy savings for electric programs.

Island’s average measure life exceeded 8 years. Comparing 2011 to 2012, average measure life for this program type rose in all states but Maryland, where it declined slightly (6.9 to 6.3 years). The most significant increase was in Connecticut, where it rose from 3.9 to 5.2 years.

**Table 12: Electric Residential Lighting and Appliances Program Type Average Measure Life**

State <sup>47</sup>	Average Measure Life (years)
Connecticut	5.2
District of Columbia	4.5
Maryland	6.3
Massachusetts	8.5
New Hampshire	7.2
Rhode Island	8.3
Vermont	7.2

Differences in average measure life across states are due to the mix of measures used in programs as well as different measure life assumptions provided in each state’s Technical Reference Manual (TRM) or Program Savings Documentation (PSD) for each measure. States continue to use different methods to develop measure life assumptions, and there is a lack of measure life and persistence studies in the region that would promote greater consistency in measure life assumptions across the states. Differences in these assumptions across states have a significant impact on reported lifetime energy savings, as well as the cost of saved energy, as discussed in Section IVC above.

Table 13 compares measure life assumptions in the states with the longest and shortest average measure lives, Massachusetts and the District of Columbia. The relatively short measure life assumptions for CFL bulbs in the District of Columbia drive the District’s relatively low average measure life. The District’s main lighting and appliance program, Energy Efficiency Products, is focused on increasing the availability and sales of energy efficiency light bulbs, in particular CFLs. In 2010, the US Environmental Protection Agency (EPA) identified the District as a major metropolitan area with a low saturation of CFL bulbs. Thus, when the DC Sustainable Energy Utility launched their energy efficiency programs in 2011, a main focus was to increase the uptake of efficient CFL lighting.<sup>50</sup>

<sup>49</sup> New York is not included in Table 12 since it did not submit lifetime energy savings for electric programs.

<sup>50</sup> District of Columbia Sustainable Energy Utility Annual Report 2012. See: <http://www.dcseu.com/docs/about-us/DCSEU-2012AnnualReport-Final.pdf>.



**Table 13: Measure Life Assumptions for Electric Residential Lighting and Appliances Programs**

MEASURE	MEASURE LIFE	
	DISTRICT OF COLUMBIA <sup>49</sup>	MASSACHUSETTS <sup>50</sup>
CFL Bulbs	5.5 years for residential interior or unknown location; 3.8 years for exterior	7 years for screw-in bulbs
CFL Indoor Fixtures	8 years	7 years
Room Air Conditioning Unit	12 years	9 years
Refrigerators	12 years	12 years
Dehumidifier	12 years	12 years

**Small C&I Retrofit:** This program type includes programs for non-residential customers with peak loads less than 200-300 kW that provide incentives, information and technical support to encourage customers to replace existing and operating equipment with more efficient equipment that provides the same function, or to add efficient equipment or systems to an existing facility (e.g., addition of thermal insulation).<sup>53</sup>

All jurisdictions except Delaware and District of Columbia reported annual energy savings from this program type, totaling 484,220 MWh (14.1 percent of total annual energy savings), as shown in Figure 18. This is down from 606,042 MWh in 2011, when it represented 17.3 percent of annual energy savings. As it also did in 2011, New York achieved the highest amount of annual energy savings from this program type at 228,757 MWh, but this was down 38 percent from 2011 levels. Other states that also produced substantial annual energy savings from this program type were Massachusetts (105,154 MWh) and Vermont (53,423 MWh). Savings in these two states both increased from 2011 levels, by 20 percent in Massachusetts and 35 percent in Vermont.

<sup>51</sup> Mid-Atlantic Technical Reference Manual, Version 3.0. March 2013. See: [http://www.neep.org/Assets/uploads/files/emv/emv-rfp/emv-products/TRM\\_March2013Version.pdf](http://www.neep.org/Assets/uploads/files/emv/emv-rfp/emv-products/TRM_March2013Version.pdf).

<sup>52</sup> Massachusetts Technical Reference Manual, 2012 Program Year - Plan Version. See: [http://ma-eeac.org/Docs/8.3\\_TRMs/2MA%20TRM\\_2012%20PLAN\\_FINAL.pdf](http://ma-eeac.org/Docs/8.3_TRMs/2MA%20TRM_2012%20PLAN_FINAL.pdf).

<sup>53</sup> We note that Vermont’s electric energy efficiency programs administered by Burlington Electric Department and Efficiency Vermont do not distinguish between small and large C&I customers in their reporting. Therefore, all electric C&I retrofit program savings are reported in the small C&I category regardless of customer demand. This includes both Efficiency Vermont’s Business Existing Facilities program and its Customer Credit program for large customers.

**Figure 18: Electric Small C&I Retrofit Annual Energy Savings**

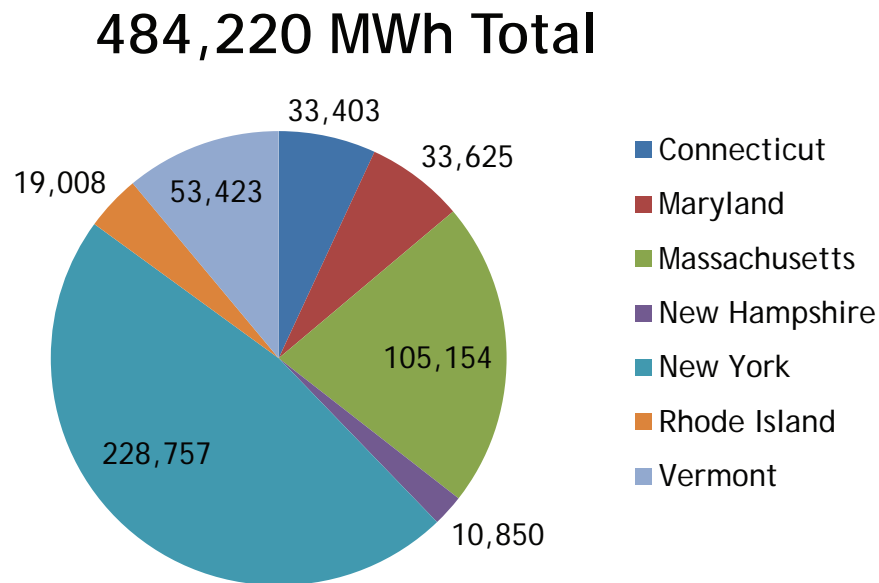


Table 14 shows the annual energy savings from small C&I retrofit programs ranged widely across most states. On the high end, these programs accounted for 45 percent of electric annual energy savings realized in Vermont. Interestingly, Vermont achieved a higher percentage of annual energy savings from this program type in 2012 than it did in 2011 (45 percent compared to 40 percent), while spending a smaller portion of total expenditures (43 percent compared to 57 percent).

This program type played less of a role in Connecticut, Maryland and Massachusetts, where small C&I retrofit programs represented around 10% or less of annual energy savings, similar to 2011 results. For all states, the level of expenditures and associated savings by state are quite closely aligned.

Table 14 also shows the annual cost and levelized CSE for small C&I retrofit programs in each state. Acquisition and levelized costs are highest in Connecticut, Massachusetts and Rhode Island, with New Hampshire and Rhode Island the lowest. Vermont’s 2012 CSE for this program type dropped substantially from 2011 to 2012, with acquisition costs falling from \$0.54 per kWh to \$0.29 per kWh, and levelized costs falling from \$0.05 per kWh to \$0.03 per kWh. The low levelized costs compared to acquisition costs reflect longer average measure lives than many other program types, such as the residential lighting and appliances program type.

