Energy Efficiency Snapshot

NEEP’s Look at Energy Efficiency by the Numbers

Northeast & Mid-Atlantic States

Spring 2016
About NEEP

Mission

Accelerate energy efficiency as an essential part of demand-side solutions that enable a sustainable regional energy system

Approach

Overcome barriers and transform markets via Collaboration, Education and Enterprise

Vision

Region embraces next generation energy efficiency as a core strategy to meet energy needs in a carbon-constrained world

NEEP is one of six regional energy efficiency organizations (REEOs) funded by the U.S. Department of Energy (DOE) to provide states guidance on policies and programs.
NEEP’s Seasonal Snapshot

An Overview

The Snapshot provides an overview of energy efficiency policy by the numbers in New England, New York, and the Mid-Atlantic regions. Updated twice annually, we include charts and tables on the following:

- Energy Efficiency as the Least Cost Energy Resource
- Energy Efficiency as an Economic Driver
- State Energy Efficiency Policies and Savings Goals
- Public Policies advancing Next Generation Energy Efficiency
- The Growing Focus on Peak Demand Reduction (Summer and Winter)
- Per Capita Energy Efficiency Expenditures
- Efficiency Savings as a Percent of Retail Sales (Gas and Electric)
- Cost of Saved Energy by State
- Energy Savings by Sector and Program Type
- Residential Lighting Assumptions
- Energy Efficiency and Avoided Emissions

The figures in this presentation are compiled from the Regional Energy Efficiency Database (REED), program administrator plans, annual reports, U.S. EIA, and ACEEE.
Energy Efficiency:

*The Least-Cost Energy Resource*

With a lifecycle cost of between $0 and $50/MWh, investments in energy efficiency are more cost-effective than investments in *any* conventional energy generation resource.

Energy Efficiency as an Economic Driver

Job Creation and Economic Growth

In New England, energy efficiency is responsible for 130,000 jobs, more than every other part of the energy industry combined. In the Northeast and Mid-Atlantic as a whole, energy efficiency is responsible for more than 300,000 direct jobs.

Energy Employment in New England

Energy Employment in the Mid-Atlantic

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>New England Jobs</td>
<td>129,977</td>
<td>67,971</td>
<td>32,146</td>
<td>29,123</td>
</tr>
<tr>
<td>Mid-Atlantic Jobs (Except Maryland, &amp; D.C.)</td>
<td>163,319</td>
<td>141,221</td>
<td>88,266</td>
<td>50,388</td>
</tr>
</tbody>
</table>

Source: U.S. Department of Energy
U.S. Energy and Employment Report
(March 2016)
# Energy Efficiency Policies and Goals: New England States

<table>
<thead>
<tr>
<th>STATE</th>
<th>POLICY TYPE</th>
<th>PROGRAM ADMINISTRATOR</th>
<th>ENERGY SAVINGS GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>All Cost-Effective Energy Efficiency</td>
<td>Electric &amp; Gas Utilities 2016-18 Plan</td>
<td>Electric: 1.5% retail sales Gas: 0.6% retail sales (forecasted retail sales)</td>
</tr>
<tr>
<td>Maine</td>
<td>All Cost-Effective Energy Efficiency</td>
<td>Efficiency Maine Trust 2017-19 Plan (proposed) Budgets and Metrics</td>
<td>Proceeding Pending</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>All Cost-Effective Energy Efficiency</td>
<td>Electric &amp; Gas Utilities + CLC 2016-18 Plan Term Sheet</td>
<td>Electric: 2.93% retail sales Gas: 1.24% retail sales (forecasted retail sales)</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>Program Funding Only</td>
<td>Electric &amp; Gas Utilities PUC Staff proposal</td>
<td>Proceeding pending</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>All Cost-Effective Energy Efficiency</td>
<td>Electric &amp; Gas Utilities 2015-17 Plan</td>
<td>Electric: 2.6% retail sales Gas: 1.1% retail sales (2012 retail sales)</td>
</tr>
<tr>
<td>Vermont</td>
<td>All Cost-Effective Energy Efficiency</td>
<td>Efficiency Vermont, BED, VGS 2015-17 Plan Demand Resource Proc.</td>
<td>Electric: 2.1% retail sales Gas: 0.9% retail sales (forecasted retail sales)</td>
</tr>
</tbody>
</table>
# Energy Efficiency Policies and Goals: The Mid-Atlantic Region

