Advancing/Enhancing Existing Initiatives, Approaches, and Measures

Briefing Documents for EEAC Commercial & Industrial Planning Workshop #1
October 3, 2017

Prepared by DOER, the EEAC Consultant Team (Optimal Energy) and the Massachusetts Program Administrators
Document Overview

The C&I briefing document content was developed by both the EEAC Consultants and the Program Administrators. Each topic has the following sections:

→ Overview Prepared by Consultants and PAs – This section is intended to be an impartial look at the topic and its context in Massachusetts
→ EEAC Consultant Team Strategic Recommendation – A single strategic recommendation proposed by the EEAC Consultants proposed as a starting point for discussion at the workshop.
→ EEAC Consultant Team Potential Approaches to Overcome Barriers – a summary of the Consultant team thoughts on barriers and solution son the topic
→ Program Administrator Provided Information – A PA prepared section on the topic
→ Appendices contain detailed information on the topic by the Consultant team

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TOPIC #1 - COMBINED HEAT & POWER
Overview Prepared by Consultants and PAs

This Brief addresses Combined Heat and Power (CHP) systems. CHP systems offer a range of benefits to owners, society, and utilities and have been an extremely important component of the energy efficiency portfolio. Combined Heat and Power is a form of distributed generation in which a system generates both electricity and useful heat at a customer site. This reduces the need for customers to purchase electricity from the grid and burn fuel solely for the creation of heating energy. CHP systems result in increased overall energy use efficiency when both the energy used on-site and the source energy used to make electricity are considered. As an energy efficiency measure, CHP reduces both electricity generation and demand year round at generating plants, not at the customer site. It is important for economic reasons to size a CHP system correctly and important for operations reasons for customer commitment to becoming a power producer for the next 20 years. Large CHP systems tend to have significant lifetime savings impacts due to both the size of the systems that are installed, as well as a long measure life.

CHP systems can use various fossil and renewable fuels. Fossil fuels include natural gas as well as coal and oil, however the PAs have not incentivize any fossil systems other than natural gas. Renewable fuels include biomass, biogas from landfills or waste water treatment plants, wood and waste. There are a variety of technologies used to transform the fuel into heat and power, such as reciprocating engines, turbines and fuel cells.

Table 1. Quick View of Massachusetts Program Activity

<table>
<thead>
<tr>
<th>Topic</th>
<th>CHP Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to C&amp;I evaluated 2016 savings</td>
<td>CHP contributed 15% of all lifetime C&amp;I savings in 2016</td>
</tr>
<tr>
<td>Cost to achieve (incentives only)</td>
<td>$0.009 per lifetime kWh of savings</td>
</tr>
<tr>
<td>Current market activity</td>
<td>Good</td>
</tr>
<tr>
<td>Projected market w/ increased PA activity</td>
<td>Outlook is PA dependent</td>
</tr>
</tbody>
</table>

As seen in Exhibit 1, lifetime savings realized in the 2010-2012 and 2013-2015 Three Year Plans were a significant part of the Commercial and Industrial (C&I) savings portfolio. The savings from CHP averaged about 18% of all C&I lifetime savings through the end of 2016. As of June 2017, the savings from CHP systems that were either completed or under construction represented 89% of the current Three Year Plan goal.

Exhibit 1. CHP Lifetime Savings

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1 Data on CHP planned and actual savings was collected from the individual PA Benefit Cost Ratio screening tools
Status in MA

The complexity of CHP systems and the need for a consistent and appreciable heat load limits the cost-effective CHP market to certain customers. Manufacturers and food processors host the most CHP systems in Massachusetts and also have the most installed MW capacity. Multifamily buildings are next in terms of quantity of systems, but the average size of the system is smaller. Manufacturers and district energy facilities have the largest CHP systems in the State, and comprise 81% of total statewide installed capacity. Hospitals and universities also make up a significant share of both the quantity and capacity of CHP. In Massachusetts, 84% of CHP systems use natural gas as the fuel and 10% use non-fossil fuels.3

The Massachusetts PAs offer support for CHP in two ways. First, they offer technical assistance for customers interested in CHP to confirm if they are good CHP candidates. Second, the PAs offer a tiered set of incentives that rewards higher efficiency systems and doing other efficiency measures first, before sizing the CHP system.4 The State also provides incentives to help meet the goals of the Alternative Energy Portfolio Standard 5 that compliment utility incentives and help customers overcome the financial barriers to implementing CHP. 6 Each of the incentives are ultimately funded through ratepayer charges either through the distribution charges (EE Incentives) or supply charges (RPS/APS Incentives) customers pay. The APS incentives are offered through the Department of Energy Resources based on the amount of energy a CHP system offsets. APS incentives are dependent on actual performance and therefore are harder to predict. In practice, APS incentives typically cover the cost of maintenance for the CHP system.7

Massachusetts Market Characterization

A DOE study estimates there is 3,434 MW of CHP technical potential at 6,659 sites that could be developed in Massachusetts.8 This is about double the currently installed 1,631 MW of capacity. However, in order to better understand this important market, there is a need for better estimates of economic and achievable potential and for scenarios of the timeline for installation. Only a portion of the technical potential will be economically viable, and only a subset of the economically viable potential will actually be achievable within a given time frame.

Exhibit 2. Industrial and Commercial Technical Potential

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6 https://www.masssave.com/~/media/Files/PDFs/Business/MassachusettsAPSIncentiveforCHP.pdf
7 John Ballam, DOER Manager of Engineering and CHP program
EEAC Consultant Team Strategic Recommendation

The PAs have had success with increasing CHP savings in each successive plan, and the Council would like to see the electric PAs continue to grow CHP savings by:

1. Utilizing EM&V and Council feedback on streamlining the project process,
2. Increasing support and outreach by the PAs, and
3. Increasing collaboration with CHP vendors.

EEAC Consultant Team Potential Approaches to Overcome Barriers

Massachusetts has made significant progress in achieving CHP savings, and the EEAC Consultants have identified the following barriers and opportunities for implementing more CHP systems moving forward.

<table>
<thead>
<tr>
<th>BARRIERS</th>
<th>OPPORTUNITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customized Expertise:</td>
<td>To overcome technical barriers, especially in the small electric PA service</td>
</tr>
<tr>
<td>Because CHP is a complex, custom</td>
<td>territories, there may be a need for more CHP technical experts beyond those</td>
</tr>
<tr>
<td>measure, customers need technical</td>
<td>currently working for National Grid and Eversource. The PAs could consider a</td>
</tr>
<tr>
<td>help.</td>
<td>CHP circuit rider model in which the PAs share the cost of technical experts</td>
</tr>
<tr>
<td></td>
<td>who work across PA territories to identify candidate customers, promote CHP</td>
</tr>
<tr>
<td>Small Customers: smaller</td>
<td>where it makes sense and support customers with technical assistance and other</td>
</tr>
<tr>
<td>customers may not have capital to</td>
<td>review services when they are considering CHP investments.</td>
</tr>
<tr>
<td>purchase or personnel to maintain</td>
<td>The PAs could work with vendors to identify a third party delivery model that</td>
</tr>
<tr>
<td>and operate a CHP system.</td>
<td>would own and operate a small scale CHP system.</td>
</tr>
</tbody>
</table>

A recently completed process evaluation of the CHP programs\(^9\) has also identified some suggested improvements to the delivery of the energy efficiency program listed below.

<table>
<thead>
<tr>
<th>BARRIERS</th>
<th>OPPORTUNITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Aversion: If a customer or</td>
<td>Any future changes to the incentive structure could be made cautiously and</td>
</tr>
<tr>
<td>project developer is concerned about</td>
<td>incrementally. Changes could be announced and explained to the project</td>
</tr>
<tr>
<td>changes to the program or incentives,</td>
<td>developers with sufficient lead time to limit the impact on project</td>
</tr>
<tr>
<td>that increases risk.</td>
<td>development from the introduction of uncertainty.</td>
</tr>
<tr>
<td>Economic Uncertainty: CHP projects</td>
<td>The PAs could be able to encumber incentive funds for proposed CHP projects</td>
</tr>
<tr>
<td>can take a long time to develop,</td>
<td>for up to three years in order to provide security and reduce risk for</td>
</tr>
<tr>
<td>customers want to be sure of</td>
<td>developers and customers.</td>
</tr>
<tr>
<td>incentive eligibility.</td>
<td></td>
</tr>
<tr>
<td>Outreach: Only 17% of CHP program</td>
<td>The Program Administrators could ensure that all customers with summer</td>
</tr>
<tr>
<td>participants found out about CHP and</td>
<td>monthly use over 1,000 therms and 25,000 kWh be aware of CHP opportunities in</td>
</tr>
<tr>
<td>program incentives from the PAs.</td>
<td>their facilities. These are the CHP project developer minimum thresholds.</td>
</tr>
<tr>
<td>Project Process: The</td>
<td>The interconnection process could be streamlined to reduce the amount of time</td>
</tr>
<tr>
<td>interconnection approval process can</td>
<td>required to complete. The project developers requested that the utilities</td>
</tr>
<tr>
<td>be slow.</td>
<td>respond to interconnection requests within 20 days.</td>
</tr>
<tr>
<td>Non-transparent review process:</td>
<td>The PAs could consider the publication of maps indicating where interconnection</td>
</tr>
<tr>
<td>Different parts of the state may have</td>
<td>with the electric distribution circuits could require additional time for</td>
</tr>
<tr>
<td>requirements for interconnection.</td>
<td>review. Eversource has proposed to develop capacity maps as part of their</td>
</tr>
<tr>
<td></td>
<td>current rate case.</td>
</tr>
</tbody>
</table>

\(^9\) P60 Combined Heat and Power Process Evaluation
The Massachusetts PAs continue to view CHP as an important measure and savings pathway used toward achieving energy efficiency goals. Utilizing various pathways, the PAs have worked to increase number of cost-effective units installed. The PAs are committed to continuous evolution and innovation of the Massachusetts CHP market.

The PA have learned from the challenges faced by customers and developers in the CHP market through the close relationships with larger customers, segment specific considerations of customers with similar loads, and in dealing with developers of the various types and sizes of CHPs. Additionally, the PAs have made a concerted effort to collaborate and share best practices with regard to CHP and invested in training of the market actors.

The PAs use the following market influence points to drive and promote CHP:

- Customers – The PAs use a consultative sales approach as a trusted advisor. The PAs typically follow projects from concept to commissioning acting as a third party independent voice advocating for the customer. Equipment vendors can sometime be motivated to over-sized systems which are not in the best interest of the customer and the PA expertise guidance and TA vendor help inform the customer of the energy and economic impacts of these complex capital projects.

- Developers – Currently, over 50 CHP developers operate in Massachusetts. These vendors, ESCO’s, and equipment manufacturers often target specific segments or niches in the Massachusetts marketplace. The PAs educate, train, and engage these developers to pursue cost-effective CHP projects. The PA’s host an annual CHP summit to convey all changes, new opportunities and lessoned learned in the marketplace. This helps improve program implementation and consistency.

- Technical Engineering firms – We screen our TA firms to meet our stringent requirements and timing bandwidth. As more and more engineering firms dabble in CHP we are finding that they do not have the qualifications in this field. Poor engineering studies can result in negative marketplace results. This includes all CHP sizes.

Regardless of size, certain pieces of any CHP project do not scale such that increasing volume or velocity of projects is challenging. These include the engineering studies required, interconnection of systems, and installation and reconfiguration of physical plant at customer facilities. The challenges are site-specific and require overcoming on a case by case basis.

A recent development in the National Grid Massachusetts distribution company interconnection requirements may significantly impact future CHP development within the service area. The Massachusetts Electric Company and Nantucket Electric Company Interconnection Process now require any CHP or rotating mass generator over 500KW to install direct transfer trip capability that mitigates anti-islanding from occurring. National Grid estimates this new requirement to add roughly $300,000 to project costs which may challenge cost-effective CHP since when the fuel usage increase is factored in CHPs are typically marginally cost-effective.

The PAs observe and envision the following market actor experience:

- Customer Experience – Customers rely on the PA’s expertise to be the true independent experienced voice that will steer them through a very complicated, time consuming, and capital intensive journey.

- Developer Experience – Developers rely on the PA’s expertise to provide customer insight and utility network experience and market changes. An important part of the PAs role is to ensure that projects are not oversized and reduce the Overall Energy Efficiency and defeat the purpose of minimizing GHG reduction.

The PAs conduct the following outreach to promote and guide the CHP market in Massachusetts:

- Direct customer outreach using PA Staff and Marketing
The PAs use the following innovation pathways to expand and evolve the CHP market in Massachusetts:

- PA’s rely on manufacturers and vendors to bring new ideas and innovations to share with our customers.
- Energy Solutions Center is also providing webinars on CHP, micro-CHP’s, and CHP tools which the PAs make available are available to our sales groups, engineers, and business partners.
- PA CHP subject matter experts attend various seminars and webinars throughout the year. PA’s also visit vendor installation sites and conduct factory tours.

2016-2018 Plan Commitments and Status

**Commitment 1**: The PAs committed to have continued focus on CHP, building on the strong history of projects in previous plans.

**Status**: Table 2. CHP Project Status

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>MW</th>
<th>MWh (annual)</th>
<th>MWh (lifetime)</th>
<th>Incentives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Construction for 2017 completion</td>
<td>20</td>
<td>12.68</td>
<td>78,443</td>
<td>1,524,276</td>
<td>$13,918,741</td>
</tr>
<tr>
<td>Completed/Paid thru Q2 2017</td>
<td>20</td>
<td>12.35</td>
<td>82,406</td>
<td>1,663,992</td>
<td>$9,536,315</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>40</strong></td>
<td><strong>25.03</strong></td>
<td><strong>160,849</strong></td>
<td><strong>3,188,268</strong></td>
<td><strong>$23,455,056</strong></td>
</tr>
<tr>
<td>Under Construction for 2017 completion (% change from Jan 2017)</td>
<td>0.0%</td>
<td>14.1%</td>
<td>7.7%</td>
<td>1.7%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Completed/Paid thru Q2 2017 (% change from Jan 2017)</td>
<td>53.8%</td>
<td>42.1%</td>
<td>29.3%</td>
<td>31.4%</td>
<td>22.4%</td>
</tr>
<tr>
<td><strong>TOTAL (% change from Jan 2017)</strong></td>
<td><strong>21.2%</strong></td>
<td><strong>26.4%</strong></td>
<td><strong>17.8%</strong></td>
<td><strong>15.3%</strong></td>
<td><strong>14.1%</strong></td>
</tr>
</tbody>
</table>

**Commitment 2**: The PAs committed to provide Semi-annual presentations to the Council and CHP within the Dataset on MassSave Data.

**Status**: The PAs presented CHP progress in February and August of 2017. CHP has also been a feature in Quarterly Reports to the Council.

**Commitment 3**: The PAs committed to study CHP & provide training for business partners

**Status**: The PAs have commissioned, coordinated, or sponsored the following:

- CHP Process Study – DNVGL – Expected Fall 2017
- **2016 CHP Summit Vendor**, Developers and Manufacturers June 23rd, 2016 – hosted at National Grid
- Energy Solutions Center Webinars and CHP Magazine
- **UMass Industrial Assessment Center Partnership**
TOPIC #2 – MANUFACTURING PROCESS
Overview Prepared by Consultants and PAs

This Brief addresses the savings opportunity from improving the efficiency of the process equipment used in manufacturing. Manufacturing processes in Massachusetts include the production of a broad array of goods, ranging from sneakers, to missile defense systems, to the paper that US currency is printed on. Manufacturing process end uses are varied and related to the equipment that is directly involved in manufacturing goods. Each manufacturer has unique requirements and unique equipment and operations at each customer site. For example, the manufacturing equipment needed to make printed circuit boards for electronic goods is very different from the equipment used to make paper.