*There is a key difference in how states administer their Small C&I retrofit programs and serve customers in this segment. Connecticut, Maryland, Massachusetts, Rhode Island, and at least parts of New York, utilize a Direct Install model as the primary vehicle to serve these customers. Direct Install models may have some benefits in ease of adminis-*



tration and quality control, but have a higher cost because the utilities fully administer the programs rather than relying more on the market to do it and may pay a higher percent of project costs. This comes through in the numbers, as Vermont and New Hampshire have the lowest annual and levelized CSE of serving this market.

**Table 14: Electric Small C&I Retrofit Program Type**

State <sup>52</sup>	Annual Energy Savings as a % of Total State Savings	Annual Expenditures as a % of Total State Expenditures	Acquisition Cost (\$/kWh)	Levelized Cost of Saved Energy
Connecticut	11%	14.4%	\$0.52	\$0.05
Maryland	6.3%	5.5%	\$0.37	\$0.04
Massachusetts	10.7%	14.1%	\$0.54	\$0.05
New Hampshire	20.1%	19.1%	\$0.33	\$0.03
New York	20.7%	23.4%	\$0.37	
Rhode Island	15.9%	19.1%	\$0.49	\$0.05
Vermont	45.41%	43.96%	\$0.29	\$0.03

Table 15 shows that small C&I retrofit programs’ average measure life in each state for was quite consistent across the region, with only a two year gap between the shortest average measure life of 11 years in Rhode Island and the longest at 13.1 years in New Hampshire. There was a slight convergence in average measure life from 2011 to 2012, as the gap between the shortest and longest measure life shortened from 3.5 years to 2 years. This indicates that programs’ measure mix and measure life assumptions across states are quite consistent for this program type.

**Table 15: Electric Small C&I Retrofit Program Type Average Measure Life**

State <sup>53</sup>	Average Measure Life (years)
Connecticut	12.3
Maryland	12.3
Massachusetts	12.6
New Hampshire	13.1
Rhode Island	11
Vermont	12.5

Large C&I Retrofit: This program type includes programs for non-residential customers with peak loads greater than 200-300 kW that provide incentives, information and technical support to encourage customers to replace existing and operating equipment with more efficient equipment that provides the same function, or to add efficient equipment or systems to an existing facility (e.g., addition of thermal insulation).

54 New York is not included in the Levelized Cost of Saved Energy portion of Table 14 since it did not submit lifetime energy savings for its electric programs.

55 New York is not included in Table 15 since it did not submit lifetime energy savings for electric programs.



All states reported annual energy savings from this program type except for Vermont, totaling 1,201,100 MWh (representing 35.1 percent of total annual energy savings), as shown in Figure 19.56 This is up from 1.1 million MWh in 2011, when it represented 32.8 percent of total annual energy savings. New York achieved the highest amount of annual energy savings from this program type at 550,155 MWh, an increase from 528,438 MWh in 2011. Massachusetts (336,257 MWh) and Maryland (151,111 MWh) also achieved a large amount of annual energy savings from this program type. Savings in Massachusetts decreased 5 percent from 2011 levels, while savings in Maryland increased 14 percent from 2011.

**Figure 19: Electric Large C&I Retrofit Annual Energy Savings**

**1,201,100 MWh Total**

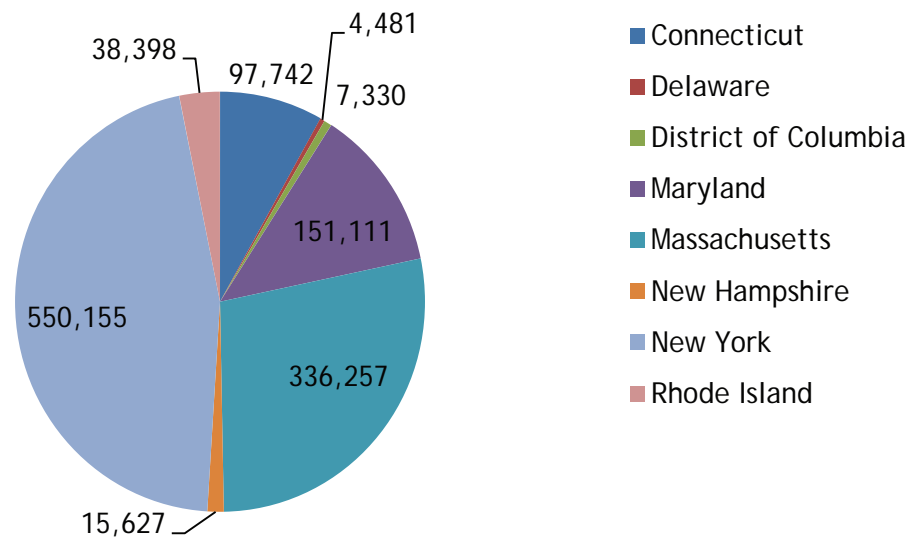


Table 16 shows that large C&I retrofit programs contributed a large portion of the total annual electric energy savings in most of the states. On the high end, Delaware achieved 100 percent of its savings from this program type, as the sole Delaware 2012 electric efficiency program was a large C&I retrofit program. For the other states, this program type accounted for between 30 percent of annual savings in New Hampshire up to 50 percent of annual savings in New York. Compared to 2011, New York and Connecticut achieved a greater percentage of savings from this program type, while the percent of total state savings from this program type declined in Maryland and Massachusetts and held steady in New Hampshire and Rhode Island.

Table 16 also shows the acquisition cost and levelized CSE for large C&I retrofit programs in each state. The range for both metrics across the states is quite narrow, with acquisition costs between about \$0.20 per kWh and \$0.30 per kWh and levelized costs between \$0.02 per kWh to \$0.03 per kWh. Overall, acquisition costs are lower in the large C&I retrofit program type than the small C&I retrofit program type, as the larger C&I projects tend to deliver more im-

56 Vermont does not distinguish between large and small C&I customers in its reporting of its electric programs, and all of its C&I retrofit savings are reported under the small C&I program type.



mediate savings compared to costs. Like the small C&I retrofit programs, the low levelized cost compared to acquisition cost reflects longer average measure lives than other program types.

All states achieved a greater percentage of annual energy savings from this program type than their relative investment in this program type. This is most pronounced in District of Columbia where 15 percent of state program expenditures produced 37 percent of state annual energy savings, and in New York, where 30 percent of expenditures produced 50 percent of savings.

**Table 16: Electric Large C&I Retrofit Program Type**

State <sup>55</sup>	Annual Energy Savings as a % of Total State Savings	Annual Expenditures as a % of Total State Expenditures	Acquisition Cost (\$/kWh)	Levelized Cost of Saved Energy (\$/kWh)
Connecticut	32.3%	23.4%	\$0.29	\$0.03
Delaware	100%	100%	\$0.18	\$0.02
District of Columbia	36.9%	14.9%	\$0.28	\$0.03
Maryland	28.1%	21.7%	\$0.33	\$0.03
Massachusetts	34.3%	24.1%	\$0.29	\$0.03
New Hampshire	28.9%	16.4%	\$0.20	\$0.02
New York	49.8%	29.9%	\$0.20	
Rhode Island	32.1%	25%	\$0.32	\$0.03

This program type continued to be the leader in annual energy savings once again in 2012 because it consistently achieves a high level of savings per participating customer when compared to savings per customer from other program types.

As with the small C&I retrofit programs type, average measure life is mostly consistent across the region, with seven of eight jurisdictions in a tight range of 10.9 to 12.9 years, as shown in Table 17. Comparing 2011 to 2012, average measure life held steady for all states but Massachusetts, where it fell from 16.5 years to 12.9 years. Massachusetts' 2012 average measure life for this program type is more in keeping with the other jurisdictions. The high 2011 average measure life was due to the completion several large custom combined heat and power (CHP) projects in 2011 with very long measure lives.<sup>58</sup>

<sup>57</sup> New York is not included in the levelized cost of saved energy portion of Table 16 since it did not submit lifetime energy savings for its electric programs. Vermont is not included because it did not report savings under this program type in 2012.