<table>
<thead>
<tr>
<th>STATE</th>
<th>POLICY TYPE</th>
<th>PROGRAM ADMINISTRATOR</th>
<th>ENERGY SAVINGS GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delaware</td>
<td>All Cost-Effective Energy Efficiency</td>
<td>Utilities+ Sustainable Energy Utility</td>
<td>Proposals Pending</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>Efficiency Utility Goals</td>
<td>Sustainable Energy Utility</td>
<td>Electric: 0.53% retail sales</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gas: 0.44% retail sales</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2014 retail sales)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Order No. 87082</td>
<td>Gas: Pending Proceeding (2014 retail sales)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gas Working Group Targets</td>
<td></td>
</tr>
<tr>
<td>New Jersey</td>
<td>Efficiency Funding</td>
<td>NJCEP OCE+ Utilities</td>
<td>No mandated savings goals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strategic Plan</td>
<td></td>
</tr>
<tr>
<td>New York</td>
<td>Energy Efficiency Portfolio Standard</td>
<td>NYSERDA + Utilities</td>
<td>Electric: 1.09% retail sales</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NYSERDA Clean Energy Fund</td>
<td>Plus PSEG-LI/NYPA: 1.51% total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Utility ETIPs</td>
<td>Gas: 0.35% retail sales</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2014 retail sales)</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Energy Efficiency Resource Standard</td>
<td>Electric Utilities</td>
<td>Electric: 0.8% retail sales</td>
</tr>
<tr>
<td></td>
<td>Funding Capped</td>
<td>Act 129 Phase III</td>
<td>Gas: none</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2013 retail sales)</td>
</tr>
</tbody>
</table>
Policies Provide Extensive Savings

Annual verified electric savings have more than doubled in recent years, moving from ~3,100 GWh in 2009 to ~6,300 GWh in 2014. This is a direct result of regulatory policies and executive leadership in states supporting energy efficiency as a first order resource.

Sources: 2013-14 data is drawn from EIA form 861. 2011-12 data is drawn from NEEP’s REED Database and ACEEE Scorecard/program administrator reports (D.C. Del., NJ. Pa.). 2009-10 data is drawn from ACEEE scorecards.
## Advancements in Public Policy:
### Next Generation Energy Efficiency

<table>
<thead>
<tr>
<th>TREND</th>
<th>NEXT GENERATION POLICY</th>
<th>STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grid Modernization</strong></td>
<td>Examining new utility frameworks responsive to emerging technologies/societal challenges and anticipating proliferation of multidirectional power flows, while also emphasizing greater customer engagement.</td>
<td>MA, NY, CT, RI, DC, NH</td>
</tr>
<tr>
<td><strong>Strategic Electrification and Geo-targeting</strong></td>
<td>Planning to procure savings from energy systems as a whole — across all fuels — with an emphasis on targeting distributed energy resources and their capabilities to defer or limit the need for further investments in distribution and transmission system assets.</td>
<td>VT, RI, NY, MA, ME</td>
</tr>
<tr>
<td><strong>Advanced Building Policies</strong></td>
<td>Shifting toward a whole-building approach to efficiency emphasizing advanced building energy codes, code compliance mechanisms, and building energy rating and labeling practices that drive toward “zero energy.”</td>
<td>RI, MA, CT, VT, DC, NY, DE</td>
</tr>
<tr>
<td><strong>New Program Strategies</strong></td>
<td>Harnessing new technology and policy innovations within utility program plans to enhance customer understanding around energy usage through expanded energy data access, information communication technologies, and strategic energy management strategies.</td>
<td>MA, VT, CT, NY</td>
</tr>
<tr>
<td><strong>Integrating Energy Efficiency and Demand Response</strong></td>
<td>Pairing energy efficiency program planning with opportunities for demand response in a manner that enhances cost-effectiveness and reduces peak load growth.</td>
<td>MD, CT, RI, MA, PA.</td>
</tr>
<tr>
<td><strong>EM&amp;V 2.0</strong></td>
<td>Coupling new data collection technologies and software-as-a-service analytic tools with traditional evaluation, measurement, and verification strategies for real-time feedback of efficiency program impacts that is less costly and sufficiently accurate.</td>
<td>States exploring use as customer engagement tool</td>
</tr>
<tr>
<td><strong>Ongoing Evolution of Financing Tools</strong></td>
<td>Leveraging private capital investments to increase funding available for energy efficiency programs through the use of Green Banks and related credit facilities, while also preserving proven program structures.</td>
<td>NY, CT, PA., NJ</td>
</tr>
</tbody>
</table>

See NEEP’s 2016 Regional Roundup for more information.
The Growing Focus on Peak Demand: 
A Look at ISO-NE

In ISO-NE, investment in energy efficiency will decrease overall load growth, but peak demand continues to grow spreading MW costs over fewer MWhs.