Table 3. Quick View of Massachusetts Program Activity

<table>
<thead>
<tr>
<th>Topic</th>
<th>Industrial Process Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to C&amp;I gross annual 2015 savings</td>
<td>8% of C&amp;I electric and 26% of C&amp;I gas\textsuperscript{11}</td>
</tr>
<tr>
<td>Cost to achieve (incentives only)</td>
<td>$0.02 per lifetime kWh and $0.10 per lifetime therm</td>
</tr>
<tr>
<td>Current market activity</td>
<td>Growing overall</td>
</tr>
<tr>
<td>Projected market w/ increased PA activity</td>
<td>Very good</td>
</tr>
</tbody>
</table>

Error! Reference source not found. shows the distribution of energy use in manufacturing facilities in Massachusetts. Although the largest electric end-use is motors, drives, pumps, and fans, these are primarily used as part of the processes in a manufacturing facility, and therefore should be addressed as an opportunity to reduce process-related energy consumption.

Exhibit 3. Massachusetts Manufacturer Energy End Use\textsuperscript{12}

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\textsuperscript{10} Customers falling into North American Industry Classification System (NAICS) codes beginning with 31-33

\textsuperscript{11} Draft Final 2015 C&I Expedited Customer Profile Report Tables 3-5 and 4-2

\textsuperscript{12} National Grid MA EE Potential Study October 2015, pages 57 and 58
Status in MA

In 2015, process contributed proportionally more to statewide savings than it did to statewide consumption. This comparison may indicate a high savings yield for process, further proving its value as a resource to the C&I portfolio. Savings from custom process projects process have been increasing almost every year since 2011. In addition to custom process projects, savings from motors, pumps and fans are claimed through the Existing Building Retrofit or New Construction prescriptive initiatives. Examining process performance by PA highlights key differences in engagement with industrial customers as well as industrial customer density in the various territories. For electric PAs, Eversource and National Grid achieved higher participation rates and more savings as a percent of manufacturer usage than the smaller PAs. For gas programs, Eversource had the highest participation and savings compared to other PAs. The gas programs had fewer participants and lower savings as a percentage of usage by when compared to electric programs.

Massachusetts PAs have engaged manufacturers through the use of account managers, MOUs, and technical support. These program approaches specifically target medium and large customers (>1.5 million kWh or >100,000 therms). Process end uses often require complex and specialized measures that are costly to identify, quantify, and implement because of their technical complexity and size. However, custom process projects tend to be larger than many other measures. Strategies to increase savings for all customers are discussed in more detail in this brief.

Massachusetts Market Characterization

With annual output valued at over $45 billion, manufacturing is a significant part of the Massachusetts economy, contributing 10% to the gross state product in 2014. About half of this output, $23 billion, is exported to other countries, bringing money into both the state and the United States. Manufacturers employ over 7% of the state workforce, nearly a quarter million employees.

The manufacturing sector in Massachusetts is dominated by high technology, chemical, and fabricated metal products. There are over 19,000 manufacturer sites in the Massachusetts PAs’ territory, representing 16% of electricity consumption and 18% of gas usage in the state. In order to provide some sense of scale, Table 4 shows the range of manufacturers by usage size and estimated annual costs for electricity.

<table>
<thead>
<tr>
<th>Manufacturer Size</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Usage (kWh)</td>
<td>Less than 300,000</td>
<td>Between 300,000 and 4,500,000</td>
<td>More than 4,500,000</td>
</tr>
<tr>
<td>Manufacturer Count</td>
<td>18,000</td>
<td>950</td>
<td>230</td>
</tr>
<tr>
<td>Annual Cost per Manufacturer</td>
<td>Less than $42,000</td>
<td>Between $42,000 and $495,000</td>
<td>More than $495,000</td>
</tr>
</tbody>
</table>

13 It is important to recognize that not all manufacturer energy usage is due to process, there are other end uses too.
15 National Association of Manufacturers Massachusetts Factsheet
16 C&I Onsite Assessment page 325
17 The 2015 C&I Customer Profile provides more insight and lists a range of industry classifications in the goods-producing supersector group. These include 9573 electric accounts for manufacturers, along with 628 agriculture, 8578 construction, and 95 mining accounts.
18 These are estimated costs, based on assumed blended rates.
EEAC Consultant Team Strategic Recommendation

The PAs have been steadily increasing electric and gas savings from the process end use. The Council would like to see the PAs continue to increase process savings, in addition to other end use savings from industrial customers.

EEAC Consultant Team Potential Approaches to Overcome Barriers

Table 5. Opportunities for Energy Savings from Manufacturing Process

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk Aversion:</strong> The process is the core of a manufacturer’s business. Any potential efficiency measure that impacts the process is seen as risky.</td>
<td>Partner with customers through account management to support trials under controlled conditions and meter the results to prove energy savings without a detrimental impact to the process or product. With customer approval, successes can be shared through case studies and best practice exchanges.</td>
</tr>
<tr>
<td><strong>Energy Metrics:</strong> Lack of understanding of energy usage and metrics. Some use plant level energy consumption as a proxy measure of production.</td>
<td>The Massachusetts efficiency programs are currently supporting the use of temporary data loggers to identify one-time capital project opportunities; supporting the installation of permanent measurement equipment and integrated EMIS would enable broader, longer-term savings over time.</td>
</tr>
<tr>
<td><strong>Financing:</strong> A lack of available capital/compelling information for the key decision makers can stall and prevent projects.</td>
<td>The Massachusetts PA Pro Forma economic analysis tool is a powerful way to demonstrate the value of a project in the language of senior management. Use other non-energy benefits to sell a project, but document this so the programs get proper credit.</td>
</tr>
<tr>
<td><strong>Variations in Service:</strong> Different PA implementation strategies result in different approaches toward manufacturers.</td>
<td>Spread best practices and account manager resources from the best performing PAs to the others in a more unified, statewide approach. This would allow for more specialization to better serve customer sectors.</td>
</tr>
<tr>
<td><strong>Serving Small Customers:</strong> Small manufacturers may have specialized process needs that the Small Business initiative contractors are unable to address.</td>
<td>There is opportunity to work with more manufacturers though expanded account management for manufacturing customers or engagement through the Small Business turnkey initiative.</td>
</tr>
<tr>
<td><strong>Customized Expertise:</strong> There must be enough savings to justify the cost of the Technical Assistance study, or the project will not be cost effective.</td>
<td>A systems approach focusing on discrete systems used in manufacturing, such as compressed air, may reduce expenses. Combining systems initiatives with the Small Business program could be effective as long as contractors are trained to recognize custom opportunities.</td>
</tr>
<tr>
<td><strong>Realizing Operational, Maintenance, and Behavioral Savings:</strong> Programs are not equipped to claim these types of savings easily.</td>
<td>Other states have implemented EMIS and SEM programs, which claim savings from operational and behavioral changes, and document the difference between the baseline operational period and the treatment period. SEM programs also drive increased capital projects.</td>
</tr>
</tbody>
</table>
Savings Potential

The PAs are planning for increased electric process savings for the 2016-2018 Three Year Plan as compared to previous plans. This indicates that the PAs see good potential for continued increases in the amount of process savings that can be realized through 2018.

Exhibit 4. Lifetime Electric Process Savings by 3 Year Plan

<table>
<thead>
<tr>
<th>Year Period</th>
<th>Planned</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2012</td>
<td>1,000,000</td>
<td>500,000</td>
</tr>
<tr>
<td>2013-2015</td>
<td>1,500,000</td>
<td>750,000</td>
</tr>
<tr>
<td>2016-2018</td>
<td>3,000,000</td>
<td>1,500,000</td>
</tr>
</tbody>
</table>
Program Administrator Provided Information

Overview

The Massachusetts PAs have always viewed the Industrial and Manufacturing base as high value partners in achieving energy efficiency goals. Utilizing varied pathways, the PAs have worked to increase the savings and overall participation in a manner that is tailored to the unique barriers faced by industrial customer base. The PAs are committed to continuous program improvement as well as innovation to approach and delivery that is driven by specific characteristics of and experience in the MA market.

The PA teams have come to learn the challenges faced for EE in the industrial environment through the close relationships established by the MOUs and SEMPsWith larger customers, and as well as through the direct customer contact associated with the ‘managed accounts’ approach with medium sized manufacturers. Additionally, the PAs have made a concerted effort to collaborate an approach to industrials. The vendors and value offerings have become much more closely aligned and the overlapping customers are seeing a single expert supported by both their electric and gas PAs.

Barriers

Massachusetts PAs have made significant progress in achieving process energy savings. Still, there are several hurdles faced when engaging with the industrial base, all of which rank differently for individual customers, however the broad themes are fairly consistent. The list of barriers is highlighted above in Table 3 - Opportunities for Energy Savings from Manufacturing Process.

PAs approach to industrial customers has been on understanding our customers and focusing on their needs. PAs have relied on segment specific program delivery model with emphasis on deploying strategic initiatives and pathways to meet the needs of our customers.

Delivery of Process Savings

The delivery of process savings has been achieved through a combination of activities including technical expertise deployed with outcome-focused contractual partnerships with high levels of commitment such as MOUs and strategic initiatives (both technical based and commercial based) that cut across all size manufacturers, and managed accounts which include medium and large customers.

MOUs/SEMPs

Several large industrial customers have entered into long term agreements with their respective PAs to their mutual benefit. The customer benefits from technical and organizational resources dedicated to identifying opportunities and delivering projects unique to their sites as well as pre-negotiated rates for energy savings. The PAs benefit from improved customer relationship and added certainty in forecasting costs and achievement toward their overall C&I goals. This partnership is resulting in active engagement from customers business, facilities and operation teams slowly transforming the culture, which is based on energy efficiency, productivity and sustainability.

While the MOU/SEMP pathway has historically been an engagement path with large customers, the PAs continue to explore ways to translate these lessons and best practices to efforts to influence medium and small industrial customers.

Strategic Pathways

The PAs use a combination of Technical Assistance and Targeted Delivery as well as end-use targeted techniques to drive process savings within customers’ facilities.

TECHNICAL ASSISTANCE, TARGETED DELIVERY AND CROSS-PA COORDINATION

In the delivery of technical assistance, the PAs have contracted with independent engineering firms under an Industrial Engineering Initiative. These firms specialize in process-related energy efficiency and in some instances management of customer project delivery in the manufacturing environment. The structure of these vendor contracts is designed to align the vendor to focus on delivered savings versus delivered reports (thus a lower cost
per delivered kWh or them), and it’s also designed to address the time-related barriers associated with traditional technical assistance models, while providing tailored expertise. Although the PAs oversee and manage their contracts independently of each other, they have the ability to deploy these resources in an expedited fashion and look essentially the same to the customer. The targeted implementation based technical assistance has been found to be successful for large customers and is now utilized for small and medium industrial customers. This collaboration has increased the instances of shared knowledge and savings delivery between the PAs. Deploying strategic technical assistance, which is focused on implemented savings has resulted in increased customer participation and process related energy savings. This strategic approach has helped to address several of above identified barriers.

**TURNKEY DELIVERY FOR SMALL INDUSTRIAL CUSTOMERS**

The PAs have historically used implementation vendors with industrial experience to provide turnkey services for small industrial customers. This delivery approach is strategically used through select vendors and is focused on identifying and implementing energy efficiency measures in small business customers’ while ensuring minimum disruption to their business. Additionally, all small business turnkey vendors are identifying process opportunities and notifying the PAs for strategic deployment of specialty vendors based on customer needs.

**ENERGY USE & ENERGY EFFICIENCY OPPORTUNITY TYPE INITIATIVES**

The PAs have developed targeted offerings which focus efforts by energy use types as well as by customer process type. These offerings are often delivered through the Managed Account approach to customers, where the customer has a single point of contact with the PA. Examples include the Compressed Air Initiative or Thermal Heat Recovery. There have also been customer process focused efforts such as the Asphalt Plant initiative where PA teams looked at a process These are just a few examples of the targeted offerings that PA teams deliver to customers. The PAs are also exploring offerings and delivery approaches that are able to reach to scale with the smaller and medium size customers.

**Customer Experience**

Having access to independent third party resources with credible process experience and on timelines that align with customer needs has dramatically increased the overall value delivered to the customer. That is, when the PA-and third party teams work with customers on EE, the projects that result often have benefits for their business that go far beyond energy.

Additionally, it’s worthy of note that PA internal hiring practices have mirrored the sector-based approach as discussed in the previous 3-year plan. That is, by having professionals on PA staff with experience in the industrial space has further driven a positive customer experience. The PAs have continued to learn to speak the language of the customer and work with customer facility managers to identify, scope, and specify projects.

The customer as well as the business/vendor partner experience has improved as the PAs actively coordinate on approach and method for program delivery.

**Marketing/Outreach**

The PAs have been actively working with industry organizations to increase awareness and outreach. PAs are active participants on state level summits, roundtable discussions and collaborating events. PAs are working collaboratively with statewide organizations (example: Advanced Manufacturing Collaborative) to facilitate small and medium business customer participation. PAs are also working with Massachusetts Clean Energy Center to aid innovation in industrial sector. PAs are actively engaged in customer discussions to lure industrial customers and corporations to Massachusetts through meetings and discussions with manufacturers.

**Trainings**

The PAs also market and provide resources and training opportunities through the MA Energy Efficiency Partnership (MAEEP) which supports deployment of energy efficient technology and tools to the industrial, commercial and institutional sectors. The MAEEP partnership delivers its value through a combination of
stakeholder input, technology transfer, education, outreach and research.\textsuperscript{19}

\textbf{2016-2018 Plan Commitment and Status}

In line with the 2016-2018 Plan commitments, the PAs have undertaken a comprehensive effort to explore and potentially incorporate more elements of Strategic Energy Management (SEM) into program offerings, understanding that the current MOU/SEMP approach is a sizable portion down the path towards SEM. This includes creating a pathway in the near term which should make it easier for customers of all sizes to capture non-capital measures like Operations & Maintenance (O&M) as well as potentially behavioral measures. The PAs are also taking steps to test the ‘cohort model’ and as such are running an RFP to test this delivery mechanism in the MA market. Additionally, there is a demonstration underway for Operator Training which looks to provide site specific O&M training for on-site customer staff.

PAs are also exploring new pathways for inclusion of behavioral and O&M measures. PAs are actively engaged in revising the Pay-for-Performance (P4P) offering to include these measures to gain more participation of industrial customers.

The PAs continue to take the lead in expanding the innovation pathways in ways that tailor to market needs and energy savings opportunities, with an emphasis on scale of impact given limited resources and cost effectiveness.

\textbf{Evaluation/Code/Baseline Considerations}

The PA’s continue to work on improving documentation of attribution and to document baselines in the most accurate way possible. PAs recently completed baseline framework study and will be using the framework identified in the study as a basis for establishing baseline for industrial customers. PAs also continue to investigate measures pertinent to our customer base in MA and utilize the findings to establish appropriate baseline (Example: Injection Molding Machine Market Baseline Study)\textsuperscript{20} Where Industry Standards exist, are clear and can be effectively studied, the PAs work to incorporate those into Baseline assessments. In the absence of standards, the PAs continue to emphasize proper measurement and documentation of customer-specific conditions, motivations and considerations in order to increase realization rates and improve the retention of claimed savings through the evaluation process.