<sup>58</sup> NSTAR Electric 2011 Energy Efficiency Annual Report. See [http://ma-eeac.org/Docs/5.1\\_Annual%20Reports/2011/Electric/NSTAR\\_Electric\\_2011%20Annual%20Report.pdf](http://ma-eeac.org/Docs/5.1_Annual%20Reports/2011/Electric/NSTAR_Electric_2011%20Annual%20Report.pdf).

**Table 17: Electric Large C&I Retrofit Program Type Average Measure Life**

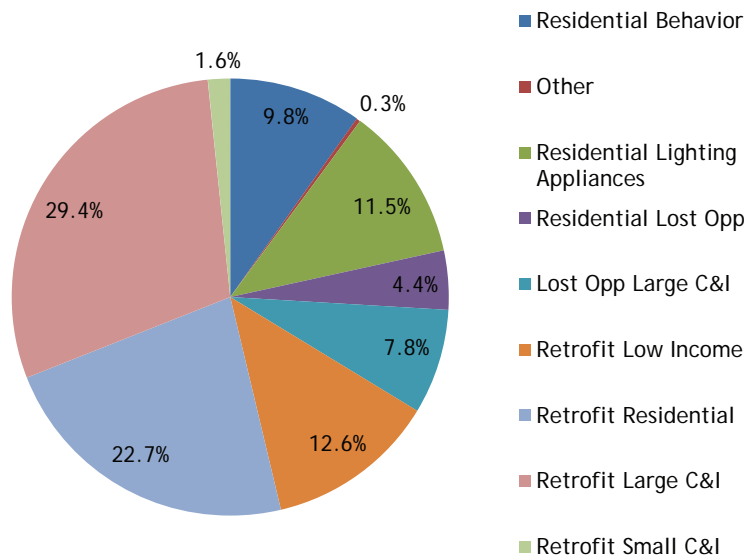
State <sup>57</sup>	Average Measure Life (years)
Connecticut	11.4
Delaware	10.9
District of Columbia	11.7
Maryland	12.9
Massachusetts	12.9
New Hampshire	12.6
Rhode Island	12.2

### C. Annual Natural Gas Energy Savings by Program Type - Regional Overview

Figure 20 shows the breakdown of regional natural gas energy savings by program type. Like 2011, several program types dominated annual energy savings in 2012, with three retrofit program types delivering 65 percent of total gas annual energy savings. These were also leading program types in 2011:

- Large C&I retrofit - 29.4%
- Low income retrofit - 12.6%
- Residential retrofit - 22.7%

**Figure 20: Regional Natural Gas Annual Energy Savings by Program Type**



The following four program types with annual energy savings were new in 2012: commercial lighting and appliances, low income lighting and appliances, small C&I lost opportunity and

<sup>59</sup> New York is not included in Table 17 since it did not submit lifetime energy savings for electric programs. Vermont is not included because it did not report savings under this program type in 2012.



low income lost opportunity. These new program types were offered by only one or two jurisdictions and collectively constituted only 0.3 percent of annual energy savings. They have been combined into the Other category in Figure 20.

Two program types that were offered by only a few states contributed substantial savings in 2012 and made more of an impact than in 2011:

- **Residential Behavior:** 9.8 percent, offered by Massachusetts and New York. Both of these states included both electric and natural gas behavioral programs in their 2012 program portfolios. Natural gas savings in this program type increased from 8.3 percent of the region's total annual energy savings in 2011 to 9.8 percent in 2012. On a therms basis, annual savings in this program type rose 28 percent from 4.1 million therms in 2011 to 5.3 million therms in 2012. The majority of this increase was realized in New York, where savings in this program type more than doubled from 2011 to 2012.
- **Residential Lighting and Appliances:** 11.5 percent, offered by District of Columbia, Maryland, Massachusetts, New Hampshire and New York. This is up from 4.1 percent of annual energy savings in 2011, when this program type was offered by only Massachusetts and New Hampshire. Massachusetts achieved 80 percent of the energy savings from this program type, with 15 percent coming from New York. Savings in Massachusetts increased 250 percent from 2011 levels.

#### D. The Top Three Energy Saving Natural Gas Program Types - A Closer Look

This section takes a closer look at the three natural gas program types that achieved the highest level of net annual energy savings:

- **Large C&I Retrofit:** This program type includes natural gas programs for non-residential customers with peak loads greater than 200-300 kW that provide incentives, information and technical support to encourage customers to replace existing and operating equipment with more efficient equipment that provides the same function, or to add efficient equipment or systems to an existing facility (e.g., addition of thermal insulation).

All jurisdictions reported annual energy savings from this program type, totaling 15.8 million therms (representing 29.4 percent of total annual gas energy savings), as shown in Figure 21. This was up from 10.4 million therms in 2011 when it accounted for 20.9 percent of total savings. Massachusetts achieved the highest amount of annual energy savings from this program type at 7.3 million therms, more than doubling its results from 2011. New York followed with just under 4 million therms, 20 percent lower than its 2011 results. Delaware also contributed impressive savings from this program type, at 1.7 million therms.

**Figure 21: Natural Gas Large C&I Retrofit Annual Energy Savings**

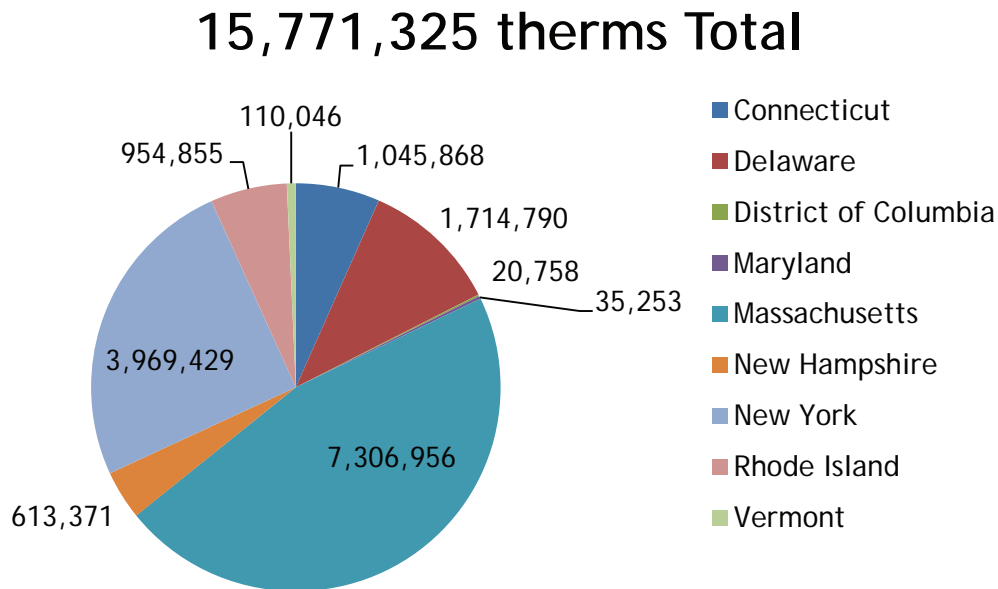


Table 18 shows that large C&I retrofit programs contributed a substantial amount of annual gas energy savings in all states but Maryland, where it consisted of only ancillary savings from the electric large C&I programs. All of Delaware’s gas energy savings was achieved in this program type, as Delaware only administered one natural gas program, a large C&I retrofit program. Savings in other states ranged from 15 percent of Vermont’s annual gas savings to 45 percent of District of Columbia’s annual natural gas energy savings. Like the large C&I retrofit electric programs, this program type achieves large savings due to the nature of its projects, which are targeted to non-residential customers with high energy use and generally have large savings potential. All states but New York achieved a higher level of savings from this program type than their relative investment in this program type. Most striking is Massachusetts, which realized 32 percent of its savings from this program type with only 12 percent of total expenditures and Rhode Island, which achieved 42 percent of its savings from 22 percent of its expenditures.<sup>60</sup>

Table 18 also shows the acquisition cost and levelized cost of saved energy for natural gas large C&I retrofit programs in each state. Delaware had the lowest acquisition cost and levelized cost, at \$0.34 per therm and \$0.02 per therm, respectively. As previously mentioned, this low cost was due to the nature of projects completed through Delaware’s program in 2012 (see Section VB). Comparing 2012 to 2011, acquisition and levelized costs increased fairly substantially in Vermont. Even with this increase, Vermont’s costs remained quite low compared to all other jurisdictions but Delaware.