Forward looking program administrators are targeting system peaks on a temporal and locational basis through focus on peak coincident energy efficiency measures, demand response, and geo-targeting.

Source: ISO-NE RSP 15
The Growing Focus on Peak Demand: A Look at NY-ISO

The same is true for NY-ISO, where investment in energy efficiency will decrease overall load growth, yet peak demand continues to grow.

A key focus of the New York Public Service Commission’s “Reforming the Energy Vision” proceeding is peak MW reductions, playing a pivotal part in discussions on dynamic load management and utility business models.

Data Source: NY-ISO 2015 Gold Book
PJM began accounting for state level investments in energy efficiency in their long-term plan for the first time in January 2016. However, their plan does not include estimates of system needs before accounting for energy efficiency.

Relative to the ISO-NE and NY-ISO, the level of investment on a per capita basis in the Mid-Atlantic states is insufficient to flatten load growth.

Data source: [PJM 2016 Load Forecast Report](#)
Among the energy efficiency measures currently accounted for in ISO-NE’s Energy Efficiency Forecast, heating, hot water, and appliances have the greatest coincidence with winter peak. Motors/Drives/VFDs have the greatest coincidence with summer peak.
Peak to Energy Ratio by State

A Look at the Leading States

While the region as a whole has enjoyed success at reducing peak demand, there are a few distinct leaders: New Hampshire, Maryland, and New York. These states have achieved a peak to energy ratio higher than .14 MW/GWh.

Source: NEEP REED Database,
Per Capita Energy Efficiency Investments

Electric and Natural Gas Programs Combined

Efficiency investments are increasing across New England and the Mid-Atlantic. In 2016, combined efficiency program investments will average approximately $45 per capita.

Source: 2011-14 data is drawn from NEEP’s REED Database with the exception of DC, DE, NJ, and PA, which are drawn from ACEEE Scorecard. 2015-16 data is drawn from energy efficiency program plans in each state. For further information on which program administrators are included in REED, please see the REED Footnotes website.
Per Capita Investment

Electric Programs, 2011-14

The overwhelming majority of per capita energy efficiency investments in our region are directed toward electric programs, largely because avoided costs for electricity are higher than they are for natural gas.

$38 Average (2014)

Source: 2011-14 data is drawn from NEEP’s REED Database with the exception of DC, DE, NJ, and PA, which are drawn from ACEEE’s Scorecard. For further information on which program administrators are included in REED, please see the REED Footnotes website.
Thanks to policy leadership, efficiency serves a growing portion of electricity demand, with leading states achieving savings of more than two percent of annual electric sales.

Many states, including Rhode Island and Delaware, are embracing Combined Heat and Power (CHP) as a cost-effective means of delivering savings and encouraging large customer participation in programs.

Source: 2011-14 data is drawn from NEEP’s REED Database with the exception of DC, DE, NJ, and PA, which are drawn from ACEEE ‘s Scorecard. For further information on which program administrators are included in REED, please see the REED Footnotes website.
Investments Drive Savings
A Look at Electric Programs, 2011-14

The graph below uses savings and investment figures from states within the REED database to examine the relationship between electric efficiency program investment and annual program savings. *The more a state invests, the more it saves.*

\[ y = 329.28x \quad R^2 = 0.941 \]

- If \( R^2 \) is 0, savings has no correlation with amount invested.
- If \( R^2 \) is 1, savings is determined entirely by amount invested.

*Here, \( R^2 \) is .941.*

Source: NEEP REED Database. For further information, see the NEEP REED footnotes page. Graph includes savings and spending data from CT, MD, MA, NH, NY, RI, and VT.
Levelized Cost of Saved Electricity:
*LCOE per kwh, New England States*

While the costs of saved energy may vary according to state-specific factors such as program scale, maturity, and depth, one thing remains constant: the cost of saved energy is a fraction of cost of retail electricity, which is more than $0.14. The LCOE figures in this graph are based on a consistent discount rate across states, derived from the long-term U.S. treasury bond.

Source: NEEP REED Database. For further information, see the NEEP REED footnotes page.
Per Capita Investment
Natural Gas Programs, 2011-14

On a simple per capita basis, investments in gas efficiency programs in the region are generally less extensive than investments in electric efficiency, but this may have to do with several states in our region that lack a statewide gas distribution level infrastructure.