\textsuperscript{19} \url{https://www.maeep.org/}
TOPIC #3 - DATA DRIVEN CUSTOMER ACQUISITION AND ENGAGEMENT STRATEGIES
DATA DRIVEN CUSTOMER ACQUISITION AND ENGAGEMENT STRATEGIES

EEAC C&I Workshop

► October 3, 2017
OVERVIEW

► Background – Data Sources
► Opportunities – Data Mining
► Consultant Recommendation
► PA Perspective
► Council Discussion
Data Driven Customer Acquisition and Engagement Strategies

### DATA SOURCES - UTILITY METER

- **Data depends on customer rate structure**
  - Monthly kWh or kWh on/off peak
  - Demand kW monthly peak
  - Demand 15 minute intervals
    - ~ 5,000 of MA largest customers

- **AMI – Advanced Metering Infrastructure**
  - AMI can apply to electricity or natural gas
  - Enables smart grid management with renewable and cogeneration integration

- **MA ranks 46th nationally for AMI**

1 From the Energy Information Administration Survey Data
DATA SOURCES – SITE SPECIFIC

► **End use metering**
  - Common in newer high performance buildings

► **Circuit sub-metering**
  - Energy metrics for larger loads

► **Building Automation System**
  - Continuous data acquisition of building data (HVAC)
  - Common in large buildings
  - 50% of C&I have it

► **Lighting Systems**
DATA MINING - UTILITY METER

- PA quartiles based on meter data
  - Target specific load profiles and NAICS codes
- Automated data uploads to support continuous benchmarking
- Qualify buildings for in-depth investigation through remote audits
  - Software as a Service (SaaS)
  - Disaggregation of 15 minute interval data
DATA MINING – BEYOND THE UTILITY METER

Energy Management Information System (EMIS)

- Reactive Analysis
  - Fault Detection
  - Automated Modeling
- Predictive Analysis
  - Advanced Control
  - Demand Response
  - Predictive Maintenance

Beyond the Utility Meter

- End Use Metering
- Circuit Sub-metering
- Building Automation System
DATA DRIVEN EE – CHALLENGES

► Limited number of providers
► No standardization of services or quality
► Unreliable savings
► Requires highly engaged customers who take action on flagged issues
► Meters don’t save energy by themselves
► Existing MA P4P Program
  - Low participation
  - Higher than expected costs
► New contract structures/market incentives needed to overcome these barriers
DATA MINING - INNOVATION EXAMPLE

DYNAMIC BASELINE METER

METERED ENERGY EFFICIENCY

Building energy use

UTILITY
Meters traditional energy and energy efficiency

Pays for metered energy efficiency over 20 years

ENERGY TENANT
Has long-term rental agreement to harvest and sell metered energy efficiency.

Ongoing payments for 20+ years

INVESTOR
Has stable, long-term investment

Capital

Pays Rent

BUILDING OWNER
Has more comfortable and valuable building

Pays for and maintains improvements

TENANTS
Have more comfortable, highly productive building

Pay share of utility bills including metered energy efficiency

PAYING RENT

www.ma-eeac.org Data Driven Customer Acquisition and Engagement Strategies
DATA MINING ADVANCES

► Smart Energy Analytics (DOE/LBNL Campaign)
  - One year of operation
  - Median Savings 5%, $0.20/sq.ft.
  - 15 Businesses, 39 million sq.ft.
CONSULTANT RECOMMENDATION

The MA PAs should create a framework to increase the presence and use of market-driven data acquisition, software and monitoring based commissioning services in the C&I market.

- Identify and address market barriers
  - EMIS/MBCx adoption
  - Measure implementation
- Increase market capacity to reliably deliver these data related services
- Drive and support innovation
- Address attribution and measure-life issues
PA PERSPECTIVE

PAs concur that data mining and acquisition space is evolving at rapid pace and is faced with unique challenges based on infrastructure, providers, program eligibility and customer engagement.

► PAs continue to monitor and support the innovative data acquisition and data based implementation technology marketspace.

► PAs continue to explore strategically utilizing market based and internally developed data mining products in energy efficiency ecosystem as customer engagement and implementation assist tools within the guidelines of the existing programs.

► PAs engage in training and education to gauge customers interest to enable implementation based adoption of data driven products.
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TOPIC #4 – SMALL BUSINESS
Overview Prepared by Consultants and PAs

The purpose of this brief is to review opportunities to build onto the solid foundation of the existing Small Business Initiative (SBI). The SBI in Massachusetts is a turnkey offering, where program vendors complete a no cost to the customer energy assessment, propose energy saving retrofit measures, and coordinate the installation of accepted measures at the customer’s discretion. Vendors handle the bulk of SBI marketing, which is supplemented by PA efforts.\(^\text{21}\) Once a potential participant agrees to have their space assessed, an electric or gas trained auditor identifies savings opportunities and recommends measures. The SBI incentives offered average up to 70% of the project cost, and in most cases zero interest financing is available to cover remaining expenses.\(^\text{22}\) Vendors usually install measures during a second visit after the customer has had a chance to review the assessment report and select measures.\(^\text{23}\) Alternative demonstrations to target small businesses customers are also in place by some Program Administrators (PAs).\(^\text{24}\) Refer to Table 6 for a review of SBI performance metrics in 2016.

Table 6. Quick View of Massachusetts Small Business Initiative Activity, 2016

<table>
<thead>
<tr>
<th>Topic</th>
<th>Electric</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to C&amp;I evaluated 2016 lifetime savings</td>
<td>15% annual, 14% lifetime</td>
<td>3% annual, 2% lifetime</td>
</tr>
<tr>
<td>Cost to achieve</td>
<td>$0.60/kWh annual, $.05/kWh lifetime</td>
<td>$5.27/therm annual, $0.45/therm lifetime</td>
</tr>
<tr>
<td>BCR</td>
<td>2.5 (2016 TRC)</td>
<td>3.7 (2016 TRC)</td>
</tr>
<tr>
<td>Savings per participant</td>
<td>355,882 lifetime kWh</td>
<td>3,698 lifetime therms</td>
</tr>
</tbody>
</table>

Status in MA

The small business customer pool is extremely diverse including every type of business from offices to manufacturing. As seen in Exhibit 5, the most common business types eligible for the SBI in Massachusetts are retail, food sales and services (i.e. restaurants, bakeries, grocery stores), and offices.\(^\text{25}\) This market represents about 40% of energy consumption and over 97% of C&I accounts in Massachusetts.\(^\text{26}\) However, SBI participation was lower than expected for nearly all Program Administrators (PAs) in 2016. Also, despite efforts to increase comprehensive measures, non-lighting and

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\(^\text{21}\) Small Business Program Process Evaluation, Massachusetts 2015\(^\text{ (page 11 & 37).}\)

\(^\text{22}\) According to Mass Save, measures can be paid for by up to 70%, though this number varies by PA, see Exhibit 9 below. Individual measures could be covered 100%. Examples include spray valves and faucet aerators.

\(^\text{23}\) Ibid (Process Evaluation)

\(^\text{24}\) The Main Street, customer directed option, and business energy solutions demonstrations are discussed in more details in the supplementary information section.

\(^\text{25}\) MA Onsite Study, buildings <500,000 kWh

\(^\text{26}\) From 2015 Profile-Electric 40% consumption, 99% accounts. Gas: 41% consumption, 97% accounts
gas measures were not adopted as readily as planned in the 2016-2018 Three Year Plan.27

SMALL BUSINESS INITIATIVE MEASURES

The SBI initially focused only on lighting and refrigeration measures.28 However, the program has evolved into a more comprehensive offering with the addition of gas and electric measures for HVAC, hot water, process and custom projects.29 While PAs have recently taken steps to extend savings beyond lighting, the program remains largely a lighting driven program. In 2016, lighting accounted for 94% of small business savings rather than 82% as planned. On the gas side lifetime HVAC savings were about 50% lower than planned.30

The Massachusetts C&I Market Characterization Study (or on-site study) revealed a significant market share of inefficient linear lighting systems and controls. Linear lamps make up 73% of the small business (<500 MWh) market, 68% of which is made up of less efficient T8’s and T12’s. Additionally, the on-site study found that 92% of small business buildings use manual controls for lighting.31

Other inefficient non-lighting measures were also identified as having significant market share by the onsite study. Many of the measures available to increase the market penetration of high efficiency equipment are incentivized outside of the SBI offering. For example, high efficiency split and packaged air conditioning and heat pumps are incentivized through the Upstream HVAC delivery channel.32 One of the features of the SBI offering is the established referral process used by trained contractors to facilitate additional savings and incentives for small businesses through C&I offerings outside of SBI.

Reaching Small Business Customers

Small businesses typically are more expensive to serve compared to medium and large customers, due to relatively small amount of energy savings in comparison to the cost of project investments. In addition, participation rates are lowest among small accounts.33 The SBI is a longstanding offering designed to deliver offerings in a turnkey package to improve program savings and performance among a segment that has been hard to reach. Small business customers can participate in all C&I initiatives, and appear to be doing so. Small business accounts brought in about 56% of gross C&I sector savings in 2015.34 In comparison, net SBI savings from that same year made up 13% of net C&I sector savings. Small business participants have also been saving significantly, averaging over 16% reduction in annual usage in 2015. In comparison, large businesses average about 4%.35 This means that small business participants are experiencing the benefits from significant energy reductions from addressing simpler loads, namely lighting. However, in terms of energy saved, the savings per participant of a small business customer using less than 100 MWh annually represents about .002% of lifetime C&I goals. A similar trend was also reflected in the gas segment.

27 Mass Save Data and 2016 BCR Screening Model
28 The SBI has been offered since the 1990’s by National Grid
29 Refer to supplementary information section, Exhibit 6 for details
30 Mass Save Data- Small Business Initiative measure details, 2016
32 Upstream HVAC measures are reported under the New Construction-New and End Of Useful Life Equipment core initiative
33 C&I Profile Report, 2015. Refer to supplementary information, Exhibit 5 for supporting details
34 C&I Profile Report and Mass Save Data, 2015. Refer to supplementary information, Exhibit 6 for chart.
35 2015 C&I Profile Report, Gas small businesses save 13% compared to about 3% for large gas customers.
EEAC Consultant Team Strategic Recommendation

Increase savings in the Small Business Initiative by:

- Continuing to move toward a consistent statewide solution (including statewide PA led marketing)
- Promote uptake of comprehensive measures
- Expanding outreach to engage a wider range of small business customers.

EEAC Consultant Team Potential Approaches to Overcome Barriers

Exhibit 6. Barriers and Opportunities to Improve Small Business Performance

<table>
<thead>
<tr>
<th>BARRIERS</th>
<th>OPPORTUNITIES</th>
</tr>
</thead>
</table>
| Vendor led marketing limits SBI access. Participation has been lower than expected | Expand statewide and PA led marketing and outreach efforts  
  - Create a small business ambassador to act as circuit rider, partner with towns and other stakeholders to raise awareness  
  - Target small businesses  
    - Increase general small business marketing  
    - Increase marketing to specific business types  
  - Market bundled measures and non-lighting measures  
  - Adopt a Main Street marketing and delivery effort to reach dense small business areas statewide  
  - Adopt statewide CDO marketing effort, targeting non-participating vendors  
  - Assess effective marketing techniques used by vendors and PAs |
| Significant variation exists between vendor and PA performance.         | Unify SBI delivery model statewide  
  - Implement a statewide RFP for all vendors  
  - Create a small business ambassador to set and monitor vendor performance metrics, raise awareness about most effective marketing and delivery techniques, and work with PAs to resolve any core program structure deficiencies |

Savings Potential

Through 2018, the PAs are planning for increased SBI savings and participation compared to 2016 targets. Gas performance is expected to improve, with planned 2018 lifetime savings at 140% of achieved 2016 savings. Electric participation targets are also 140% of achieved 2016 participants. While achieved 2016 lifetime savings surpassed 2017 and 2018 goals, savings will likely continue to meet or exceed targets if participation increases and average savings per participant remains stable. The Market Characterization Assessment indicated that the majority of small businesses are not using high efficiency equipment for target end uses including linear lighting, HVAC, EMS, hot water, and process. Lighting savings may be curtailed to some extent as a result of shifting baselines. Maintaining or increasing SBI participation beyond 2018 will help spur a market shift toward efficient small businesses, and allow for continued savings.

Program Administrator Provided Information

The PAs use a suite of approaches to delivery of services to Small Businesses. Some are turnkey approaches and others are delivered through distributors at a point-of-sale where customers can essentially self-serve. This

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36 Supporting details about barriers and opportunities discussed in the supplementary information section
wide array of approaches allows the PAs to effectively deliver efficient solutions to the tens of thousands of smaller customers in the Commonwealth. The PAs always consider the complimentary and conflicting aspects of these different delivery models and must weigh benefits and costs of any to customer experience and the portfolio. PAs look at what is working and lessons to take from one delivery path that can be applied to others. This wide approach serves the thousands of smaller customers more than just the traditional “Small Business Program” which is important and has been improved and expanded overtime. The flexibility of approaches really serves customer needs efficiently.

**Turnkey**, sometimes called direct install (DI), delivery is the traditional form of energy efficiency delivery to small business customers. The approach consists of a no-cost assessment, customer specific proposal, installation, and recycling or post-installation cleanup for customer-selected measures. The Turnkey delivery path offers electric and gas measures and is intended to help customers navigate efficiency options, mostly retrofit type measure, that improve the operations of their existing buildings in a streamlined manner. The vendors working for the PAs conduct many thousands of these projects each year and have during the long history of this delivery pathway. The activity and savings from this pathway are recorded presently in the Small Business Core Initiative line item.

**Customer Directed Option** (CDO) is a delivery path recently opened up to customers and other trade allies, not under contract to the PAs, to allow for Customers to choose the installation vendor with which they are the most comfortable. Some PAs provide this pathway using an administrator role under contract to the PA acting as the gateway to ensure base case conditions requirements, installation rigor, and EM&V requirements are met. This pathway has been welcomed by customers and trade allies and has grown over the past couple of year and at a comparatively lower cost of savings than that of Turnkey, however it has predominantly targeted lighting with larger small business eligible customers. The activity and savings from this pathway are recorded presently in the Small Business Initiative line item.

**Upstream** delivery, involves inserting PA incentives at the wholesale or distributor level in the supply chain for efficient equipment. This broad reaching approach changes stocking patterns of distributors and yields a behind the scenes promotion of efficient equipment across many transactions, many more than PAs have traditionally been a part of using downstream delivery approaches. Upstream also allows for a customer self-serve model which has been powerful in moving large quantities of efficient equipment. Upstream delivery creates efficient decisions at a narrow point; meaning by reaching a couple hundred distributors PAs are reaching tens of thousands of customers, in the supply chain and as a result drives a large volume of units across many more customers than a Turnkey approach can over the same time. There are tradeoffs and the PAs work to minimize downsides and maximize customer choice. Upstream activity is reported in either the Upstream Lighting Initiative line item or in the New Construction – New and End of Useful Life Equipment initiative.

**Downstream Applications**, these are traditionally referred to as Large Commercial applications or prescriptive applications which can be for retrofitting existing buildings or for new or replacing failed equipment. These applications are open to all customers that have the equipment or run hours to meet the minimum requirements for eligibility. Often trade allies’ use these applications to create a value add to their business. Small Businesses use these incentive pathways to improve their facilities, replace failed equipment, and make their operations more efficient.

**New Approaches & Demonstrations proposed and tried during 2016-2018**

- Tenant space improvements in commercial real estate
  - Ongoing effort
- More LED retrofit kits and fixtures with integrated controls
  - Ongoing effort
- Main Street/Community Blitz
  - Ongoing marketing effort on a case by case basis
- Energy Savvy online portal for Small Businesses
Tested 2016 and discontinued

→ HES style approach

Tested 2016-2017

Trainings and Workforce Development

MAEEP SMALL BUSINESS VENDOR AUDITOR TRAINING
This one day training session delves into the many non-lighting cost-effective energy conservation opportunities. Common, and some not so common, non-lighting electric and gas energy conservation measures will be detailed including how to easily recognize, quantify, justify and apply for incentives.

LIGHTING & CONTROLS TRAINING - PROPOSED
The PAs are investigating Advanced Lighting Controls Training Programs developed in other jurisdictions. The training program provides electrical contractors and electricians with training and a certification in Advanced Lighting Controls. The curriculum covers the proper programming, testing, installation, commissioning and maintenance of advanced lighting control systems, including dimmers, occupancy sensors, photo-sensors, relay modules and communication-based control devices.