<sup>60</sup> We note that Vermont does not distinguish between small and large C&I customers for its natural gas retrofit programs. All of Vermont Gas Systems’ 2012 natural gas program savings are reported under the large C&I retrofit category regardless of customer size.



**Table 18: Natural Gas Large C&I Retrofit Program Type**

State <sup>59</sup>	Annual Gas Energy Savings as a % of Total State Savings	Annual Expenditures as a % of Total State Expenditures	Acquisition Cost (\$/therm)	Levelized Cost of Saved Energy (\$/therm)
Connecticut	28.1%	14%	\$2.33	\$0.27
Delaware	100%	100%	\$0.34	\$0.02
District of Columbia	44.6%			
Maryland	2.2%			
Massachusetts	32.3%	12.3%	\$2.40	\$0.24
New Hampshire	34.7%	22.2%	\$2.68	\$0.27
New York <sup>60</sup>	21.1%	25%	\$5.52	
Rhode Island	41.5%	21.9%	\$3.06	\$0.36
Vermont	14.8%	13.1%	\$2.37	\$0.17

State-level average measure life for natural gas large C&I retrofit programs varies broadly across the region, ranging from a low of 5.5 years in District of Columbia to a high of 19.7 years in Delaware, as shown in Table 19. Compared to 2011, average measure life decreased in all states except for Vermont, where it increased from 14.3 to 17.1 years, and Rhode Island where it remained constant. The most marked decrease was in New Hampshire, where it fell from a leading 16.2 to 11.6 years.

As noted previously, savings from Delaware’s large C&I retrofit program were from two large combined heat and power projects that not only delivered high savings per dollar spent, but also had long measure lives. This had a strong influence on Delaware’s position as the state with the longest average measure life. One should be cautious about drawing any conclusions about the District of Columbia’s position as the jurisdiction with the shortest measure life given the small number of natural gas measures deployed by the District. Even though this program type constituted 45 percent of the District’s natural gas energy savings, natural gas savings from the District was only 0.9 percent of the region’s total savings.

**Table 19: Natural Gas Large C&I Retrofit Program Type Average Measure Life**

State <sup>61</sup>	Average Measure Life (years)
Connecticut	9.8
Delaware	19.7
District of Columbia	5.5
Massachusetts	11.5

61 District of Columbia and Maryland are not included in any of the Table 18 sections related to expenditures since they did not submit natural gas program expenditures.

62 New York is not included in the Levelized Cost of Saved Energy section of Table 18 since it did not submit lifetime energy savings for its natural gas programs.

63 Maryland and New York are not included in Table 19 since those states did not submit lifetime energy savings for natural gas programs.

State <sup>61</sup>	Average Measure Life (years)
New Hampshire	11.6
Rhode Island	9.7
Vermont	17.1

**Low Income Retrofit:** This program type is designed for households with income not more than a stated percentage of state or area median income or meeting low income requirements based on the number of family members in the household. These programs provide incentives, information and technical support to encourage customers to replace existing and operating equipment with more efficient equipment that provides the same function, or to add efficient equipment or systems to an existing facility (e.g., addition of thermal insulation).

All jurisdictions except Delaware reported annual energy savings from this program type, totaling 6,753,918 therms (representing 12.6 percent of total annual gas energy savings, as shown in Figure 22. This is down from 7.7 million therms in 2011, when this program type accounted for 15.6 percent of total annual gas energy savings. New York and Massachusetts achieved the vast majority of annual energy savings from this program type at 3.6 million therms and 2.3 million therms respectively. 2012 savings in New York were down from 5.2 million therms in 2011, while savings in Massachusetts increased from 1.3 million therms.

**Figure 22: Natural Gas Low Income Retrofit Annual Energy Savings**

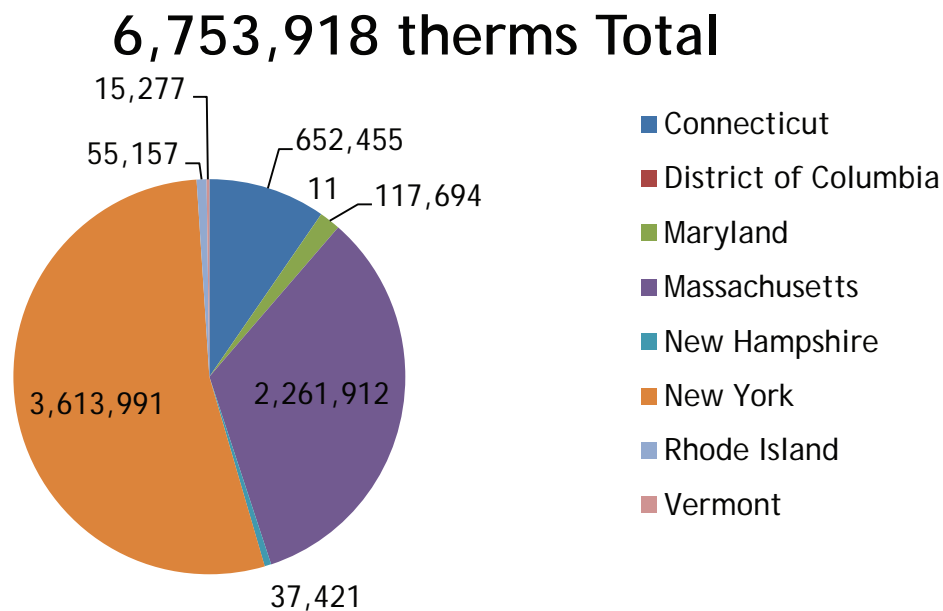


Table 20 shows that low income retrofit programs resulted in a wide range of natural gas energy savings in each state. Connecticut and New York achieved the highest amount of annual energy savings as a percent of their total savings, at around 20 percent. These states, along



with Massachusetts, invested relatively heavily in their low income retrofit programs, at 25 percent to 30 percent of their natural gas program expenditures. This was comparable to 2011 expenditures in Connecticut, and an increase in New York. While savings in Connecticut and New York came close to the relative investment in these programs, savings in Massachusetts fell far short of the relative investment, though did increase from 2011 levels. Maryland realized only 7.3 percent of its total gas savings from this program type, down from 19 percent of total savings in 2011. For District of Columbia, New Hampshire, Rhode Island, and Vermont, this program type did not play a prominent role in savings from their natural gas program portfolio. All states that reported expenditures spent more on this program type compared to total expenditures than they achieved in savings compared to total savings.

Table 20 also shows a wide range in acquisition cost and levelized cost for this program type across states. Like it also did in 2011, acquisition and levelized costs for Vermont’s natural gas low income retrofit program stick out as quite low.