Source: 2011-14 data is drawn from NEEP’s REED Database with the exception of DC, DE, NJ, and PA, which are drawn from ACEEE ‘s Scorecard. For further information on which program administrators are included in REED, please see the REED Footnotes website.
Per Capita Natural Gas Investments

$Dollars per Residential and Commercial Customer$

Looking as investments per residential and commercial customer, rather than population, provides a more accurate comparison of gas savings and investment for rural states like Vermont, New Hampshire and Connecticut, which lack statewide delivery infrastructure.

Source: 2011-14 data is drawn from NEEP’s REED Database with the exception of DC, DE, NJ, and PA, which are drawn from ACEEE’s Scorecard. For further information on which program administrators are included in REED, please see the REED Footnotes website.
Savings as a Percent of Retail Sales

Natural Gas Programs, 2011-14

While natural gas programs are more modest than their electric counterparts, leading states aim to achieve savings of about one percent of retail sales, with the region saving on average ~0.65 percent of retail sales. Pennsylvania remains the only state in the region state doesn’t claim savings from comprehensive gas efficiency programs.

Source: 2011-14 data is drawn from NEEP’s REED Database with the exception of DC, DE, NJ, and PA, which are drawn from ACEEE’s Scorecard. For further information on which program administrators are included in REED, please see the REED Footnotes website.

*While Pennsylvania doesn’t claim savings for programs run by any regulated program administrator, the Department of Environmental Protection does in fact fund gas efficiency incentives for consumers.
The analysis below uses savings and investment figures from the REED database to examine the relationship between investments in gas efficiency and annual program savings. While there is slightly more variability than in the electric programs, the correlation between the two variables remains strong: greater investments = more savings.

If $R^2$ is 0, savings has no correlation with amount invested.
If $R^2$ is 1, savings is determined entirely by amount invested.

Here, $R^2$ is 0.8443.

$y = 4.9872x$

$R^2 = 0.8443$

Source: NEEP REED Database. For further information, see the NEEP REED footnotes page. Graph includes savings and spending data from CT, MA, NH, NY, RI, and VT.
While conventional wisdom holds that the cost of saved energy should be rising as programs mature, program administrators in Massachusetts and Rhode Island have been able to push the levelized cost of energy per therm downward. The downward trend from 2013 to 2014 may correlate with a recent expansion in program scale. In all cases, the cost of energy savings is far less than the cost of retail natural gas, which is more than $1/therm.

Source: NEEP REED Database. For further information, see the NEEP REED footnotes page.
Energy Savings by Sector

Natural Gas and Electric, 2014

In the states reporting to REED, electric programs budgets are about four times as big as for natural gas, with more mature programs doing more with gas. Electric programs derive the majority of their savings from the commercial sector, while for gas programs, residential programs deliver the most savings.

### Electric
- Residential: 36%
- Commercial and Industrial: 62%
- Low Income: 2%

### Gas
- Residential: 54%
- C&I: 35%
- Low Income: 11%

#### REED States 2014 Expenditures

<table>
<thead>
<tr>
<th>Sector</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>$1.5 Billion</td>
</tr>
<tr>
<td>Gas</td>
<td>$376 Million</td>
</tr>
</tbody>
</table>

Savings by Program Type

Natural Gas and Electric, 2014

Electric programs mine the majority of their savings from lighting, appliances, and large commercial and industrial retrofits, while natural gas programs focus greater attention on low income and residential retrofit programs.

**Electric**
- Retrofit Large C&I: 33%
- Behavior: 7%
- Lighting/Appliances: 21%
- New Construction Large C&I: 11%
- New Construction Residential: 3%
- Retrofit Residential: 10%
- Retrofit Low Income: 2%

**Gas**
- Retrofit Residential: 35%
- New Construction Large C&I: 9%
- New Construction Residential: 1%
- Retrofit Small C&I: 14%
- Retrofit Low Income: 11%
- Education: 6%
- Lighting/Appliances: 2%
- New Constr. Residential: 3%
- New Constr. Small C&I: 2%

Residential Lighting Programs

**Insights from NEEP’s Residential Lighting Deep Dive**

Lighting is the single largest source of savings for residential electric energy efficiency programs. Seeking to better inform program design, NEEP published *The State of Our Sockets*, analyzing the residential lighting market, followed up by a Residential Lighting Deep Dive, detailing program assumptions to better understand differences in cost of saved energy for residential lighting.

**A major takeaway:** program savings assumption inputs vary widely, as seen below in the case of assumed measure lives. This significantly effects how cost-effectiveness is calculated, and therefore impacts program design.