Recently the PA Workforce Development Subcommittee hosted a presentation on an Advanced Lighting Controls Training program. The Workforce Development Subcommittee recommends implementation of this type of training program directed to business partners who are primarily “hands on” with respect to the installation of lighting controls at customer facilities. It is recommended that our key business partners who participate in turn-key delivery models should be required to have their staff, contractors, and sub-contractors attend this training effort prior to implementing projects.

2016-2018 Plan Commitments and Status

COMMITMENTS

→ National Research of Small Business Turnkey Delivery models
  • Complete April 1, 2017

→ Thorough review of Small Business Turnkey Delivery in Massachusetts
  • Ongoing

Evaluation/Code/Baseline Considerations
In an agreement the PAs with the EEAC Consultants back in 2012. The parties agreed that T12s were outlawed by EISA but would not go away overnight, instead T12s were slowly phased them out over 5 years (2012-2016) by decreasing their lifetimes each year. 2017 is the first year where T12s can no longer be used as a baseline and T8s would be used as the baseline for any T12s that were replaced. This affects both Large and Small Business Retrofit project baselines.
TOPIC #5 – NEW CONSTRUCTION
Overview Prepared by Consultants and PAs

The purpose of this brief is to review opportunities to build onto the solid foundation of the offerings to design, specify and build new commercial, industrial, institutional, and municipal buildings. The PAs intervene in the design and construction of new buildings using many approaches:

→ Whole Building New Construction Pathways for Ground-Up and Major Renovation Buildings
→ Upstream Delivery Pathways
→ Downstream Prescriptive/Custom Incentive Pathways

While the Upstream and Downstream Incentive Pathways are important vehicles to incentivize the most efficient equipment being installed in new buildings, this brief focuses on whole building approach which includes engaging with the customer during early design phase and working along with the customer until the building is occupied and installed equipment/systems are functioning and producing intended energy savings.

Table 7. Quick View of Massachusetts New Building Initiative Activity

<table>
<thead>
<tr>
<th>Topic</th>
<th>Electric</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to C&amp;I evaluated 2016 lifetime savings</td>
<td>6% annual, 8% lifetime</td>
<td>25% annual, 32% lifetime</td>
</tr>
<tr>
<td>Cost to achieve</td>
<td>$0.25 annual, $.02 lifetime</td>
<td>$2.32 annual, $0.13 lifetime</td>
</tr>
<tr>
<td>Savings per participant</td>
<td>1,465,723 lifetime kWh</td>
<td>310,945 lifetime therms</td>
</tr>
<tr>
<td>Contribution to C&amp;I evaluated 2016 lifetime savings</td>
<td>6% annual, 8% lifetime</td>
<td>25% annual, 32% lifetime</td>
</tr>
</tbody>
</table>

State of New Construction in MA

Massachusetts is fortunate. The economy is strong and growth continues apace despite recessions in the recent and distant past. A strong economy means the built environment must expand to accommodate an influx of people, workers, new businesses and infrastructure to host and support else the existing base becomes too expensive. This produces the need to build more commercial buildings to house workers, industrial facilities to produce products, multifamily facilities to house people, and government and institutional facilities to support the expanded population and businesses.

However, this experience is not equally shared across the Commonwealth. The Bureau of Economic Analysis has tracked GDP by the Metropolitan Area for a number of years. Data shows the Boston Metropolitan Area roughly an order of magnitude greater than the next closest area which is Worcester. Strong GDP is often associated with strong new construction starts. When economies enter recession, often new construction starts contract.

37 St. Louis Federal Reserve: https://fred.stlouisfed.org/series/MANGSP
38 BEA: https://www.bea.gov/newsreleases/regional/gdp_metro/2017/xls/gdp_metro0917.xlsx
Exhibit 8. GDP by Metropolitan Area

Massachusetts sees these trends in the New Construction Market. Metro Boston (Middlesex & Suffolk Counties) show strong construction starts, historically and out into the future, which is a forecast, and everywhere else it is comparatively flat:


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40 Dodge Construction Database + Forecast
The Effect of State Energy Code Changes on New Construction Programs

The New Construction – New Building and Major Renovations core initiative uses the most current International Energy Conservation Code (“IECC”) as a reference baseline. PAs have also developed baseline document (described in PA section below), which takes prevailing standard practice (which is equal to or better than prevailing building energy code) in to consideration which calculating energy savings. The claimable savings from the whole building approach initiative are calculated as the modeled incremental delta from the referenced baseline code and baseline document. In addition, Massachusetts overlays its own amendments on top of IECC to increase stringency of the code here in the Commonwealth. The latest version of IECC, IECC 2015, was adopted with Massachusetts amendments last year, and became fully effective following a concurrency period on January 2, 2017.

Starting in 2010, as specified in the Green Communities Act, the state of Massachusetts adopts a new energy code (IECC) every two to three years. These rapid code adoptions reduce the claimable savings for PAs since some stretch energy conservation measures (ECM) that work under the previous code, become baseline. The newer code with lower lighting power densities is resulting in customers adopting new generation lighting technologies. PAs are taking a space by space lighting power density approach which is resulting in an efficient lighting system. See the chart below.

Exhibit 10. Code Adoption Over Time

This change affects the New Buildings & Major Renovation core initiative as follows:

→ The increased code stringency is positive for the building stock of Massachusetts because statewide minimum code forces building efficiencies to increase.

→ The challenge is that as that baseline increases there are fewer overall claimable savings to be incentivized through whole building energy efficiency initiatives.

→ As the baseline increases in the state, impact studies are conducted and standard practice in the state increases, further impacting the claimable saving into the whole buildings program.

→ As the code requirements push to reduce the energy use intensity of new commercial buildings, the most cost-efficient measures are becoming standard code requirements, namely lighting

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41 ACEEE based on analysis from Pacific Northwest National Laboratory
power densities; that is, they become part of the baseline and are no longer available for PAs to support. The remaining ECMs tend to be less cost effective for customers, with longer paybacks. This increases the costs of a code compliant building and further challenges the ability of efficiency incentives to push the building owner and designer to design and construct beyond code because there are diminishing benefits and increased cost. The table below, courtesy of New Buildings Institute, shows just how little incremental claimable savings operating space is available now as compared to three decades ago.

**Exhibit 11. Code and Program Savings Over Time**

In order for Massachusetts to continue to be on the leading edge of building new commercial buildings that meet and exceed the latest building energy code requirements, the whole building approach needs to continue to look for ways to innovate beyond the traditional program offerings by continuing to claim more savings through building code education and compliance improvement in the Codes & Standards initiatives. In CA, the IOUs are claiming nearly 50% of net portfolio savings from Codes & Standards Initiatives. Also, more support for zero net energy should be considered as well as pushing the bounds of the traditional measure-driven whole building approach by mining new and different savings. This will entail looking for next generation equipment and design opportunities and an investigation into a shift to a commissioning/ performance based program instead of modeled savings like enhanced HVAC controls, improved building envelope & orientation, and things like smart elevators.

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42 New Building Institute
43 CPUC: Energy Efficiency Potential & Goals Study for 2015 and Beyond, September 25, 2015
EEAC Consultant Team Strategic Recommendation

The consultant recommendation is for the PAs to seek opportunities to drive continuous improvement and effective feedback loops in the new construction market so that low energy buildings are measured, recognized and emulated in the market.

EEAC Consultant Team Information Summary

The Consultants largely concur with the PA assessment, new construction is heavily concentrated in the Boston Metro Area; code advances are improving the baseline for design practices and new opportunities must be tapped.

We note several important themes that provide a framework for the future of high-performance new construction activity in MA.

1. **Performance Based incentives** – while the energy codes are designed to drive down the energy use of new buildings, some new buildings are in fact more energy intensive than their older counterparts. Performance based incentives help close the loop for the design community – enabling designers to understand how the designs that they promulgate relate to real world building performance. Owners need incentives to hire and train personnel to operate their buildings optimally. Incentives that focus on the end results for new construction will improve the operating efficiency of buildings, increase the understanding of design best practices by key market actors and improve realization rates for the initiative.

2. **Zero Energy Buildings and Passive Buildings** – very low energy buildings, sometimes called Zero Energy Buildings or those that follow Passive House requirements, that can meet their annual energy needs through renewable energy generation will benefit from performance based incentives. In addition, working with the design professionals to increase understanding of the systems that lead to lowest energy buildings will result in better buildings across the board. Specific beyond code opportunities are to use refrigerant or water to heat and cool buildings (rather than the more common air-based HVAC systems) and use a dedicated outside air system with energy recovery for ventilation. This approach requires a high performance envelope which is fundamental to low energy buildings in the Northeast.

3. **Commissioning** – building commissioning services range from check-the-box to system optimization. The MA PAs have the opportunity to help advance the commissioning industry in MA by requiring system optimization commissioning for all measures receiving incentives and working with the industry to increase the availability of this more comprehensive approach.

4. **Next generation products** – the programs should continue to seek opportunities to support the demonstration of leading edge products. New buildings can serve as an accelerator for new, innovative technologies that will ultimately be deployed much more broadly in the market once proven.
Program Administrator Provided Information

Overview

The Massachusetts PAs have always viewed the whole building new construction as an important and impactful pathway in achieving energy efficiency throughout the newly constructed built environment. The buildings constructed today will stand for decades, like the rest of the old building stock in Massachusetts, and the best time to intervene for efficiency is at the point of design and construction. The PAs are committed to continuous program evolution as well as innovation to approach and delivery that is driven by specific characteristics of and experience in the MA market. PAs strive to engage with various stakeholders (building owner, architect, design engineers, construction manager, distributor and commissioning agents) very early (conceptual design phase) to influence energy efficiency and sustainability in new buildings.

Delivery of Services for New Buildings

LARGE BUILDINGS>100,000 SQUARE FEET (“SF”)

The PAs have established a consistent approach to supporting new buildings and major renovations of buildings over 100,000 sf in size, programmatically considered “Large Buildings.” All new buildings, building additions, and major renovations over 100,000 sf will be offered the consistent set of technical assistance and customer incentives statewide (though incentive rates by PA may vary). Previously, while the major components of support for large new construction projects were generally consistent statewide, PAs differed in how they determined incentives for customers (based on projected savings or based on incremental costs), in the availability of design team incentives, in how energy simulations for these projects were to be set up and run, in the baseline assumptions (see baseline document report above), in PA cost share for energy modeling, and in the content of the reports by TA vendors.

The statewide program offering is defined clearly in a PA Memorandum of Understanding (“MOU”) specifically designed for Large Buildings. Internal policies including but not limited to project screening, splitting of costs are consistent throughout MA. By documenting the program offering and ensuring consistency of that offering statewide, and by ensuring transparency in the PAs’ “back of house” policies for working more efficiently, PAs offer a dramatically improved customer, TA vendor, and channel partner experience.

The consistent program offering for new construction and major renovation projects greater than 100,000 sf is contingent on early engagement with PAs during the design process. The full offering is offered only to customers who engage PAs early in design (conceptual or schematic design phase) when the opportunity to influence projects is greatest. The key features of offering are below:

→ Large Buildings Program Technical Assistance:
  o Design Charrette: $3,000 energy “charrette” stipend paid to the design team lead and intended to bring the full design team together for an energy specific brainstorming session early in design.
  o Energy Modeling: Up to 75% PA cost share for energy modeling and analysis services by PAs’ preferred TA vendors and up to 25% for non-preferred vendors.
  o Design team incentives: Incentives paid to the design team lead based on project savings if the project achieves the program’s minimum 10% whole building savings target.

→ Large Buildings Program Customer Incentives
  o Paid to customers based on savings. Some PAs offer tiers of incentives to encourage deeper savings with higher per kWh and per therm incentive rates.
  o To participate in the full program, customers must target a minimum of 10% whole building savings beyond PA baseline.
SMALLER BUILDINGS 20,000 TO 100,000 SF

The PAs have established a consistent approach to supporting new buildings and major renovations of buildings between 20,000 and 100,000 sf in size, programmatically considered “Small Buildings.”

The PAs utilize a consistent approach to all new buildings, building additions, and major renovations between 20,000 and 100,000 sf, programmatically considered “Small Buildings.” All Small Buildings are offered the same set of technical assistance and customer incentives statewide (though incentive rates by PA may vary).

The statewide program offering is defined clearly in a PA Memorandum of Understanding (“MOU”) specifically designed for Small Business. Internal policies including but not limited to project screening, splitting of costs are consistent throughout MA. By documenting the program offering and ensuring consistency of that offering statewide, and by ensuring transparency in the PAs’ “back of house” policies for working more efficiently, PAs offer a dramatically improved customer, TA vendor, and channel partner experience.

The consistent program offering for new construction and major renovation projects between 20,000 and 100,000 sf is contingent on customers’ early engagement (conceptual/schematic design phase) with PAs during the design process. The full program, as described below, is offered only to those customers who engage PAs early in design when the opportunity to influence projects is greatest.

→ Small Buildings Program Technical Assistance:
  o TA vendors: Up to 100% co-pay for four technical assistance vendors, which have been pre-selected for deployment with customers through the Small Buildings Program.
  o Concierge: TA vendor acts as concierge guiding customers through various stages of design and construction, which ensuring implementation of identified energy saving measures.
  o Design Team Incentives: Design team incentives are offered to the design team lead based on project savings if the project is modeled and achieves the program’s minimum 10% whole building savings target.

→ Small Buildings Program Customer Incentives:
  o Paid to customers based on savings. Rates are published, but they vary by PA due to differing needs in each PA’s service territory.
  o To participate in the full program, customers must target a minimum of 10% whole building savings beyond PA baseline.

Marketing/Outreach/Training

The PAs conduct the following outreach to promote and guide the New Construction market in Massachusetts:

→ Direct customer & market actor (architects and engineers) outreach using PA Staff and Marketing and construction databases like Dodge, Reed, and Construction News.
→ Generating leads through preferred TA vendors
→ Mass Save New Buildings Page44
→ MEPA Reviewed projects shared by DOER
→ Trainings offered through MAEEP and PA staff

2016-2018 Plan Commitments and Status

→ Improved comprehensiveness in mid-sized new construction buildings through the use of Advanced Buildings and other tools. Broader application of Sustainable Office Design as a means of delivering integrated and comprehensive technical solutions to the leased commercial office market.

Complete – See Small Building Offer Consistency

- Encouragement of Net Zero Buildings as the premium option in the Whole Building path in the New Construction Program.

- Ongoing

- The PAs will continue to focus on both advancing adoption of progressive energy codes, including voluntary stretch codes, and improving levels of compliance with these codes in new construction and major rehabilitation, through training and technical assistance.

- Ongoing

- The PAs will continue to support DOER’s efforts to encourage more Massachusetts cities and towns to adopt the stretch code, and provide education and training on compliance. In addition, the PAs plan to work with the DOER and other stakeholders to develop the technical and economic case for a variety of proposed state level appliance standards.

- Ongoing

Evaluation/Code/Baseline Considerations

Given Massachusetts’ position as a leader in Energy Efficiency, high efficiency in market transformation and related evaluation baseline adjustments are expected to continue pressuring claimable savings during the next planning cycle. This effect will be felt most in the New Construction/Equipment Replacement space, but also more generally, for any measures where the evidence supporting broader market transformation is mounting.

STATEWIDE BASELINE FOR CUSTOM NEW CONSTRUCTION PROJECTS

The PAs have completed a baseline document that establishes statewide baselines for custom new construction project equipment and systems. The PAs have worked collaboratively to develop the 2017 Mass Save® baseline document for new construction projects, which references the newly adopted state energy code, fully effective as of 01/02/2017. The baseline document:

- Clarifies how to establish the baseline for various ECMs and system types in custom new construction projects such as new buildings or major renovations
- Clarifies how projects using different energy code compliance paths (ASHRAE versus IECC) may participate in Mass Save
- Clarifies where the Mass Save baseline differs from the energy code due (e.g., due to standard practice)
- Clarifies how Mass Save treats the enhanced energy efficiency measure section of the new energy code, which requires that in most municipalities, project teams choose 2 of 6 enhanced energy efficiency options.
- Clarifies that the Mass Save baseline differs from Stretch Code and that the Mass Save baseline is the same whether a project is in Stretch Code territory or not.