**Table 20: Natural Gas Low Income Retrofit Program Type**

State <sup>62</sup>	Annual Gas Energy Savings as a % of Total State Savings	Annual Expenditures as a % of Total State Expenditures	Acquisition Cost (\$/therm)	Levelized Cost of Saved Energy (\$/therm)
Connecticut	17.5%	26.2%	\$7.00	\$0.50
District of Columbia	0.02%			
Maryland	7.3%			
Massachusetts	10%	24.9%	\$15.65	\$0.96
New Hampshire	2.1%	14.4%	\$28.53	\$1.83
New York <sup>63</sup>	19.2%	30.3%	\$7.35	
Rhode Island	2.4%	9.3%	\$22.40	\$1.43
Vermont	2.1%	3.5%	\$4.59	\$.30

Table 21 shows state-level average measure life for natural gas low income retrofit programs in most states had a relatively narrow range, from a low of 17.6 years in Connecticut to a high of 21 years in Massachusetts. District of Columbia was a low outlier at 4.9 years, but again, caution should be exercised in drawing any conclusions about this low figure, as the District had such a low level of savings that this figure is likely skewed to whichever few measures were implemented. Average measure life was mostly consistent from 2011 to 2012 for all states, with small increases across the board for all states but Rhode Island, which had a 20 year average measure life both years.

64 District of Columbia and Maryland are not included any of the Table 20 sections related to expenditures since they did not submit natural gas program expenditures.

65 New York is not included in the Levelized Cost of Saved Energy section of Table 20 because it did not provide lifetime energy savings for its natural gas programs.



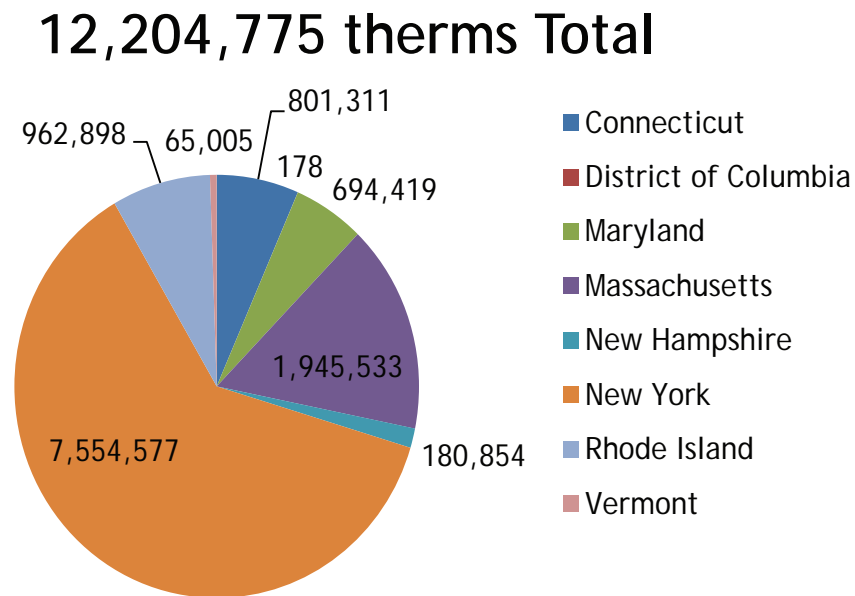
**Table 21: Natural Gas Low Income Retrofit Program Type Average Measure Life**

State <sup>64</sup>	Average Measure Life (years)
Connecticut	17.6
District of Columbia	4.9
Massachusetts	21
New Hampshire	19.9
Rhode Island	20
Vermont	19.7

**Residential Retrofit:** This program type includes residential natural gas programs that provide incentives, information and technical support to encourage customers to replace existing and operating equipment with more efficient equipment that provides the same function, or to add efficient equipment or systems to an existing facility (e.g., addition of thermal insulation).

All jurisdictions but Delaware reported annual energy savings from this program type, totaling 12,204,775 therms (representing 22.7 percent of total annual gas energy savings), as shown in Figure 23. This is down from 2011, when this program type produced 14.4 million therms of savings and accounted for 29.1 percent of total annual energy savings. New York achieved over 50 percent of total savings in this program type, at 7.6 million therms. This is a decrease from 2011, when New York residential retrofit annual energy savings exceeded 10 million therms. Massachusetts also contributed a high level of savings at 1.9 million therms, though this was also down from its 2011 level of 2.3 million therms.

**Figure 23: Natural Gas Residential Retrofit Annual Energy Savings**



66 Maryland and New York are not included in Table 21 since those states did not submit lifetime energy savings for natural gas programs.



Table 22 shows that residential retrofit programs resulted in a wide range of natural gas energy savings in each state, from a low of 0.4 percent in District of Columbia, to slightly over 40 percent in Maryland, New York and Rhode Island. For all but one state, New York, the relative level of expenditures exceeded the relative level of savings for this program type. Comparing 2011 results to 2012, savings from this program type was much more significant in 2012 for Rhode Island, jumping from 22 percent to 42 percent of total state savings, while expenditures for this program type increased only from 45 percent to 50 percent. Savings from this program type compared to total state savings also increased substantially in Maryland, from 25 percent in 2011 to 43 percent in 2012. In New York, expenditures dropped from 56 percent of the total in 2011 to 31 percent, while the percent of savings held steady.

Table 22 also shows the acquisition cost and levelized cost of saved energy for natural gas large C&I lost opportunity programs in each state. The range for this program type was tighter than the low income retrofit program types, but still varied across the states. Compared to 2011, the 2012 acquisition cost and levelized cost of saved energy were largely consistent for each state.

**Table 22: Natural Gas Residential Retrofit Program Type**

State <sup>65</sup>	Annual Gas Energy Savings as a % of Total State Savings	Annual Expenditures as a % of Total State Expenditures	Acquisition Cost (\$/therm)	Levelized Cost of Saved Energy (\$/therm)
Connecticut	21.5%	27.4%	\$5.95	\$0.41
District of Columbia	0.4%			
Maryland	43.1%			
Massachusetts	8.6%	15.5%	\$11.32	\$0.74
New Hampshire	10.2%	16%	\$6.56	\$0.42
New York <sup>66</sup>	40.1%	31.4%	\$3.64	
Rhode Island	41.9%	51%	\$7.07	\$0.49
Vermont	8.7%	27%	\$8.29	\$0.54

Table 23 shows that state-level average measure life for natural gas residential retrofit programs fell in a very tight range of 18.2 to 20.2 years for all jurisdictions but District of Columbia. Like the District's low income retrofit average measure life, its residential retrofit average measure life is based on a very small amount of savings, which means it is heavily influenced by just a few measures.

67 District of Columbia and Maryland are not included any of the Table 22 sections related to expenditures since they did not submit natural gas program expenditures.

68 New York is not included in the Levelized Cost of Saved Energy section of Table 22 because it did not provide lifetime energy savings for its natural gas programs.