### Table 9: Measure Life Values by State for Retail Residential Lighting Programs

<table>
<thead>
<tr>
<th></th>
<th>CT</th>
<th>DC</th>
<th>MA</th>
<th>MD</th>
<th>NH</th>
<th>NY</th>
<th>RI</th>
<th>VT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard CFL Bulb</strong></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>EUL reduced each year until 2020</td>
<td></td>
<td></td>
<td>EUL reduced each year until 2020</td>
</tr>
<tr>
<td><strong>Standard LED Bulb</strong></td>
<td>10</td>
<td>&lt;15W = 15</td>
<td>&gt;=15W = 15</td>
<td></td>
<td>10</td>
<td>20</td>
<td>20</td>
<td>TRM does not specify an EUL for LEDs</td>
</tr>
<tr>
<td><strong>Decorative LED Bulb</strong></td>
<td>10</td>
<td>&lt;15W = 15</td>
<td>15 &lt;= W &lt; 25 = 10.5</td>
<td>20</td>
<td>19 (EISA exempt)</td>
<td>16.7</td>
<td>20</td>
<td>TRM does not specify an EUL for LEDs</td>
</tr>
<tr>
<td><strong>Directional LED Bulb</strong></td>
<td>10</td>
<td>&lt;20W = 15</td>
<td>&gt;=20W = 15</td>
<td>19 (EISA exempt)</td>
<td>20</td>
<td>20</td>
<td>TRM does not specify an EUL for LEDs</td>
<td>17</td>
</tr>
</tbody>
</table>

Source: [NEEP Residential Lighting Deep Dive](#)
Identifying Trends in Regional Data

The Regional Energy Efficiency Database (REED)


**REED features:**
- Annual & Lifetime Savings
- Peak Demand Savings
- Avoided Air Emissions
- Program Expenditures
- Job Creation Impacts
- Cost of Saved Energy
- Program Funding Sources
- Supporting Information

Learn more at reed.neep.org
Energy Efficiency and Avoided Emissions

Insights for Clean Power Plan and NAAQS Compliance

In 2014, energy efficiency programs significantly reduced emissions of CO₂, NOₓ, and SO₂, aiding states in compliance with the air quality goals, including recently promulgated changes to National Ambient Air Quality Standards (NAAQS).

The CO₂ emissions reductions are equivalent to the annual emissions from:

- More than 530,000 passenger vehicles.
- More than 347,000 homes.

<table>
<thead>
<tr>
<th>State</th>
<th>Avoided CO₂ (tons)</th>
<th>Avoided NOₓ (tons)</th>
<th>Avoided SO₂ (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>131,492</td>
<td>69</td>
<td>40</td>
</tr>
<tr>
<td>Delaware</td>
<td>5,188</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>34,593</td>
<td>28</td>
<td>69</td>
</tr>
<tr>
<td>Maine</td>
<td>58,650</td>
<td>31</td>
<td>35,546</td>
</tr>
<tr>
<td>Maryland</td>
<td>660,908</td>
<td>537</td>
<td>1,324</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>603,947</td>
<td>316</td>
<td>183</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>25,009</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>New York</td>
<td>517,229</td>
<td>612</td>
<td>728</td>
</tr>
<tr>
<td>New Jersey</td>
<td>277,434</td>
<td>185</td>
<td>555</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>564,612</td>
<td>459</td>
<td>1,131</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>119,981</td>
<td>63</td>
<td>36</td>
</tr>
<tr>
<td>Vermont</td>
<td>38,357</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,037,400</strong></td>
<td><strong>2,337</strong></td>
<td><strong>39,643</strong></td>
</tr>
</tbody>
</table>

Source: NEEP REED Database, and for Maine, Maryland, New Jersey, and Pennsylvania, the ACEEE Scorecard.
More from NEEP

A Sample of reports at NEEP.org/Resources

2016 Regional Roundup of Energy Efficiency Policy

Opportunities for HEMS to Advance Residential Energy Efficiency Programs

The Changing EM&V Paradigm

Please visit NEEP’s blog for the latest news and insights.
Questions?

For more information on state policies, please contact:

Brian Buckley, bbuckley@NEEP.org  
781.860.9177 ext. 152  
Natalie Treat, ntreat@neep.org  
781.860.9177 ext. 121

For more information on the Regional Energy Efficiency Database (REED), please contact:

Colin Walker, cwalker@neep.org  
781.860.9177. ext. 138

Northeast Energy Efficiency Partnerships (NEEP)  
91 Hartwell Avenue Lexington, MA 02421  
www.neep.org