WHOLE BUILDING ENERGY MODELING GUIDELINES

The PAs have developed a building energy modeling guideline document that provides assistance on modeling buildings using cutting edge building simulation tools (such as eQuest, Energy Plus). This document guides users on consistency in simulating typical energy modeling parameters including but not limited to building geometry, building loads, building schedules and HVAC systems. The document also provides information on simulating common building energy conservation measures. The document establishes consistency and clarity within the building modeling community across entire MA. It also results in efficient review process and documenting of baseline and standard practices for new buildings.

The availability of these documents, in combination with the work that has been done to streamline the New Construction Large and Small Buildings program offerings (described above) will result in enhanced customer and stakeholder experience. This increased transparency, clarity and consistency of program elements across all PAs will reduce confusion in the marketplace for customers and design teams with projects spanning multiple PA territories. Now customers who participate in Worcester will experience the same program offerings and expectations as customers who participate in Boston or Cape Cod or Western Massachusetts.
APPENDIX
EEAC CONSULTANT TEAM DETAILED INFORMATION ON CHP

Massachusetts recently earned a top spot in the American Council for Energy Efficient Economy (ACEEE) state rankings for Combined Heat and Power (CHP) due to strong CHP incentive offerings, good interconnection policies, and a strong track record of actual installations, despite only about 50% of potential projects progressing to completion. This brief provides an in-depth look at CHP technology and the current PA offerings as well as limits of and barriers to CHP systems and opportunities to build on the already strong CHP offerings in Massachusetts.

CHP systems offer a range of benefits to owners, society, and utilities. Owners save money, improve power quality, and take more control over energy costs by having the option of making or purchasing electricity. CHP systems can enable owners to isolate site power systems from the electric grid to increase resiliency by providing a barrier from grid level power quality or reliability issues, however it also changes some of the core competency focus of the owner to that of a power producer which adds risk and the need for sophistication, unlike a lighting system upgrade or other traditional EE projects. On a societal basis CHP systems reduce carbon emissions in states like Massachusetts where fossil fuels make up more than half of electric generation capacity. While fuel use increases on-site with the installation of a CHP system, fuel use decreases overall on a statewide basis as demonstrated in Exhibit 13. The utilities benefit from reduced transmission congestion and demand, and from voltage support provided by customer sited CHP systems as well as from the services provided by third party operated, utility scale systems which give them a lower carbon source of electricity for their customers.

CHP is an important component of the energy efficiency portfolio. As shown in Exhibit 12, CHP contributed 19% and 13% of all C&I lifetime savings in the last two Three Year Plans.

Exhibit 12. CHP Lifetime Savings

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46 CHP projects are complicated and face many barriers. Therefore it is not surprising to see that many projects do not progress to completion. [http://aceee.org/files/pdf/white-paper/chp-and-electric-utilities.pdf](http://aceee.org/files/pdf/white-paper/chp-and-electric-utilities.pdf)
Combined Heat and Power Technology Overview

Combined Heat and Power is a form of distributed generation in which a system generates both electricity and useful heat at a customer site. This reduces the need for customers to purchase electricity from the grid and burn fuel solely for the creation of heating energy as shown in Exhibit 13.

Exhibit 13. Efficiency of Conventional Generation versus CHP

Combined Heat and Power systems result in increased overall energy use efficiency (including source energy). As seen in Exhibit 13, conventional electricity generation combined with an on-site boiler requires 147 units of fuel to produce 30 units of electricity and 45 units of steam. This results in an overall system efficiency of 51%. By comparison, the CHP system requires only 100 units of fuel to produce the same amount of electricity and steam and has an efficiency of 75%. Exhibit 13 also shows that CHP systems create more usable units of heat than electricity. As a result, CHP systems are typically sized to meet a site’s thermal load as opposed to sizing the system based on electricity usage.

Depending on the customer type, the thermal load could be all heat or all cooling, or a mix depending on the time of the year. Chillers are machines that chill water to serve a purpose such as providing air conditioning. While most chillers are powered by electricity, absorption chillers can use heat from a CHP system to drive the refrigeration cycle that makes the chilled water. For example, a multifamily building has a need for hot water throughout the year for showers and other domestic use. A manufacturer may require heat or chilled water or a combination of both for their manufacturing process year round.

CHP SYSTEM TYPES

- Piston engines use a gaseous fuel like natural gas or biogas and can be up to about 5 MW in size.
- Combustion turbines are powered by the combustion gasses of a gaseous or liquid fuel and can range from 100 kW to more than 100 MW.
- Steam turbines use high pressure steam from a boiler and range in size from 50 kW to 250 MW. The boiler that provides the steam to a steam turbine could be fueled by any gaseous, liquid or solid fuel. It is also possible to use steam generated from combustion turbine operation to also power a steam turbine in a combined cycle system as seen in Exhibit 5.
- A micro-turbine is a packaged CHP system of 300 kW or less and burns gaseous fuels.
- Fuel cells are unique in that they use a chemical process to make electricity, and the chemical process also produces heat. Available sizes range up to 2.8 MW and most use natural gas or biogas as fuel.

49 https://www.epa.gov/chp/chp-benefits
50 The exception to this rule is CHP systems that make use of existing waste heat streams to make electricity.
Large CHP Systems 1 MW and Greater

Large CHP systems generate steam, hot water, and sometimes chilled water that is used within a single facility or is piped to adjacent buildings on a campus or within a city district. As shown in Exhibit 14, in a campus application, the CHP system is typically owned and operated by one customer and the electricity and thermal energy is used on campus by that customer or their tenants. There are 30 CHP installations at colleges and universities in Massachusetts.51

Exhibit 14. CHP System in a Campus Setting52

District energy CHP systems sell the electricity, steam, and hot and chilled water to buildings within the district, essentially acting as a utility or export electricity to the wholesale power market. For example, the 256 MW Kendall Cogeneration Station, owned and operated by Veolia, provides electricity and steam to 250 customers in Cambridge and Boston, including large medical facilities.53 District energy systems with multiple separate customers do not participate in the PA CHP offering.54

Small – Medium CHP Systems less than 1 MW

While it is typically easier to size and sell a CHP system for a large facility, it is possible for a CHP system to generate economic benefits for small to medium size customers. Customer types such as hotels, retirement homes, and multifamily apartment buildings can have a large and consistent enough heat load for a CHP system to pass cost versus benefit criteria.

CHP System Sizing

There are several considerations that need to be taken into account to size CHP systems so that they perform as needed and expected by customers and utilities. To maximize energy efficiency, systems need to be sized to optimize utilization of outputs, meaning to maximize the use of both the electricity and the heat generated. It is important from a PA perspective to size a system as accurately as possible for several reasons. A system that is too small will not take full advantage of the potential savings, and therefore will not be optimized for cost effectiveness. A system that is too big will not run as efficiently or for as many hours as one that is optimally sized. Poor efficiency or reduced hours limit potential savings. Because it is so important to size a CHP system correctly, the PAs have developed a tiered incentive schedule55 to encourage customers to undertake efficiency measures prior to sizing CHP systems to improve the match between installed CHP capacity and site loads.

Other factors that may be important to a customer that can impact affect CHP sizing and efficiency include:

→ Creating an “islandable” micro-grid served by the CHP system
→ Sizing to address peak electric demand to reduce customer utility costs
→ Sizing for participation in electric demand response markets

These applications typically result in higher levels of heat rejection during some hours of system operation. For

51 https://doe.icfwebservices.com/chpdb/state/MA
52 http://greenpowersystems.com/resources/other-renewable-sources/combined-heat-power/
54 Confirmed through communication with Eversource
projects that include one of more of these considerations, CHP systems may be intentionally oversized, reducing the energy efficiency of the system, but providing other benefits that have been prioritized by the owner/developer. In these cases, the PAs may have limitations regarding the support that they can provide, or may be unable to support a CHP project, depending on the utilization rate of the CHP outputs over the course of the year.

**Measure Life**

The measure life of a CHP system tends to be long. Turbines and piston combustion engines have measure lives that range from 17 to 25 years, with proper maintenance and repowering. Micro turbines have 15 year measure lives, and fuel cells are only expected to last 5 years. A longer measure life results in more lifetime kilowatt-hour (kWh) savings, which is the primary metric used to set achievement goals for the Massachusetts energy efficiency programs. Therefore, CHP systems tend to have a big savings impact due to both the size of the systems that are installed, but also due to their extended life spans.

**Limitations of CHP**

The limitations of CHP systems result from the common use of natural gas as the primary fuel. While CHP systems reduce fuel use overall, fuel usage on-site does increase. This could cause localized constraints on a natural gas transmission pipeline system that may be near capacity in some places at certain times of the year. In addition, CHP systems that use fossil fuels instead of renewable fuels look less attractive in meeting the Global Warming Solutions Act carbon emission reduction goals as the Massachusetts grid transitions to more green sources of electricity such as solar, hydro and wind. However, for now and the foreseeable future, CHP is the most efficient and lowest carbon fossil fuel option for creating large amounts of heat and power.

**Combined Heat and Power customers and programs in Massachusetts**

Massachusetts currently has 1,631 Megawatts (MW) of CHP generation capacity, which is about 12% of Massachusetts' total generation capacity.

**CHP Fuel Sources**

CHP systems can use various fossil and renewable fuels. Fossil fuels include natural gas, which is the most common fuel in the U.S. and in Massachusetts, as well as coal and oil. Renewable fuels include biomass, biogas, wood and waste. Biomass includes agricultural waste and treated sewage. Biogas includes landfill gas and wastewater digester gas. Wood can be either wood chips, pellets, or wood from construction waste. Waste can include waste heat from an industrial process, or a fuel such as municipal solid waste (garbage), or black liquor, which is a byproduct of making pulp for paper.

As of the end of 2015, Massachusetts had a total of 206 commercial and industrial installations with a capacity of 1,631 Megawatts (MW). Table 8 shows that 84% of CHP systems in Massachusetts use natural gas as the fuel, and that non-fossil fuels are used in about 10% of CHP systems: biomass, biogas, waste and wood.

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Table 8. Existing MA C&I CHP Systems by Fuel Type

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Quantity</th>
<th>Capacity MW</th>
<th>% of Total Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass</td>
<td>6</td>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>Biogas</td>
<td>4</td>
<td>17</td>
<td>2%</td>
</tr>
<tr>
<td>Coal</td>
<td>3</td>
<td>33</td>
<td>1%</td>
</tr>
<tr>
<td>Natural gas</td>
<td>173</td>
<td>1,442</td>
<td>84%</td>
</tr>
<tr>
<td>Oil</td>
<td>10</td>
<td>76</td>
<td>5%</td>
</tr>
<tr>
<td>Waste</td>
<td>8</td>
<td>61</td>
<td>4%</td>
</tr>
<tr>
<td>Wood</td>
<td>2</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>206</td>
<td>1,631</td>
<td>100%</td>
</tr>
</tbody>
</table>

CHP by Customer Type

As seen in Table 9, manufacturers and food processors host the most CHP systems in Massachusetts and also have the most capacity. Multifamily buildings are next in terms of quantity, but the average size of the system is smaller. Manufacturers have the largest CHP systems in the State, and comprise 65% of total statewide installed capacity. Hospitals and universities also make up a significant share of both the quantity and capacity of CHP in Massachusetts.

Table 9. C&I CHP Systems in Massachusetts by Customer Type

<table>
<thead>
<tr>
<th>Customer Type</th>
<th>Quantity</th>
<th>Capacity (MW)</th>
<th>Average Capacity (MW)</th>
<th>% of Total Quantity</th>
<th>% of Total Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>3</td>
<td>3</td>
<td>0.9</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>Amusement / Recreation</td>
<td>12</td>
<td>87</td>
<td>2.9</td>
<td>15%</td>
<td>5%</td>
</tr>
<tr>
<td>Colleges / Univ.</td>
<td>30</td>
<td>87</td>
<td>2.9</td>
<td>15%</td>
<td>5%</td>
</tr>
<tr>
<td>Data Centers</td>
<td>1</td>
<td>0</td>
<td>0.3</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>District Energy</td>
<td>2</td>
<td>257</td>
<td>128.3</td>
<td>1%</td>
<td>16%</td>
</tr>
<tr>
<td>Manufacturing / Food Processing</td>
<td>44</td>
<td>1,059</td>
<td>24.1</td>
<td>21%</td>
<td>65%</td>
</tr>
<tr>
<td>Food Stores</td>
<td>3</td>
<td>1</td>
<td>0.3</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>Hospitals / Healthcare</td>
<td>12</td>
<td>120</td>
<td>10.0</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td>Hotels</td>
<td>11</td>
<td>1</td>
<td>0.1</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Justice / Public Order</td>
<td>4</td>
<td>2</td>
<td>0.4</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>Military</td>
<td>1</td>
<td>0</td>
<td>0.2</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Multi-Family Building</td>
<td>39</td>
<td>4</td>
<td>0.1</td>
<td>19%</td>
<td>0%</td>
</tr>
<tr>
<td>Nursing Home</td>
<td>17</td>
<td>2</td>
<td>0.1</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td>Office Building</td>
<td>7</td>
<td>2</td>
<td>0.2</td>
<td>3%</td>
<td>0%</td>
</tr>
<tr>
<td>Restaurants</td>
<td>1</td>
<td>0</td>
<td>0.0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Schools</td>
<td>9</td>
<td>2</td>
<td>0.3</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>Utilities</td>
<td>4</td>
<td>63</td>
<td>15.7</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td>Solid Waste / Wastewater Treatment</td>
<td>6</td>
<td>28</td>
<td>4.6</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>206</td>
<td>1,631</td>
<td>-</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

CHP and the Energy Efficiency Programs

The PAs introduced changes to the CHP offering in 2016, which were intended to increase the adoption of energy efficiency with CHP and to improve the utilization of installed CHP systems by tying higher incentives to system efficiency.

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60 Ibid
61 Ibid
62 Hospitals / Healthcare includes 87.8 MW for the Medical Area Total Energy Plant, a district energy system
CHP has been considered an electric efficiency measure since the Green Communities Act of 2008. The first CHP systems to go through the energy efficiency programs were installed in 2010, the first year of the PA’s first Three Year Plan. Since that time, lifetime savings from CHP have grown to be a large share of C&I savings, exceeding 30% in 2011 and 2015.

To promote the installation of CHP systems, the PAs offers incentives for CHP systems on a tiered basis. Tier 1: Incentive of $750 per kW of installed capacity or up to 50% of the total project cost. Customers agree to consider future energy efficiency measures and not to oversize the CHP system for expected loads after efficiency measures are installed.

Tier 2: Incentive of $1,000 per kW for projects of up to 150 kW capacity, and $950 per kW for larger systems. Customers must perform an ASHRAE Level 1 audit and agree to implement all cost effective measures with a three year payback or less within a certain timeframe. The annual efficiency of the CHP plant must be greater than 60%, which means the system must be right-sized for the loads after the efficiency measures are installed.

Tier 3: Incentive of $1,200 per kW for systems up to 150 kW, and $1100 per kW for larger systems. Customers must complete a more comprehensive Level 2 audit, and agree to reduce the total site energy use by more than 10%. The annual efficiency of the CHP system must be greater than 65%.

The Massachusetts Department of Energy Resources (DOER) administers the Renewable Energy Portfolio Standard (RPS) and the Alternative Energy Portfolio Standard (APS). The RPS sets goals for a certain percentage of Massachusetts electric generation to come from renewable sources. The APS is a set of goals to encourage development of non-standard electric generation capacity in order to supply 5% of Massachusetts’ usage by 2020. Historically, the majority of APS compliance has come from CHP. Retail electric suppliers are required to demonstrate compliance with the APS by purchasing Alternative Energy Credits. Ratepayers pay for RPS and APS through the supply cost on their electricity bills.