**Table 23: Natural Gas Residential Retrofit Program Type Average Measure Life**

State <sup>67</sup>	Average Measure Life (years)
Connecticut	18.2
District of Columbia	11.1
Massachusetts	19.5
New Hampshire	20.2
Rhode Island	18.3
Vermont	19.7

## VIII. AVOIDED EMISSIONS

Over the past several years, avoided air pollution emissions from energy efficiency programs have been increasingly of interest across the region. Many states in the REED region have adopted energy efficiency as a cost-effective strategy to meet not only energy and economic policy goals, but also to make progress towards environmental policy goals. These include:

- Allowance proceeds from the Regional Greenhouse Gas Initiative (RGGI) are largely invested in state energy efficiency programs, the results of which (energy savings and associated avoided emissions) are reported by RGGI in its annual report on Regional Investments in CO<sub>2</sub> Allowance Proceeds <http://www.rggi.org/docs/Documents/2012-Investment-Report.pdf>.
- RGGI and REED reporting on avoided CO<sub>2</sub> emissions overlap but are not consistent. REED focuses on reporting EE data from largely SBC-funded EE programs (which may in part be funded by RGGI), while RGGI focuses on RGGI allowance proceed funded EE investments, which can include a range of EE activities within a state (e.g., in state buildings, municipal and local community EE projects, and/or in coordination with SBC funded programs.) REED reports on the sources of funding for the data collected. NEEP and RGGI Inc. have discussed the importance of coordinating on data collection, and will continue to identify opportunities for coordination going forward.
- In 2012, the US Environmental Protection Agency (US EPA) issued a guidance document, “[Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans](#).” The Roadmap encourages jurisdictions designated as non-attainment<sup>70</sup> to consider incorporating energy efficiency and renewable energy into their State or Tribal Implementation Plans (SIP/ TIP) to help achieve National Ambient Air Quality Standards (NAAQS) and provides guidance about how to do so.
- US EPA recently issued its Clean Air Act 111(d) regulations that set limits on existing power plant GHG emissions, and identifies energy efficiency as a key ‘building block’

<sup>69</sup> Maryland and New York are not included in Table 23 since they did not submit lifetime energy savings for natural gas programs.

<sup>70</sup> Non-attainment areas are jurisdictions with air quality that does not meet National Ambient Air Quality Standards. An area may be a non-attainment area for one pollutant and an attainment area for others.



for states to meet the required emission rates set forth by EPA. As states develop their state compliance plans to submit to EPA (by June 30, 2016, or within 2 years in cases where states coordinate on a multi-state framework like RGGI), REED data and supporting documentation of EE savings and underlying EM&V can support states' compliance plans.

In anticipation of the increasing importance of energy efficiency data for air quality and GHG planning and regulation, NEEP, with approval from the Forum's Steering Committee and funding, plans to expand REED in 2015 to include a State Energy Efficiency Resource Directory that will add information about and links to relevant sources of energy efficiency information that will help support air planners and regulators' ability to incorporate energy efficiency into their air quality and GHG 111(d) compliance plans.

REED currently calculates avoided carbon dioxide (CO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) emissions using average annual emission rates for each participating region, provided by ISO-NE, PJM Interconnection (PJM) and NYSERDA for the New York Independent System Operator (NYISO) as follows:

- ISO-NE: CO<sub>2</sub> = 780 lbs/MWh, NO<sub>x</sub> = 0.42 lbs/MWh, SO<sub>2</sub> = 0.95 lbs/MWh
- PJM: CO<sub>2</sub> = 1146 lbs/MWh, NO<sub>x</sub> = 1.32 lbs/MWh, SO<sub>2</sub> = 3.53 lbs/MWh
- NYISO: CO<sub>2</sub> = 826 lbs/MWh, NO<sub>x</sub> = 0.81 lbs/MWh, SO<sub>2</sub> = 1.78 lbs/MWh

REED's calculated emissions reductions do not capture the cumulative effect of program savings over the lifetime of the measures installed in 2011 and 2012, nor the impact of programs from previous years. REED may ultimately use marginal emissions factors rather than average annual emission factors to calculate avoided emissions when such factors become available using a consistent methodology. NEEP is currently tracking several developments related to avoided air emissions calculations, including 1) discussions amongst state air regulators, Northeast States for Coordinated Air Use Management (NESCAUM), and the regional ISOs/RTOs about use of a consistent marginal emissions methodology for calculating avoided emissions, and 2) the US EPA's recently released [Avoided Emissions and Generation Tool \(AVERT\)](#). NEEP may incorporate a new methodology for Program Year 2013 data for its avoided emissions calculations, drawing from one or more of these efforts. Currently, REED provides avoided emissions for electric programs only.

Table 24 provides the avoided emissions for each state, as well as totals across all states for CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>2</sub> emissions. In 2012, energy efficiency programs in the REED jurisdictions collectively avoided 3.5 billion pounds of CO<sub>2</sub> emissions, 2.7 million pounds of NO<sub>x</sub> emissions, and just over 7 million pounds of SO<sub>2</sub> emissions. This is roughly consistent with the annual emissions reductions from energy efficiency programs realized in REED jurisdictions in 2011.

**Table 24: Avoided Emissions from Electric Programs by State**

State	Avoided CO <sub>2</sub> (lbs.)	Avoided NO <sub>x</sub> (lbs.)	Avoided SO <sub>2</sub> (lbs.)
Connecticut	232,719,088	125,310	283,440
Delaware	5,612,269	5,070	17,290
District of Columbia	24,892,623	22,470	76,680
Maryland	937,017,193	845,730	2,886,280
Massachusetts	980,847,769	528,150	1,194,620
New Hampshire	40,676,433	21,900	49,540
New York	1,058,053,642	1,037,560	2,280,070
Rhode Island	122,023,811	65,710	148,620
Vermont	99,900,301	53,790	121,670
<b>TOTAL</b>	<b>3,501,743,129</b>	<b>2,705,680</b>	<b>7,058,200</b>

*The amount of avoided CO<sub>2</sub> emissions resulting from REED's 2012 energy efficiency programs is equal to the amount of carbon sequestered by over 40 million tree seedlings grown for 10 years.<sup>71</sup>*

The New England states had comparatively smaller emissions reductions per MWh than New York and the Mid-Atlantic jurisdictions because ISO-New England has lower emissions factors than the factors used by PJM (applied to Delaware, District of Columbia, and Maryland) and NYISO (applied to New York). The PJM factors are higher due to a greater use of coal-fired power plants than the other

regions, while the NYISO factors are due to the use of marginally more petroleum for power generation than the other regions.<sup>72</sup> Maryland and New York also have relatively higher populations than the other REED jurisdictions.

## IX. JOB CREATION IMPACTS

In addition to saving energy and reducing emissions, energy efficiency programs also stimulate the economy and create jobs. REED recognizes that reporting job impacts from energy efficiency programs helps demonstrate the state and regional economic benefits of energy efficiency, and is therefore a metric of interest to many policymakers. REED's job creation impacts data from 2011 and 2012 is incomplete, however, as not all states have job impact data applicable to program years 2011 and/or 2012, and some that do prefer not to provide data given differences in methodologies employed across states.

Job calculation methodologies currently range from fairly straightforward calculators to more comprehensive modeling. In order to address the challenges posed by the lack of a consistent, credible job calculation methodology across states, NEEP is supporting a study that is being conducted by ACEEE in 2014 and 2015 to review methodologies in use across the country

<sup>71</sup> According to the US EPA Greenhouse Gas Equivalency Calculator. See: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results>.

<sup>72</sup> For information on the electricity generation profiles of the states, see the U.S. Energy Information Agency's (EIA's) website at [www.eia.gov](http://www.eia.gov).



and recommend a methodology or options of methods depending on purpose/scope of study needs and budget. Methodologies will be evaluated based on (1) their ability to establish concrete proof of job creation, (2) their effectiveness in capturing the full range of job creation impacts including direct, indirect, and induced jobs, and (3) their ease of use and ability to be replicated.<sup>73</sup> After the study is completed in 2015, NEEP, with the input of EM&V Forum participants, will potentially recommend the use of ACEEE’s recommended methodology for reporting job impacts to REED going forward.

For 2012, jurisdictions were asked to report job impacts to REED based on whichever methodology they use for state tracking and reporting purposes. Delaware, District of Columbia, Rhode Island and Vermont reported job creation impacts, which are shown in Table 25.

**Table 25: Energy Efficiency Program Job Creation Impacts by Jurisdiction (Job Years)**

State	Program Sector	Net Full Time Equivalent Jobs	Gross Direct Jobs
Delaware	C&I		38
District of Columbia	C&I	33	
	Residential	111	
Rhode Island	C&I	170	
	Residential	1,006	
Vermont	C&I	1,161	
	Residential	774	

Delaware provided only gross direct jobs that resulted from its 2012 large C&I retrofit programs. It did not calculate net jobs.

The District of Columbia Sustainable Energy Utility (DC SEU) has a contract metric for green collar jobs that requires full documentation of each hour worked on DC SEU activity. The District defines green collar jobs as the number of hours directly worked by DC residents, earning at least a living wage, on DC SEU activities. The District’s reported job numbers are third party verified.<sup>74</sup>

Like it did in 2011, Rhode Island estimated 2012 job creation impacts based upon economic impacts from energy efficiency expenditures using the REMI-based model for New England developed by Environment Northeast.<sup>75</sup> Implementation expenses were multiplied by multipliers outlined in the report for electric (36.2 job years per million dollars) and gas (38.5 job years per million dollars) expenditures. Rhode Island was the only state to report the median wage of energy efficiency jobs, at \$19,116/year.

<sup>73</sup> American Council for an Energy Efficient Economy (ACEEE). Proving Energy Efficiency Creates Jobs: Seeking a New Standard Method. See: <http://aceee.org/blog/2014/01/proving-energy-efficiency-creates-job>.

<sup>74</sup> District of Columbia Sustainable Energy Utility Annual Report 2012. See: <http://www.dcseu.com/docs/about-us/DCSEU-2012AnnualReport-Final.pdf>.

<sup>75</sup> Environment Northeast, Energy Efficiency, Engine of Economic Growth. October 2009. See: <http://www.env-ne.org/resources/open/p/id/964>.

Vermont estimated job impacts using a REMI-based model developed by Optimal Energy and reported job-years created over a 20 year period. Like Rhode Island, Vermont energy efficiency expenses were multiplied by multipliers outlined in the report for energy efficiency expenditures (43 job years per million dollars spent). REMI has built-in baseline forecasts of economic activity that were calibrated to Vermont. The study included policy changes that affect the economy, including changes to consumer spending, energy costs for businesses, and additional commercial activity and industry demand related to energy efficiency investments. The REMI model shows the difference between alternative forecasts and the original baseline, representing future activities over and above what would have occurred in the Vermont's economy absent any changes in policy.<sup>76</sup>

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<sup>76</sup> Optimal Energy. Economic Impacts of Energy Efficiency Investment in Vermont - Final Report. August 17, 2011. See: [http://legislature.idaho.gov/sessioninfo/2011/interim/energy\\_public\\_optimal.pdf](http://legislature.idaho.gov/sessioninfo/2011/interim/energy_public_optimal.pdf).



## X. CONCLUSION AND RECOMMENDATIONS

This REED Program Year 2012 Annual Report provides an overview of the high-level impacts of 2012 energy efficiency programs at the state and regional level. It also includes a more detailed study of several electric and natural gas program types that achieved the highest level of net annual energy savings across the region. Throughout the report, key differences in energy efficiency program results across states are highlighted, and some insights are provided into why these differences occurred.

REED's 2012 energy efficiency program data demonstrates that energy efficiency is a cost effective and increasingly important energy resource. REED now includes two years of energy efficiency program data, helping to document energy efficiency's contribution to achieving state energy, economic and environmental policy goals over time. Analysis of the REED data also helps to increase our understanding of similarities and differences in results across programs by type, sector and state.

NEEP recommends future work in the following key areas to further building a common platform for the region for reporting of efficiency impacts. The EM&V Forum Steering Committee can play an important role in the execution of these activities by recommending that REED jurisdictions support these activities and adopt associated products for use in each jurisdiction.

1. ***Develop greater consistency in state definitions and application of gross versus net savings.*** The varying ways that states report savings can make direct comparisons between state savings levels difficult. Furthermore, it can be difficult to make direct comparisons between states' net savings impacts due to variations in the evaluation methods used and components included in net savings evaluations (free-ridership, spillover, long-term market effects.) The EM&V Forum is currently working with Forum stakeholders to provide guidance on greater transparency around reporting and documentation of evaluation methods as well as developing regional guidance focused on applications of net savings.
2. ***Incorporate a more detailed energy efficiency program typology*** into REED to help resolve issues with allocating programs to the more limited set of program type categories that are currently used in REED. REED should incorporate LBNL's proposed energy efficiency program typology<sup>77</sup> to help resolve issues with allocating programs to the more limited set of program type categories that are currently used in REED. Using a broader program typology that better fits each program will increase the comparability of energy efficiency program results across states in the REED region and beyond. NEEP should continue to work with LBNL, CEE, ACEEE and others to track and encourage the use of the LBNL program type categories for formal state reporting purposes.
3. ***Add a State Energy Efficiency Resource Directory to REED*** with comprehensive information about and links to relevant sources of energy efficiency information.

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<sup>77</sup> Lawrence Berkeley National Laboratory. Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology. August 28, 2013. See: <http://emp.lbl.gov/sites/all/files/lbnl-6370e.pdf>.



Develop a State Energy Efficiency Resource Directory in REED that contains information about and links to relevant sources of energy efficiency state plans, forecasts, and other data. Such a Resource Directory will help support the work of a range of energy efficiency stakeholders, including state agencies, US EPA and US DOE, and system planners.

4. *Provide for greater transparency in EM&V practices* used to inform reported program results in REED by finalizing the EM&V Forum's current EM&V Methods project to develop standardized EM&V methods reporting forms for use in each REED jurisdiction. The forms will be presented to the EM&V Forum's Steering Committee for adoption later in 2014. The information collected using these forms should be incorporated into REED's Energy Efficiency Resource Directory to provide for a more understanding of and access to energy efficiency program results.
5. *More thoroughly examine measure life assumptions* currently used in each state and potentially conducting additional measure life and persistence studies in the region. The Forum should more thoroughly examine where and why states are using different measure life assumptions, and how these differences affect reported lifetime savings and the cost of saved energy. The Forum should also consider conducting additional measure life and persistence studies in the region that would promote greater consistency in measure life assumptions across the states, and encourage states to use the same measure life assumptions in the TRMs.
6. **Review Baseline Assumptions.** The Forum should study differences in baseline assumptions across the REED states and how these assumptions affect reported program results. Such an analysis can help to inform Forum research, with focus on priority measures, as identified by Forum participants and NEEP recommendations based on REED data review.
7. *Select and encourage the use of a common methodology to calculate job impacts* from energy efficiency programs. NEEP should select and support a common methodology to calculate job impacts from energy efficiency programs and encourage use of this methodology for calculating job impacts in each state. As a first step, NEEP is supporting the ACEEE job impacts study being conducted in 2014 to 2015. Upon study completion, NEEP should review with Forum states whether ACEEE's methodology is acceptable, and if so, should recommend its use for energy efficiency jobs reporting throughout the REED region.

REED will be updated with program year 2013 data by year-end 2014, and NEEP plans to issue a REED Program Year 2013 Annual Report in 2015. As each year of data is added, this Annual Report will be able to provide an increasingly robust analysis of energy efficiency trends across time, including differences in program impacts across states.

NEEP welcomes questions and feedback from all REED users in order to help determine which data to include and questions to address in the Program Year 2013 Annual Report. Please provide your feedback to: [reed@neep.org](mailto:reed@neep.org).