One MWh of net source energy saved by a CHP system using natural gas or biogas is worth one Alternative Energy Credit. These Alternative Energy Credit (AEC) payments are based on performance after the CHP system is operational, and act as an additional incentive for potential customers to develop CHP projects. The amount of incentive per kWh is dependent on the value of an AEC and the electrical and thermal efficiency of the CHP system.

When the AEC performance payments, which closely match operational expenses, are combined with the PA incentives to compliment capital incentives, it makes for an integrated incentive package for Massachusetts CHP program participants.

Opportunities for More CHP in Massachusetts

The U.S. Department of Energy (DOE) released a study in 2016 that estimates the remaining technical potential for new CHP installations in the United States. Technical potential is the amount of potential that is technically possible, but does not consider what is economically feasible or achievable. Economic potential is therefore a subset of the technical potential. The report does not make an estimate of what portion of the technical potential makes sense economically, or what subset of the economic potential is actually achievable within a set timeframe. Nor does the estimate break out the potential between the Program Administrator territory and the

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65 http://programs.dsireusa.org/system/program/detail/4624
66 https://www.masssave.com/-/media/Files/PDFs/Business/MassachusettsAPSIncentiveforCHP.pdf
67 Ibid
territory served by municipal utilities that do not participate in the PAs programs. Therefore, the DOE study only estimates the theoretically maximum possible remaining CHP potential. The achievable potential in PA territory is unknown, and is likely much less.

The DOE study estimates there are 3,434 MW of remaining CHP technical potential at 6,659 sites that could be developed in Massachusetts. This is about double the currently installed 1,631 MW of capacity. Of the identified technical potential 3026 MW was not from waste heat or district energy opportunities: 777 MW at industrial sites and 2,249 MW at commercial, institutional and multifamily sites. Exhibit 15 shows a breakout by customer type. Chemical manufacturers lead the industrial pack for potential with 389 MW at 220 sites, followed by paper with 109 MW at 96 sites. There were 112 hospitals identified with 621 MW of potential, 140 college/universities with 506 MW, and over 2000 office buildings with 448 MW on the commercial side.

Exhibit 15. Estimated Industrial and Commercial Technical Potential in Massachusetts

The study also states there are two stone/clay/glass and one instruments manufacturing site that could use waste heat for a total of 3 MW of capacity. While the DOE study is interesting, it is mainly useful for confirming that there is still potential for additional CHP in Massachusetts, and for highlighting the customer types who represent the best candidates.

CHP has not been included in potential studies commissioned by the PAs in the past, and is not included in the latest round of studies that are due to complete in fall 2017. In order to better understand this important market, there is a need for better estimates of economically achievable potential and for scenarios of the timeline for installation.

Barriers to CHP projects

The Massachusetts electric Program Administrators recognize both the importance of CHP to the efficiency programs and the barriers of developing CHP system projects. CHP projects require a significant customer commitment to develop and implement. This process includes analysis, engineering, project management, site work, system construction, and commissioning. Because of the issues mentioned above, the sales cycle for a CHP system can take multiple years, and some customers stop the process along the way.

The EEAC Consultants have identified two primary barriers to doing more CHP projects.

69 Ibid
Technical assistance from the PAs is limited, especially in the small PA territories. There are only a few PA experts to help identify opportunities, provide guidance, ensure correct sizing of the system, and to help maintain project development momentum.

Smaller customers may want to realize the benefits of CHP, but may not have the capital to pursue a project or operate it when installed.

A recent process evaluation in Massachusetts\(^{70}\) assesses how the PAs programs are working to promote and incentivize CHP systems. The evaluation team\(^{71}\) issued findings from surveys conducted with CHP customers who participated in the program, customers who started down the path to CHP but dropped out, and project developers. One key finding is that project developers and the PAs differ in their perception of the main barriers that limit the growth of CHP. Project developers believe the interconnection process and limited PA outreach are limiting growth, whereas the PAs believe the main limiting factor is the number of “high value” customers with consistent coincident thermal and electric loads. The customers surveyed identified capital costs, maintenance costs, the complexity of engineering the system, and interconnection requirements as the top barriers.

The participants in the evaluation surveys identified the following barriers:

- Technical risks.
- Financial risk from substantial capital costs.
- The length of time it takes to develop a project and uncertainty from changes to the program such as the incentive redesign in the spring of 2016.
- Lack of outreach. Surveys found that only 17% of CHP program participants learned about CHP and incentives from the PAs. Developers would also like to work more closely with the PAs, who have access to valuable customer energy use data.
- Uncertainty and implementation delays from the interconnection process.

**EEAC Consultant Potential Strategies to Overcome Barriers**

The evaluation findings observe that the program incentives and technical support from the PAs must be working, because these statements came from program participants. However, there are a number of solutions to the barriers described above from both the Consultants and as recommended by the evaluation.

**Technical risk:** Eversource and National Grid have dedicated CHP experts on staff to help facilitate projects and provide technical support, and the large PAs account for almost all of the projects and savings. Cape Light Compact and Unitil have done CHP projects, but their smaller customer base may prevent the hiring of dedicated CHP experts, which may limit the opportunity to do more CHP projects. To provide more support to all potential CHP customers, the PAs could consider a CHP circuit rider model in which the PAs share the cost of technical experts who work across all Program Administrator territories to identify candidate customers, promote CHP where it makes sense and support customers with technical assistance and other review services when they are considering CHP investments. These circuit riders could even target specific customer types such as hotels or nursing homes.

**Small customers:** The PAs could work with vendors to identify a third party delivery model that would own and operate a small scale CHP system for the customer.

**Financial risk:** To overcome financial and maintenance concerns for some customers, the market has provided the option of energy service agreements for CHP systems. Under an energy service agreement, the CHP system is financed, designed, installed and maintained by the vendor. The customer purchases heat or electricity or both under a Power Purchase Agreement. There are also leasing and third party ownership options available to customers.

**Financial Risk:** Project developers would like to be able to secure incentives for up to three years before project

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\(^{70}\) P60 Combined Heat and Power Process Evaluation

\(^{71}\) The evaluation team includes Itron, DNV GL, and Illume Advising
completion to reduce the risk of developing a project that is dependent on an incentive structure that then changes or disappears.

**Customer outreach:** The Program Administrators should ensure that all customers with the potential for CHP are aware of the opportunity in their facilities. CHP project developers suggest that customers with summer monthly usage of 1,000 to 5,000 therms and 25,000 to 26,800 kWh are good candidates. The PAs define “high value” customers as using at least 3,500 therms and 33,000 kWh per summer month. Changing the definition of a high value customer to the project developer lower thresholds would increase the pool of customers. Identifying good candidates for CHP systems should be easier for the PAs if they serve the customer with both electricity and natural gas because they have usage data for both. It is more complicated for customers who are served by different utilities, but because gas usage increases from CHP and the electric PA can claim the electric savings, there are benefits for both PAs from collaborating.

**Project process:** The interconnection process should be streamlined to reduce the amount of time required to complete. The process currently takes six to twelve months. The project developers requested that the utilities respond to interconnection requests within 20 days. If interconnection requests are increasing due to solar photovoltaic interconnection projects, and therefore slowing CHP requests, then more personnel may be required to meet the load.

**Increase transparency:** There may be some locations in Massachusetts where interconnection to circuits is complicated due to existing infrastructure and the varying load. Mapping has several advantages. Hosting capacity maps would increase transparency for developers and customers. There are also benefits for the PAs. As stated in Eversource’s rate case: “these maps will allow the Company [Eversource] to use a load-flow tool that simulates the impact of adding new facilities in certain locations to determine the ease of interconnection.”

**Consultant Team Strategic Recommendation**

The PAs have had success with increasing CHP savings in each successive plan, and the Council would like to see the electric PAs continue to grow CHP savings by:

1. utilizing EM&V and Council feedback on streamlining the project process,
2. increasing support and outreach by the PAs, and Increasing collaboration with CHP vendors.

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72 P60 Combined Heat and Power Process Evaluation, Page 20
EEAC CONSULTANT TEAM DETAILED INFORMATION ON PROCESS SAVINGS

Current Savings Trends for Process End Uses

PA-supported energy savings from process end-uses have increased over the last two years for which we have data, 2014 and 2015. Lifetime net electric savings peaked in 2014 when process savings totaled 900,000 lifetime MWh and accounted for 10% of all C&I savings. As seen in Exhibit 16, annual gross electric process savings peaked in 2015 and totaled 70,470 MWh.

Exhibit 16. Electric Process Savings

Gas process savings are an even larger portion of the overall C&I savings portfolio at 26% of total annual savings in 2015. The magnitude of gas savings from process peaked in 2014 at 3,740,540 annual therms, due to a one-time unusually large project. See Error! Reference source not found.17 for historic gas process savings.

Exhibit 17. Gas Process Savings

74 In this section process refers to both manufacturing and non-industrial end uses classified as process.
Process end uses make up a disproportionate share of savings as compared to their share of energy use. The C&I Customer Profile Reports use a statistic called “contribution ratio” which compares the contribution of savings for an end use to the energy consumption for the same end use. The contribution ratio is calculated as follows:

\[
\text{Proportion of the PAs Total Savings from Process} / \text{Proportion of PAs Total Consumption from Process}
\]

The statewide electric process contribution ratio for 2015 was 13.3, and the gas contribution ratio was 2.6. The fact that both these ratios are significantly larger than 1 indicates that process energy efficiency is a very important resource to the C&I portfolio.

**Current Program Administrator Performance**

Over the five year span from 2011-2015, the Massachusetts PAs worked with about 2,000 manufacturing customers, representing about 16% of total manufacturing customers. The participating manufacturers represent 75% of all electricity consumed by manufacturers, indicating that non-participants are smaller than average.

There is a range of performance with respect to PA engagement with manufacturers. Eversource and National Grid achieved both higher participation rates and more savings as a percent of usage in 2015 than did the smaller electric PAs. CLC and Unitil have lower participation rates and lower savings achieved. See Table 10 below.

**Table 10. 2015 Electric Manufacturer Participants, Savings, and Usage by PA**

<table>
<thead>
<tr>
<th>Program Administrator</th>
<th>Participation Rates</th>
<th>Savings Rate</th>
<th>Manufacturer Savings as % of PA C&amp;I Savings</th>
<th>Manufacturer Usage as % of PA C&amp;I Usage</th>
<th>Manufacturer Contribution Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eversource</td>
<td>24%</td>
<td>5.5%</td>
<td>17%</td>
<td>10%</td>
<td>1.6</td>
</tr>
<tr>
<td>National Grid</td>
<td>16%</td>
<td>4.6%</td>
<td>32%</td>
<td>23%</td>
<td>1.4</td>
</tr>
<tr>
<td>CLC</td>
<td>6%</td>
<td>1.6%</td>
<td>1%</td>
<td>2%</td>
<td>0.5</td>
</tr>
<tr>
<td>Unitil</td>
<td>12%</td>
<td>0.8%</td>
<td>18%</td>
<td>56%</td>
<td>0.3</td>
</tr>
</tbody>
</table>

As seen in Table 10, the percentage of Eversource and National Grid manufacturer savings as a share of all C&I savings are greater than the percentage of manufacture usage as a share of all C&I usage, resulting in a contribution ratio above 1. For CLC and Unitil the savings percentages are lower than the usage percentages, resulting in a contribution ratio lower than 1.

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75 2015 C&I Expedited Profile Report, Figure 3-5 and Table 4-2  
76 C&I Comprehensive Customer Profile report, Table 5-37  
77 Ibid, Table 5-38  
78 Draft C&I Comprehensive Customer Profile report, Tables 5-71, 5-72, 5-73, 5-74  
79 Participation Rate is the number of manufacturers who participated divided by the total number of manufacturers in that PA territory.  
80 Savings Rate is the amount of manufacturer savings divided by the manufacturing population usage in kWh.
The gas programs had fewer participants and lower savings as a percentage of usage by manufacturers as compared to electric programs.81

Table 11. 2015 Gas Manufacturer Participants, Savings, and Usage by PA

<table>
<thead>
<tr>
<th>Program Administrator</th>
<th>Participation Rates</th>
<th>Savings Rate</th>
<th>Manufacturer Savings as % of PA C&amp;I Savings</th>
<th>Manufacturer Usage as % of PA C&amp;I Usage</th>
<th>Manufacturer Contribution Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>2.2%</td>
<td>0.4%</td>
<td>13%</td>
<td>22%</td>
<td>0.6</td>
</tr>
<tr>
<td>Eversource</td>
<td>3.6%</td>
<td>2.8%</td>
<td>43%</td>
<td>23%</td>
<td>1.8</td>
</tr>
<tr>
<td>National Grid</td>
<td>1.2%</td>
<td>0.7%</td>
<td>9%</td>
<td>14%</td>
<td>0.7</td>
</tr>
</tbody>
</table>

No data available for Berkshire, Liberty, or Unitil

As seen in Table 11, Eversource had the highest participation and savings rates for manufacturer gas customers, and was the only Program Administrator for whom we have data that achieved a contribution ratio greater than 1.

The exhibits above show savings from manufacturers as a proxy for process savings. However, it is important to understand that not all savings from manufacturers are from improving the manufacturing process. Some savings are from other end uses such as lighting or HVAC projects, for example. About 66% of Eversource’s manufacturing savings were from process projects in 2015, but only 13% of National Grid’s savings from manufacturers were from process.82 National Grid’s ratio of process savings to non-process savings from manufacturers is increasing as the result of a different technical support engagement approach with Leidos Engineering, which is described further below.

Opportunities for Energy savings from Process Efficiency

Manufacturing processes use a wide variety of equipment to do productive work. Measures that save energy can be a new piece of machinery that is inherently more efficient by design, such as process chillers83 or a more efficient mixing machine in a hummus factory84, or from improving the function of existing equipment through the use of insulation, controls, variable speed drives, or other modifications. Sometimes energy can be saved through conservation measures such as turning equipment off when not needed. How equipment is operated and maintained can have an impact on energy use, so efficiency measures can also include improved maintenance practices such as fixing compressed air leaks or changes in operation such as turning down the pressure set point of a compressed air system.

Because process end uses are complex and highly customized, custom projects are a common way that PAs support the adoption of process efficiency measures. Custom projects require a significant investment in project development costs, including designing efficient solutions and developing estimates of energy and operational impacts. The need for outside support to implement these complex projects is discussed further below.

Summary of Massachusetts process related Program Activities

This section addresses the strategies the Massachusetts PAs are using to engage manufacturing customers and the performance of those strategies in achieving process energy savings.

81 Draft C&I Comprehensive Customer Profile report, Tables 6-66 through 6-71
82 Calculated by dividing process savings from Table 5-59 and 5-60 by savings from manufacturers in Table 5-64 and 5-65
83 http://www.masssave.com/~/media/Files/Business/Case-Study/NP_I0033_CI_CaseStudies_Gentex.pdf
84 http://www.masssave.com/~/media/Files/Business/Case-Study/NP_I0011_CI_CaseStudies_Cedars.pdf
Customer Engagement Practices

The PAs use multiple outreach methods to engage manufacturing customers because they are diverse in size and product type. All C&I customers served by the PAs are eligible to participate in the MassSave New Construction, Retrofit, and Upstream offerings. Customers who consume less than 1.5 million kWh annually (1.0 million for Unitil) and/or 40,000 therms of natural gas are also eligible to participate in the Small Business offering.

The Upstream and regular retrofit prescriptive programs are mostly focused on lighting, drives, compressed air, and HVAC measures, where hours of use and savings are fairly predictable and savings are calculated using deemed hours of use and savings per measure. By contrast, the nature of process measures usually requires a custom approach and therefore different outreach strategies. In most cases, complex process energy efficiency retrofits require an independent third-party engineer with specific knowledge and expertise to facilitate savings quantification, project design, and implementation. To help with the cost of engineering, PA customers are eligible for an incentive to help share the cost of Technical Assistance studies. The sections below describe the most common strategies used to identify and quantify process projects in Massachusetts. Please note that most of the methods described below are focused on the largest customers, as defined by energy usage.