## APPENDIX A: 2012 STATE ENERGY EFFICIENCY PROGRAM INFORMATION

CONNECTICUT	
2012 Energy Efficiency Plan	2012 Electric and Natural Gas Conservation and Load Management Plan
2012 Energy Efficiency Annual Report	2012 Report of the Energy Efficiency Board
2012 Energy Efficiency Evaluations	<a href="http://ctenergyinfo.com/about/eeboard/evaluation-reports">http://ctenergyinfo.com/about/eeboard/evaluation-reports</a>
EM&V protocols / methods used to support the reported savings are based on and/or include:	<ul style="list-style-type: none"> <li>• ISO-NE M&amp;V Standards</li> <li>• Connecticut utilities utilize independent third party evaluators</li> </ul>

DELAWARE	
2012 Energy Efficiency Plan	Energy Efficiency Investment Fund Program Information
2012 Energy Efficiency Evaluations	EM&V was not completed during program year 2012. However, future programs will be evaluated using the Delaware Evaluation Framework (currently in draft format pending regulation promulgation).
EM&V protocols / methods used to support the reported savings are based on and/or include:	Currently, no EM&V activities are being performed. However, Delaware has recently developed its first EM&V Framework for use with future programs. EE savings data is currently not reported to a regulatory authority.

DISTRICT OF COLUMBIA	
2012 Energy Efficiency Annual Report	DC SEU Annual Report 2012
EM&V protocols / methods used to support the reported savings are based on and/or include:	DC SEU utilizes third party evaluators

MARYLAND	
2012 Energy Efficiency Plan	Utility Annual EE Plans - see case numbers 9153, 9154, 9155, and 9166
2012 Energy Efficiency Annual Report	EmPOWER Maryland Annual Report

### MASSACHUSETTS

2012 Energy Efficiency Plan	Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plan (2010-2012)
2012 Energy Efficiency Annual Report	<ul style="list-style-type: none"> <li>• MA EEAC 2012 Annual Report</li> <li>• Individual Utility 2012 Annual Reports</li> </ul>
2012 Energy Efficiency Evaluations	MA EEAC EM&V Studies
EM&V protocols / methods used to support the reported savings are based on and/or include:	ISO-NE M&V Standards (M-MVDR)

NEW HAMPSHIRE	
2012 Energy Efficiency Plan	<ul style="list-style-type: none"> <li>• 2011-2012 CORE New Hampshire Energy Efficiency Programs</li> <li>• Energy Efficiency Plan January 01, 2011 through December 31, 2012</li> </ul>
2012 Energy Efficiency Annual Report	Core Energy Efficiency Programs Annual Reports
2012 Energy Efficiency Evaluations	Completed Monitoring and Evaluation Studies

NEW YORK	
2012 Energy Efficiency Plan	New York Energy Efficiency Portfolio Standard - see 07-M-0548
2012 Energy Efficiency Annual Report	<ul style="list-style-type: none"> <li>• NY EEPS Programs - see 07-M-0548</li> <li>• NYSERDA SBC3 Programs Annual Report</li> <li>• LIPA Efficiency Long Island Annual Report</li> </ul>
2012 Energy Efficiency Evaluations	<ul style="list-style-type: none"> <li>• NYSERDA</li> <li>• NY EEPS</li> </ul>
EM&V protocols / methods used to support the reported savings are based on and/or include:	<ul style="list-style-type: none"> <li>• EEPS: State DPS prescribed guidelines/methods</li> <li>• NYSERDA: various national and international best practices and methods. Also note, PUC guidelines came to be after much evaluation was already completed on SBC3 programs.</li> <li>• LIPA: A combination of TRMs recommended by LIPA's Evaluation Contractor and NYS EEPS Tech Manual</li> </ul>

RHODE ISLAND	
2012 Energy Efficiency Plan	Energy Efficiency Program Plan for 2012
2012 Energy Efficiency Annual Report	2012 Energy Efficiency Year-End Report
2012 Energy Efficiency Evaluations	RI EERMC 2012 Evaluation Studies
EM&V protocols / methods used to support the reported savings are based on and/or include:	ISO-NE M&V Standards (M-MVDR)

VERMONT	
2012 Energy Efficiency Plan	Efficiency Vermont 2012 Annual Plan
2012 Energy Efficiency Annual Report	<ul style="list-style-type: none"> <li>• Efficiency Vermont 2012 Annual Report</li> <li>• Burlington Electric Department 2012 Annual Report</li> <li>• Vermont Gas 2012 Annual Report</li> </ul>
2012 Energy Efficiency Evaluations	Vermont Performance Evaluation
EM&V protocols / methods used to support the reported savings are based on and/or include:	<ul style="list-style-type: none"> <li>• State PUC prescribed guidelines/methods</li> <li>• ISO-NE M&amp;V Standards (M-MVDR)</li> </ul>



## APPENDIX B: 2008-2010 STATE ENERGY EFFICIENCY PROGRAM SAVINGS AND EXPENDITURES

**Table 1: 2008 - 2010 Energy Efficiency Program Savings Source Information**

State	Electric Savings Figures	Electric Savings Type	Gas Savings Figures	Gas Savings Type	Notes on Data
Connecticut	ISO NE EE Forecast Data	Net	Annual EEB Legislative Reports	Net	Unclear if verified. Excludes commitments.
Maine	ISO NE EE Forecast Data	Net	Unitil Annual Reports to PUC	unclear	Final reported data. Appears to exclude commitments.
Maryland	Utility & PSC Staff EmPOWER Annual Reports (2009-2010).	Gross	N/A	N/A	Final reported data. Appears to exclude commitments.
Massachusetts	ISO NE EE Forecast Data	Net	EEAC Reports (2010) & Utility Reports to PUC (2008-2009)	Net	Final verified data. Excludes commitments.
New Hampshire	ISO NE EE Forecast Data	Net	Annual PUC Gas EE Program Tracking Data	unclear	Unclear if verified. May include commitments.
New York	State Energy Plan Assessment (2008-09), NYSERDA Annual Energy SMART and EEPS reports (2010), and PSC report on Utility EEPS programs (2010)	Net	State Energy Plan Assessment (2008-09), NYSERDA Annual Energy SMART and EEPS reports (2010), and PSC report on Utility EEPS programs (2010)	Net	Final verified data. Excludes commitments.
Rhode Island	ISO NE EE Forecast Data	Net	National Grid Annual Reports to the PUC	Net	Final verified data. Excludes commitments.
Vermont	ISO NE EE Forecast Data	Net	VT Gas Annual Report	unclear	Final verified data. Excludes commitments.

**Table 2: 2008 - 2010 Energy Efficiency Program Expenditures Source Information**

State	Electric Expenditure Figures	Gas Expenditure Figures	Notes on Data
Connecticut	ISO NE EE Forecast Data	Annual EEB Legislative Reports	Unclear if verified. Excludes commitments.
Maine	ISO NE EE Forecast Data	Unitil Annual Reports to PUC	Final reported data. Appears to exclude commitments.
Maryland	Utility & PSC Staff EmPOWER Annual Reports (2009-2010).	N/A	Final verified data. Excludes commitments.
Massachusetts	ISO NE EE Forecast Data	EEAC Reports (2010) & Utility Reports to PUC (2008-2009)	Final verified data. Excludes commitments.
New Hampshire	ISO NE EE Forecast Data	Annual PUC Gas EE Program Tracking Data	Unclear if verified. May include commitments.
New York	State Energy Plan Assessment (2008-09), NYSERDA Annual Energy SMART and EEPS reports (2010), and PSC report on Utility EEPS programs (2010)	State Energy Plan Assessment (2008-09), NYSERDA Annual Energy SMART and EEPS reports (2010), and PSC report on Utility EEPS programs (2010)	Final verified data. Excludes commitments.
Rhode Island	ISO NE EE Forecast Data	National Grid Annual Reports to the PUC	Final verified data. Excludes commitments.
Vermont	ISO NE EE Forecast Data	VT Gas Annual Report	Final verified data. Excludes commitments.