ACCOUNT MANAGEMENT
To engage with medium and large customers, the PAs have dedicated account managers (AMs). The PAs have different structures for their customer account managers with varying duties, numbers of assigned accounts, customer size ranges for which AMs are deployed, and level of specialization. For instance, Eversource deploys Account Executives (AEs) and Energy Efficiency Consultants (EECs) to customers in its top three consumption quartiles, assigns them by industry sector to align with AE/EEC training and expertise, and limits the number of customers assigned to each AE/EEC. National Grid revamped its sales approach in 2014 and deploys account development and commercial representatives by geographic region to establish direct relationships with customers in the largest customers. To serve more customers in the, National Grid dedicates sales people to work with trade allies to increase participation. The smaller PAs typically have one or two account representatives working with their largest 30 to 100 customers across all industry sectors. With the exception of the Cape Light Compact, which only provides efficiency services, small PA account managers typically are responsible for a variety of energy-related topics ranging from billing issues to power quality in addition to energy efficiency. Where a customer receives electric and gas service from different PAs, account representatives endeavor to coordinate on energy efficiency activities in order to streamline service to the customer.

MEMORANDA OF UNDERSTANDING
For the very largest customers, including large manufacturers, the PAs use Memoranda of Understanding (MOU), sometimes referred to as a strategic energy management plan, to facilitate longer term energy efficiency projects that achieve greater depth and comprehensiveness. The MOU identifies shared goals, defines the relationship between the customer and the PAs, and outlines a plan to achieve the goals; it may also specify incentive structures.

TECHNICAL SUPPORT
In order to provide sector-specific services to its largest manufacturer customers, National Grid and Eversource maintain contracts with engineering firms with specialties in process-related energy reduction, such as Leidos and Loureiro Engineering. For example, Leidos, a large engineering firm offering specialization in industrial energy efficiency, provides energy advisor services, helping them identify energy efficiency opportunities and providing project management to support their implementation. Since Leidos started working with manufacturers in National Grid territory in 2015, about 76% of projects involve process equipment or compressed air, motors, and drives associated with the process. The remaining completed or active projects are non-process savings such as lighting.

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85 Eversource pioneered the practice of dividing its customer base into consumption quartiles and then tailoring strategies for industry sectors, such as for manufacturers, hospitals or universities, that transcend the size categories. This recognizes that customer similarities are driven more by the business in which a customer is engaged than by its size, while also allowing for size related differences in their outreach strategies.
86 Industry sectors include manufacturing, restaurants, college and university, hospitals, hotels, grocery, etc.
87 National Grid “Sales and Program Operations – Update on Commercial Sales Changes and Focus” April, 2014
88 National Grid calls such agreements Strategic Energy Management Plans (SEMP)
The value of technical support was demonstrated by the Accelerated Rebate Pilot. Offered in Massachusetts by the PAs from 2013 to 2015, the pilot program gave the five largest accounts of each PA the option to self-direct their own contribution to energy efficiency funds. Customers were offered the chance to claim up to 100% of project costs as incentives for efficiency measures, not to exceed 90% of their total annual contributions to the energy efficiency fund, and were ineligible for any other program services such as technical assistance. Less than half of the eligible customers participated, while some that did reported that, in hindsight, they could have done better with the regular programs. Despite the opportunity for higher incentives, other participants did zero energy efficiency upgrades for some of the years they were part of the pilot. Despite the fact that this was intended to be a self-direct pilot, most participating customers required significant PA support and expertise to complete projects.

SMALL BUSINESS PROGRAM
At least one PA has used the Small Business program to realize process savings, but the vast majority of savings resulting from the Small Business program are from lighting, with small amounts of HVAC and refrigeration end uses.

Barriers to energy efficiency savings in Manufacturing processes
There are many barriers to all efficiency projects, and a project must clear every barrier or it will not happen. Efficiency programs are designed to overcome barriers to drive projects and produce savings. Key barriers typical of process projects are outlined below.

Market Barriers

Risk Aversion: Manufacturers are in business to make a product and their processes are critically important to their financial well-being. Changes that could impact production quality, cause safety issues, or increase downtime are very undesirable for these customers. For some customers, if a piece of equipment does not meet expectations it can cause a complete shutdown of the process, resulting in large costs from down time, restarting the process, and ruined product. If customers do not trust or understand a potential efficiency measure, the investment is seen as risky, and the possible energy savings are perceived as being not worth this risk.

Energy Metrics: Some manufacturers use plant level energy consumption as a proxy measure of production. From this perspective, increasing energy use means more units produced and a growing business. Reducing consumption is seen as inhibiting or reducing production, and an indicator of poor production performance. This perspective may be because multiple production lines with different energy uses and schedules can complicate the understanding of how and when energy is used in a manufacturing plant. For example, manufacturers may not track production at the same time the relevant energy is being used, making time alignment with energy use difficult, especially if energy data are limited to monthly intervals. It may also be hard to understand where energy is being used in a plant, and what metrics are important to monitor. Some manufacturers develop Key Performance Indicators (KPIs) that incorporate energy use per production unit into business performance analytics, but many manufacturers do not have the understanding of energy usage, data collection equipment, or software necessary to develop meaningful and useful KPIs.

Confidentiality: Because industry information pertaining to processes is often proprietary, there may be strict confidentiality requirements associated with projects that involve process end uses. While this can create barriers to researching and understanding the specifics of process improvement projects, customer confidentiality requirements must be honored if PAs are to work effectively with their manufacturing customers.

Financial Barriers

Financial barriers can come in several forms: financial officers’ demand for a short payback on investment, a lack of available capital, or a lack of compelling information for the key decision makers. Some manufacturers require a very short simple payback before they will consider an efficiency project because of market and economic uncertainty. Efficiency projects must compete with other forms of investment, and are often seen as a low priority.

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89 Data from the National Grid Industrial Initiative information sheet, for both Massachusetts and Rhode Island.
by customer senior management. Manufacturers may be part of a multinational company, with the key decision
makers located outside the Commonwealth, which can impair the flow of information needed to make a decision
to invest in energy efficiency projects.

**MassSave Structural Barriers**

**Variations in Service:** There are differences between PA implementation strategies that result in different
approaches to manufacturing customers. The smaller PAs do provide account management, but very few people
may be assigned to a wide range of customers in the territory, which limits the amount of time and understanding
that can be achieved for a specific customer’s process and business. When AMs must work with a whole range of
different customer types, it limits their ability to speak the customers’ language and to truly understand their
business.

**Serving Small Customers:** Most manufacturers are relatively small, even though the few large customers
represent much of the energy consumption, and therefore savings opportunity. Given the smaller energy savings
potential per customer, it is not cost effective to provide account management to all small customers.
Manufacturers who fall into the small business classes may have specialized process needs that the Small
Business program is not designed to address, leaving a void in program delivery for these customers.

**Customized Expertise:** Because manufacturing process projects are typically custom, it is costly to identify
process opportunities in medium and smaller manufacturers. Even if opportunities are identified at smaller
manufacturers, the cost-effectiveness of a process project may be marginal because Technical Assistance
studies are expensive. If a Technical Assistance study costs $10,000 to identify and quantify potential savings,
there must be enough savings to justify the cost of the study, or the project will not be cost-effective. A small
manufacturer process project may not have the energy use and potential savings to cover the cost of the study,
which in this case the PAs incentivize new efficient equipment, as opposed from retrofit savings replacing existing
functioning equipment, and can make a manufacturer more efficient over time.

**Technical Barriers**

**Realizing Operational, Maintenance, and Behavioral Savings:** How equipment is operated and maintained
can have a large impact on energy use. Common examples are failed steam traps or compressed air leaks that
can cost tens of thousands of dollars annually if not repaired; the PAs are able to claim savings for these types of
projects. There are other examples such as when equipment is left on when not needed or is redundant, or
equipment that is not maintained properly such that it uses more energy than necessary. The set points or
operational parameters and how machinery is used also plays a big part in energy use. The programs are not
currently equipped to identify, document, measure, and claim these types of savings easily.

**Baselines:** Establishing the appropriate baseline against which energy savings are measured is another
challenge in achieving claimable savings from process end-uses. There are no codes or standards for
manufacturing equipment, so there are limited established baselines for efficiency. In addition, the equipment that
is to be replaced may be decades old, and fully or partly functional. This complicates the decision regarding
whether the project should be treated as a market opportunity (i.e., failed or obsolete equipment was being
replaced, regardless of energy issues) or a retrofit (i.e., retiring equipment early specifically to achieve energy
savings). This distinction between retrofit and market opportunity is important to the calculation of both energy
savings and the incentives offered by the PA. Where end-of-life replacements usually are compared against a
baseline of lowest currently available efficiency, early retirements may realize savings compared to older, lower
efficiency equipment.

**Attribution:** In addition, because energy alone may not be enough of a reason to move a project, the PAs may
be successful in causing the project to happen by using the other benefits as selling points in addition to savings
energy. This approach could cause them to lose savings if it is not properly documented that the PAs were the
driver of the project completion, regardless of the mix of customer’s reasons for moving forward.

**EEAC Consultant Team Potential Approaches to Overcome Barriers**

The manufacturing sector is an important part of the Massachusetts economy. Energy efficiency savings from
manufacturers and from process end uses are an important and growing part of the Massachusetts PA C&I portfolio. The Program Administrators anticipate an increase in process savings in the current Three Year Plan as compared to prior plans. Further increases may be possible in the 2019-2021 Three Year Plan. Potential strategies to increase the upward trend as discussed in this memo are summarized below.

1. Reduce the perception of risk: New technology must be proven before most manufacturers will invest in something new. The PAs can accelerate adoption of new technologies by partnering with customers through account management to support trials under controlled conditions and meter the results to prove energy savings. Successes with cooperating customers can be shared and publicized through case studies and best practice exchanges.

2. Create energy metrics: Support the installation of meters and software to make energy use more visible, to better track consumption and production, and to create meaningful key performance metrics so that customers can better manage their energy use.

3. Ensure confidentiality: Continue to value and protect customer confidentiality, through the use of Non-Disclosure Agreements when necessary.

4. Lower financial barriers: The Massachusetts Pro Forma economic analysis tool is a powerful way to demonstrate the value of a project in the language of a senior management. Use other non-energy benefits to sell a project, but document this so the programs get proper credit.

5. Address variations in service: Spread best practices and AM resources from the best performing PAs to the others in a more unified, statewide MassSave approach. This would allow for more specialization to better serve customer sectors.

6. Serve small customers: While the PAs are well engaged with most of their large customers, there is opportunity to work with more manufacturers though expanded account management for small customers or engagement through the Small Business program.

7. Realize operational, maintenance and behavioral savings: Other states and provinces have implemented SEM and EMIS programs to realize cost-effective savings from manufacturing process. These programs claim savings from operational and behavioral changes, and document the difference between the baseline operational period and the treatment period. SEM programs also have the effect of driving increased traditional retrofit projects.

8. Accurately identify baselines and document attribution: Through good documentation of project baselines, PA involvement, and customer motivations, the PAs can increase realization rates and improve the retention of claimed savings through the evaluation process.

**EEAC Consultant Team Strategic Recommendation**

The PAs have been steadily increasing electric and gas savings from the process end use. The Council would like to see the PAs continue to increase process savings, in addition to other end use savings from industrial customers.
EEAC CONSULTANT TEAM DETAILED INFORMATION ON SMALL BUSINESS

The Mass Save Small Business Initiative (SBI) is one of the longest running and most highly regarded small business programs across the United States. It has been repeatedly highlighted in national small business program best practices reviews and used as a model by utilities in other states looking to better serve small commercial customers.\(^9\) In spite of the SBI’s recognition and success, much of the small business segment remains difficult to reach, which is an issue encountered nationwide. Exhibit 18 below summarizes two key metrics that indicate small businesses are more expensive to serve and difficult to engage compared to large and medium businesses. Note that the table below does not include upstream data, which has been a successful delivery pathway used to reach many more customers than could be processed through traditional means.

Exhibit 18. Cost of Savings and Participation Rate Account Size, 2015\(^{91}\)

<table>
<thead>
<tr>
<th>Customer Size</th>
<th>Incentive $/kWh Saved</th>
<th>Participation as % of Accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small &lt;50 MWh</td>
<td>$0.39</td>
<td>1%</td>
</tr>
<tr>
<td>50-249 MWh</td>
<td>$0.36</td>
<td>7%</td>
</tr>
<tr>
<td>250-999 MWh</td>
<td>$0.33</td>
<td>15%</td>
</tr>
<tr>
<td>Small/Med Mix 1,000-2,499 MWh</td>
<td>$0.24</td>
<td>26%</td>
</tr>
<tr>
<td>Med and Large 2,500+ MWh</td>
<td>$0.22</td>
<td>41%</td>
</tr>
<tr>
<td>Gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small &lt;8,000 Therms</td>
<td>$1.77</td>
<td>1%</td>
</tr>
<tr>
<td>8,000-40,000 Therms</td>
<td>$2.25</td>
<td>5%</td>
</tr>
<tr>
<td>Medium 40,000-80,000 Therms</td>
<td>$1.79</td>
<td>7%</td>
</tr>
<tr>
<td>Med and Large 80,000+ Therms</td>
<td>$1.35</td>
<td>13%</td>
</tr>
</tbody>
</table>

Table excludes upstream data

Small businesses are participating in programs beyond SBI. Including Upstream, Small Business accounts saved 56% of the C&I portfolio, as shown in Exhibit 19.

Exhibit 19. Small Business Savings Contribution to C&I Portfolio

\(^9\) ACEEE Big Opportunities for Small Business, 2016; ACEEE Leaders of the Pack, 2013

\(^{91}\) 2015 MA Customer Profile Report
MA Small Business Measures

As discussed above, the SBI initially focused only on lighting and refrigeration measures. However, the program has evolved into a more comprehensive offering. See Exhibit 20 for a list of measures available to customers in 2016.

Exhibit 20. SBI Measures by End Use

<table>
<thead>
<tr>
<th>Fuel/End Use</th>
<th>Current Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electric</strong></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Lamps, Systems, controls</td>
</tr>
<tr>
<td>Motors &amp; Drives</td>
<td>Prescriptive, custom</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Cooler night covers, recycling, door heater controls, novelty cooler shut off, controls, custom</td>
</tr>
<tr>
<td>Hot Water</td>
<td>Custom</td>
</tr>
<tr>
<td>HVAC</td>
<td>Programmable thermostats, Wifi Tstats, EMS</td>
</tr>
<tr>
<td>Process</td>
<td>Custom</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td></td>
</tr>
<tr>
<td>Hot Water</td>
<td>Aerators, showerheads, pre-rinse spray valve, pipe insulation</td>
</tr>
<tr>
<td>HVAC</td>
<td>Controls, thermostats, pipe wrap, custom</td>
</tr>
<tr>
<td>Process</td>
<td>Steam traps</td>
</tr>
<tr>
<td>Envelope</td>
<td>Custom</td>
</tr>
</tbody>
</table>

New measures adopted in 2016 include freezer/cooler LEDs, VFD with motor, envelope measures, and other unspecified custom measures.

MA Small Business Demonstrations and Planned Action to Improve the Small Business Program

In addition to the turnkey delivery SBI model discussed above, the following efforts have been, or are continuing to be implemented by PAs to explore additional means to boost program performance.

Customer Directed Option (CDO)

This option was developed after feedback from non-participating vendors and customers indicated that there was demand for allowing more contractors to participate in the program. Through CDO, customers can use their preferred contractor to install eligible measures following an audit conducted by a CDO Administrator. Customers receive the same incentives and financing offered through the traditional SBI. CDO offers comprehensive measures, but has only had success with delivering lighting projects. This option has been considered a success by many stakeholders, and has extended the reach of Mass Save beyond participating vendors. This option is offered by most PAs, with key differences in program marketing approach. National Grid has had success with CDO through marketing the offering directly to trade allies, allowing non-participating vendors to include the program incentives when working with their customers. Other PAs allow customers to elect to have measures installed by a preferred vendor, but do not conduct trade ally outreach to encourage participation through this pathway.

Main Street Offering

Eversource initially offered a Main Street offering providing day of installation of measures to as many businesses in a set area within Boston through a pilot supplemented by ARRA funds in 2010. The offering was extremely successful at signing on participants, and continues in a modified form to this day. This offering runs through delivering four main street “blitzes” annually. Blitzes target high density commercial areas through knocking on doors, and getting individuals signed up and served that day. While this offering excels in bringing in participants, the approach is also considerably more expensive to deliver compared to the traditional model due to the in-field staff requirement for marketing and program delivery. National Grid also began offering main street blitzes

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92 Massachusetts Small Business Process Evaluation, DNV GL 2015
starting in 2014, as called out in the 2016-2018 three year plan.\textsuperscript{93}

**Cape Light Compact Business Energy Audit program**

Cape Light Compact started a demonstration in 2016 that mimicked the home energy services core initiative in an attempt to address participation barriers. This offering includes a business energy audit (BEA), with direct installation of measures, including complementary measures such as led bulbs and smart strips. This offering targets a smaller segment of customers, with annual usage of less than 100 MWh.\textsuperscript{94} CLC experienced challenges with identifying customers with sufficient hours of use to justify program participation, as many customers experience seasonal fluctuations.

**ADDITIONAL PLANNED OFFERINGS 2016-2018**

\begin{itemize}
  \item Tenant space improvements in commercial real estate
  \item More LED retrofit kits and fixtures with integrated controls
  \item Energy Savvy online portal (discontinued as of 2016)
\end{itemize}

Barrier: Vendor led marketing limits SBI access

**VENDOR LED MARKETING**

Lower than planned participation rates in 2016 suggest that the SBI may not be effectively reaching the small business customer base. Currently, SBI vendors carry the primary responsibility for program marketing. The 2015 process evaluation found that a core vendor strategy has been to specifically target larger small business customers with high hours of use and potential for more electricity savings compared to smaller customers. While it is unclear how many other vendors use this strategy in an effort to maximize kWh saved, there are indications that vendors consider customer size when targeting potential participants in order to maximize revenue within the current payment structure. As highlighted in the American Council for an Energy Efficiency Economy (ACEEE) Big Opportunities for Small Businesses report, “The Mass Save small business program delivered by all the Massachusetts utilities pays only for kWh and therms saved. Thus, delivery contractors are incentivized to pursue only those customers who are likely to, or can be persuaded to, accept a project offer, as unproductive audits offer no means for cost compensation.”\textsuperscript{96} While this method has helped maintain a cost effective program, it also sets up an offering in which many participants are predetermined by vendors before an audit is conducted. This means that many potential participants may be missed because of the risk in pursuing customers with limited prescreened potential.\textsuperscript{97}

**MARKETING MATERIALS**

With over 100,000 small business customers in Massachusetts, limiting marketing and outreach efforts to direct customer interactions with vendors indicates that many eligible customers are missed. \textsuperscript{98} Thus far, vendors have found that one on one interaction with potential customers has been the most effective way to gain participants, and therefore the bulk of marketing efforts go toward door to door canvassing and direct phone calls. However, this effort limits the number of small business customers that are aware of the SBI offering, as direct outreach efforts are time consuming, expensive, and not feasible in areas with a low density of small businesses.

Demand for increased program publicity is not a need specific to Massachusetts. In the California 2013-2015 Direct Install Program Process evaluation, program participants asked for greater publicity of programs available

\begin{flushleft}
\textsuperscript{94} \url{http://www.capelightcompact.org/energy-efficiency/business/existingbuilding/}
\textsuperscript{95} Ibid.
\textsuperscript{96} \textit{Big Opportunities for Small Businesses Report}, ACEEE 2016
\textsuperscript{97} Vendors may not pursue the smallest customers, but they are obligated to respond regardless of size when small customers request services.
\textsuperscript{98} From customer profile report. The number of accounts is not synonymous with the number of customers, according to the 2012 Economic Census there are about 172,579 Establishments and 607,664 Companies in Massachusetts
\end{flushleft}
to small business customers. The same study also found that audit only participants expressed feedback indicating a need for better information. In Massachusetts, material available online to customers varies widely by PA, and despite a recent Mass Save overhaul, some vital material remains unavailable, or difficult to find. Exhibit 21 demonstrates availability of different key SBI information to customers online. The EEAC consultant team conducted a website review to assess small business targeted information available through program administrator and Mass Save sites. This review brought up several issues with the ease of use for customers. Mass Save provides good information in many areas of the small business program, but could be clearer in some areas. For example, the website contains a “we make it easy” section, which lists contact your PA as the first step. The first step does not make it clear that the mass save website can provide the potential participant with contact information they need through a zip code look up, and implies that the browser needs to continue reading or go to another website to move on to the next step. Creating a link to PA contact information directly in the first step may help customers begin their application process more easily. Adding a big button at the top of the page indicating a simple message “click here to apply” will also help customers who came looking to get an application started stay on task without running out of time or getting overwhelmed by details. In the age of Amazon, expectations are high when it comes to easy online access to products and services.

Exhibit 21. Website SBI Information Review

PA AND VENDOR DIFFERENCES
PA and vendor differences have been a key barrier called out in previous reports. While PAs make efforts to improve performance through communication with vendors, the competitive nature of the work inhibits vendors from sharing best practices with each other.

PA DIFFERENCES
As shown in Exhibit 22, small business participation and saving per customer varies widely between PAs. The issue of variability between PAs has been highlighted in past studies. Differences in incentive contributions and

100 Website review conducted by the EEAC Consultants, June 28th, 2017
101 Eversource information is only available by registering on the Eversource site with a customer account number
103 Small Business Program Process Evaluation 2015 DNV GL
cost of savings may indicate differences in firmographics, measure mix, or participant experience. For instance, the average Berkshire Gas participant received incentives for about 50% of the measure installation cost while Eversource customers received 100%. Note that the incentives below illustrate the range of costs covered by PAs, but due to issues with net to gross conversion, the incentives in Exhibit 22 are all likely higher than the actual average incentives offered. None of the vendors offer incentives over 100%. Differences in performance between PAs are expected because customer firmographics differ across the state. Unitil electric, for example, defines small businesses as customers who use less than 1,000 MWh annually, indicating a smaller customer base. Exhibit 22 indicates that electric PA’s have a similar proportion of customers participating in SBI, with participation ranging from 1-2.1% of small business customer accounts. For gas PAs, the proportion of small business accounts served ranged from 0.1-5.9%, indicating that the SBI offering is implemented differently between gas PAs. While PA’s have made efforts to reduce differences, not all administrators offer the same measures, and a uniform scope of work for vendors has not been implemented.

Exhibit 22. Small Business Performance Indicators by PA (2016 Evaluated Results)

<table>
<thead>
<tr>
<th>Program Administrator</th>
<th>Participants</th>
<th>Cost of Savings ($/annual kWh)</th>
<th>Savings per Participant (net annual kWh)</th>
<th>Participant Incentive (% of total cost)</th>
<th>Estimated % of Small Business Customer Accounts Served*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cape Light Compact</td>
<td>259</td>
<td>0.91</td>
<td>10,400</td>
<td>79%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Eversource</td>
<td>1,779</td>
<td>0.63</td>
<td>34,981</td>
<td>81%</td>
<td>1.3%</td>
</tr>
<tr>
<td>National Grid Electric</td>
<td>1,665</td>
<td>0.51</td>
<td>26,163</td>
<td>76%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Unitil Electric</td>
<td>84</td>
<td>1.04</td>
<td>16,680</td>
<td>81%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Statewide Electric</td>
<td>3,787</td>
<td>0.60</td>
<td>29,017</td>
<td>79%</td>
<td>1.2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berkshire Gas</td>
<td>19</td>
<td>9.59</td>
<td>1,261</td>
<td>48%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Columbia Gas of MA</td>
<td>275</td>
<td>3.73</td>
<td>568</td>
<td>71%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Eversource (NSTAR Ga)</td>
<td>279</td>
<td>5.18</td>
<td>189</td>
<td>107%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Liberty Utilities</td>
<td>227</td>
<td>7.18</td>
<td>100</td>
<td>133%</td>
<td>5.9%</td>
</tr>
<tr>
<td>National Grid Gas</td>
<td>153</td>
<td>5.86</td>
<td>279</td>
<td>91%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Unitil Gas</td>
<td>2</td>
<td>14.29</td>
<td>1,344</td>
<td>57%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Statewide Gas</td>
<td>955</td>
<td>5.27</td>
<td>315</td>
<td>76%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

*Calculated using 2015 account details from the customer profile report for accounts <1,000 MWh. The number of 2016 accounts is assumed to be similar, though note that there are more accounts than customers

In addition to differences in SBI performance between PAs, program vendors have also ranged in their performance. This is illustrated by Exhibit 23 below, which indicates that small business office participants who use less than 400,000 kWh annual received savings ranging from 8-24% of consumption based on the vendor (G-L). Also notable is that none of the electric PAs stood out as performing better than the others, so the range in performance is likely due to differences in vendor delivery of the SBI offering.
Opportunity: Expand Statewide and PA led marketing efforts

CREATE A STATEWIDE AMBASSADOR POSITION
The creation of a statewide SBI ambassador could work to advance program marketing and streamline program delivery. This ambassador would be a centralized contact that receives customer feedback and develops a strong understanding of opportunities within the small business sector. In addition to leading an advanced marketing and communication effort, the ambassador could also provide an assessment of vendor performance, and help to facilitate implementation of vendor best practices in an effort to improve consistency of the SBI offering statewide.

Expand PA Led marketing
A PA, or third party led marketing effort may also be necessary to increase small business engagement and identify more participants. While a statewide ambassador is one means to resolve vendor and PA SBI performance differences, another related recommendation for a consistent program model and contract structure from both the 2015 Small Business Memo and the 2015 process evaluation has not yet been fully implemented.105

The vision for the SBI marketing approach includes a multifaceted marketing effort to help educate customers, foster interest in comprehensive measures, direct customers to available incentives, and increase program participation. Many potential options to improve statewide small business engagement are already offered to some extent throughout the Commonwealth. The available marketing material can be improved on to streamline the customer sign up process and appeal specifically to the small business customer base. PAs should consider strengths from the main street pilot, community partnerships, and the customer directed option (CDO) as a starting point to improve small business engagement.

USE A SEGMENT-SPECIFIC DELIVERY APPROACH
The PAs have been looking to find ways to diversify measures adopted through the SBI. One approach that some PAs in and outside of Massachusetts have implemented successfully is a segment specific approach to delivering the SBI. Through this approach, specific business or building types with high identified savings potential are targeted through marketing and delivery efforts. Data from the Market Characterization Assessment and the 2015 Customer Profile Report indicate that over 75% of savings potential for small commercial electric customers

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104 2016 PA differences study, DRAFT, Ralph Prahl & Associates
comes from four segments, retail, office, food service, and food sales.

The segment specific approach has proven successful both in and out of the State, and was recommended for adoption by North Atlantic Energy Advisors through a survey of the state of small business programs nationwide. As discussed in a 2017 Manufacturing Process memo, significant opportunity remains for reaching small manufacturing customers through a systems based approach, with the integration of related process measures including air compressors, chillers, and process boilers. The on-site study also revealed opportunities for HVAC controls and office savings. Revealing that 89% of small businesses do not have EMS, and 72% of computer monitors on site for small businesses were inefficient CRT monitors. Additional measures supporting other top segments are outlined in Exhibit 24.

Exhibit 24. Sample Segment Specific Measures

<table>
<thead>
<tr>
<th>Bundle</th>
<th>Restaurant</th>
<th>Grocery</th>
<th>Office</th>
<th>Retail</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Commercial kitchen equipment, filament LEDs, hot water, refrigeration measures</td>
<td>Cooler night covers, recycling, door heater controls, novelty cooler shut off, controls, custom</td>
<td>Lighting fixtures, controls, programmable thermostats, CRT monitor recycling, smart strips, BMS</td>
<td>Lighting fixtures, controls, programmable thermostats, air sealing, building insulation</td>
<td>Custom process measures, steam traps, no-loss compressed air drains, boiler controls</td>
</tr>
</tbody>
</table>

Additional Considerations: Possible Lighting Interactions

Another factor effecting participation, savings, and the measure mix of the SBI is the Upstream delivery approach, which was introduced in 2011. The upstream offering has a broad customer reach, and helps to encourage a market shift by incentivizing manufacturers to produce more premium efficiency products and changes distributor stocking patterns. Customers participate in the upstream program when they select efficient lighting and HVAC measures at distributors that have been subsidized to be cost competitive by PAs. This program is the most cost-effective option to serve the smallest customers. One barrier to achieving maximum savings from the upstream program is that customers may be more likely to select lower cost, smaller savings options when making purchases. SBI vendors on the other hand, are driven to maximize savings for customers and may be more effective at delivering higher efficiency measures, such as integrated LED fixtures with controls.

Lighting has, and continues to account for a large portion of the savings for the small business initiative. However, like other programs, Small Business lighting savings will be affected by changes in lighting baselines driven by the new Energy Independence and Security Act (EISA) standard. EISA reduces claimable savings from general service lamps beyond 2019 and any dual-baseline and ISP decisions made. The EISA standard has already reduced claimable lighting savings from the small business initiative, as 20% of existing screw-based lighting in small businesses comes from non-LED sources, of which a significant portion are inefficient incandescent lamps.

Comparison Area Information

The Massachusetts small business direct install (SBDI) program is available to electric customers with an annual energy use of less than 1,500 MWh and gas customers using less than 40,000 therms annually. Most small business program offerings out of state are limited to smaller customers with demand caps ranging from 100-200 kW. The difference in how small business is defined across programs limits extensive direct comparison of

106 National Survey of State of Small Business Programs
109 Mass Save Data, $.03 per lifetime kWh, 2016 actual
110 Market On-site Table C-3
111 There are also limits on municipal and national accounts, who are considered if their accounts in aggregate add up to be over the consumption cap

www.ma-eeac.org
program performance.

Table 12. Small Businesses Direct Install Eligibility Cap Comparison

<table>
<thead>
<tr>
<th>State</th>
<th>Electric Eligibility Cap</th>
<th>Gas Eligibility Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>110 kW</td>
<td>N/A</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>1,000,000-1,500,000 kWh, about 300kW</td>
<td>40,000 therms</td>
</tr>
<tr>
<td>California</td>
<td>100-500 kW</td>
<td>N/A</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>200 kW</td>
<td>40,000 therms</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>200 kW</td>
<td>No eligibility criterion</td>
</tr>
<tr>
<td>Connecticut</td>
<td>200 kW</td>
<td>No eligibility criterion</td>
</tr>
<tr>
<td>Colorado</td>
<td>100-400 kW</td>
<td>N/A</td>
</tr>
<tr>
<td>Michigan</td>
<td>400,000 kWh</td>
<td>62,000 therms</td>
</tr>
<tr>
<td>Maryland</td>
<td>60 kW</td>
<td>N/A</td>
</tr>
</tbody>
</table>

SBI costs to deliver savings are higher than other C&I initiatives. Program costs are also higher compared to many small business programs offered in other states, as seen in Exhibit 25. PAs should explore the option to offer third party financing, which may offer lower interest rates and free up program costs. In addition, vendors should explore strategies increase participation using selling points beyond incentives. Negotiated incentives geared to encourage adoption of comprehensive and high savings measures should also be used by all vendors.

Exhibit 25. Cost of Savings for Small Business Programs in 2014, National Best Practice Program Comparison

[Graph showing cost of savings for small business programs in 2014, National Best Practice Program Comparison]

112 Calculated using ACEEE Big Opportunities for Small Businesses data from Table 1.